

2016 GEORGIA PEST MANAGEMENT HANDBOOK

Commercial Edition

Special Bulletin 28, Volume I

Edited by

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With contributions from the

University of Georgia College of Agricultural & Environmental Sciences

Departments of Crop & Soil Sciences, Entomology,

Horticulture and Plant Pathology, and the

Warnell School of Forestry & Natural Resources

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The *Georgia Pest Management Handbook—2016 Commercial Edition* provides current information on selection, application, and safe use of pest control chemicals. This two-volume handbook has recommendations for controlling pests on commercial livestock, forages, pastures, row crops, vegetables, orchards, ornamentals, turf, forests, and insects of public health importance. Cultural, biological, physical, and other types of control are recommended where appropriate.

Additional information on controlling insects, plant diseases, and weeds is available in bulletins and circulars published by UGA Cooperative Extension. Your county agent will provide these publications upon request. Free publications are also available at <http://extension.uga.edu/publications>.

Recommendations are based on information on the manufacturers' labels and on performance data from research and extension trials at the University of Georgia and sister institutions. Because environmental conditions, the severity of pest pressure, and methods of application vary widely, recommendations do not imply that performance of pesticides will always be acceptable.

This publication is intended to be used only as a guide. Always follow the use instructions and precautions on the pesticide label. Trade and brand names are used only for information. The University of Georgia does not guarantee nor warrant published standards on any product mentioned; neither does the use of a trade or brand name imply approval of any product to the exclusion of others which may also be suitable. For questions, concerns, or improvement suggestions regarding the *Georgia Pest Management Handbook*, please contact Dr. Dan Horton at dlhorton@uga.edu or (706) 540-2745.

COPIES ARE AVAILABLE FOR \$50 FOR THE TWO-VOLUME SET. Purchase of the two-volume set will include an electronic copy (USB drive). Visit us online at www.ent.uga.edu/pest-management or call 706-542-2956 for information on how to order. Payments can also be made online at www.ugaextensionstore.com. Delivery by UPS will occur 7-14 business days from when the order is processed. Please provide a physical address for shipping, as UPS does not deliver to P.O. boxes. Orders can also be picked up in person in room 126 of the Hoke Smith Building on the UGA Campus in Athens, GA. Sales of books and data are considered final. Materials returned due to damage in shipping will be replaced.

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USE PESTICIDES SAFELY

Pesticides are biologically active materials applied to kill or disable target pests. Pesticides are toxins, if not handled properly, many can be dangerous, or even lethal, to non-target plants and animals, including man. Pesticide labels should be carefully followed, as they enable the applicator to use these materials in a fashion that appropriately minimizes the risks of pesticides to human health, mitigates the risks of pesticide residues in our food, minimize pesticide risks to key pollinator species such as honey bees, and encourages pesticide use patterns that slow the development of pesticide resistance in pest species. Pesticide labels, instructions affixed to all pesticide containers, provide guidelines for safe, efficient pesticide use. Pesticide labels carry the weight of law. Federal and state statutes prohibit the use of any pesticide in a manner not prescribed on the label.

Pesticide stewardship, the safe responsible use of pesticides, is a key management commitment that embraces legal requirements regulating pesticide use, while cultivating a culture of common sense and responsibility that goes beyond requirements. Conscientious pesticide stewardship is a key element in successful, justifiable use of pesticides. Pesticide users should always be aware of ethical and social issues. Commitments to worker and food safety are necessary elements of wise pesticide use. Bees and other pollinators are key providers of ecological service by enhancing fruit and seed set in numerous vegetables, fruits and wild species vital to the health of ecosystems. Honey bees are particularly important because they can be readily managed. Unfortunately, honey bees are in decline across much of the developed world. Numerous studies suggest that Varroa mites and bee diseases are primary causes of colony collapse disorder. However, pesticides, particularly insecticides, are important risk factors around heavily sprayed crops. Prudent pesticide users should proactively initiate positive relationships with beekeepers to develop and maintain a mutual appreciation for the key roles both pesticides and bees play in modern agriculture. However, other key pesticide stewardship considerations should include diligent protection of wetlands, streams and other sensitive habitats. In like fashion, protection of neighboring populated areas from pesticide runoff or drift is imperative. All pesticide users should work to minimize or slow the development of pesticide resistant pests by using IPM and rotating chemicals classes.

1. **Integrated Pest Management (IPM)** reduces dependence on pesticides by integrating nonchemical methods to help control or prevent damaging pest populations. Use IPM to make pesticide use more efficient. Ask your county agent about IPM techniques that can be used for your situation.
2. **Apply pesticides only when they are needed.** Properly identify the pest and evaluate whether it will cause enough damage to justify a pesticide application. Your local extension office can help you identify and evaluate your pest problems.
3. **Choose the correct pesticide.** Refer to the pesticide label, and other unbiased references, to make sure candidate materials are effective against your target pest(s) and registered for the site you need to treat. This handbook and your local extension office can help you choose the right pesticide.
4. **FOLLOW THE LABEL DIRECTIONS!** It is illegal to use any pesticide in a manner not prescribed on the label. Most pesticide accidents are the result of not following the directions, restrictions and precautions on the label. Avoid the temptation to use greater than the labeled rates; you increase your risks, you may cause injury or damage the site of application, and you dramatically increase your risk of adverse non-target mishaps, such as fish kills or bee kills.
5. **Prevention of adverse, non-target impacts** to people, bees and other pollinators, domestic animals, wildlife and fish should always be an overriding commitment. Careful adherence to all label precautions, close supervision of pesticide use and application of common sense are vital elements in assuring safe pesticide use.
6. **Prevent pesticide drift and runoff.** Never apply pesticide when the wind is blowing more than 5 mph or when rain is imminent. Crops that receive regular pesticide applications should not be planted near bodies of water or near sensitive areas, such as schools or wildlife habitat.
7. **Store pesticides safely.** Keep pesticides beyond the reach of children and animals. Far too many households with young children have a pesticide stored within easy reach. Keep pesticides in the original packaging with the label securely affixed. Storage areas should be clearly marked and locked. Do not store pesticides with food, feed, or clothing. Unused pesticides should be stored in their original container or package. NEVER store pesticides in any food or drink container!
8. **Wear the proper protective clothing.** Always wear the label-prescribed protective equipment, this greatly reduces your risk from mixing or applying pesticides.
9. **Measure pesticides carefully.** Mix no more pesticide than you need. It is far easier to use pesticides than to properly and safely dispose of them.
10. **Dispose of pesticide waste properly.** Refer to the pesticide label for proper disposal protocols. Empty containers that are properly rinsed, normally three times, can often be recycled or placed in landfills. Excess pesticides and rinse water can be applied to labeled sites if you will not exceed labeled rates. Contact your local landfill to determine if they accept small quantities of waste pesticides and/or properly rinsed containers.

USE PESTICIDES SAFELY

11. **Wash your hands** before you eat, drink, use tobacco or go to the restroom. Shower as soon as you can, taking care to thoroughly clean your hair and fingernails. Wash the clothes you wore while mixing or applying pesticides before wearing them again. Separate your pesticide application garments from regular household laundry, washing them in separate loads.
12. **If you or someone else is exposed to a pesticide, take immediate action.** Remove any contaminated clothing. If pesticide is on the skin, wash immediately. If pesticide is in the eye, rinse with clean water for at least 15 minutes. If pesticide is swallowed, give large amounts of water or milk to drink. **DO NOT** induce vomiting unless the label directs you to. Never give liquids or induce vomiting if a person is unconscious or convulsive. If pesticide is inhaled, move victim to fresh air. Get a copy of the pesticide label(s) off whatever material(s) the victim was exposed to. Promptly seek medical attention, be sure to bring the pesticide label(s) with the victim when they are taken to the hospital.

Selecting and Purchasing the Pesticide

1. When you choose a pesticide, consider: 1) is this pesticide labeled for use where you want to apply? 2) will your material of choice control your target pest? 3) is this material among the safest products that will control your target pest? 4) restrictions on use, 5) experience of the applicator, 6) required protective clothing, and 7) equipment needed to apply the product. You may want to choose a safer pesticide or formulation if the applicator is inexperienced.
2. Never use a restricted-use pesticide unless you or your supervisor are properly licensed through the Georgia Department of Agriculture Pesticide Applicator Licensing and Certification program (<http://www.agr.georgia.gov/pesticides.aspx>).

Transporting the Pesticide

1. NEVER transport pesticides in the passenger section of a vehicle.
2. NEVER transport pesticides with food, feed, or other products that may come in contact with humans or animals.
3. NEVER leave pesticides unattended. You are responsible for any accidents that may occur while you are away.
4. Secure pesticide containers in the back of a truck to prevent the breaks or spills that may occur when loads shift. Protect paper/cardboard from moisture.
5. Report spills on roadways immediately to the local authorities.

Storing the Pesticide

1. Pesticide storage areas should be fire-resistant, well ventilated, well lighted, locked, dry, protected from direct sunlight and insulated against temperature extremes. Access should be limited to trained adults tasked to work with pesticides. Always keep pesticides out of reach of children, untrained adults and animals.
2. Store pesticides in their original containers with intact labels. NEVER place a pesticide in a food or beverage container.
3. Do not store pesticides with food, feed or seed. Store pesticides at least 100 feet from wells and other waterways.
4. Pesticide containers should frequently be checked by trained adults for leaks or breaks. Transfer the contents of a damaged container into a replacement container with labels carefully affixed.
5. Immediately clean up any spills using label specified methods and precautions.
6. Store empty, properly rinsed pesticide containers securely until appropriate disposal is available.

USE PESTICIDES SAFELY

Mixing and Loading Pesticides

1. Carefully read the label before using any pesticide. Make sure you understand all directions and precautions. Mix only the amount you need.
2. Have an adequate supply of clean water and soap nearby.
3. Know the early symptoms of pesticide poisoning for each material you will use.
4. Be sure that emergency equipment for spills and first-aid are readily available.
5. Keep unauthorized people and animals out of the mixing area.
6. Do not work alone.
7. Work in a well-lighted and well-ventilated area, preferably outdoors.
8. Wear the protective equipment required by the pesticide label. Check protective equipment for leaks and wear. Be sure you know how to use protective equipment properly.
9. Mix in an area where spills can be contained, at least 100 feet from wells and other waterways.
10. NEVER mix pesticides near a well or where other bodies of water may be contaminated. Keep the end of the hose above pesticide/water level.
11. NEVER eat, drink, or smoke while mixing pesticides.
12. NEVER mix or load pesticides at or above eye-level. Close containers that are not in use.
13. When you are mixing or loading, stand so that wind does not blow pesticide on you.

Applying the Pesticide

1. Calibrate your application equipment so you can apply the desired rate(s). Check for leaks, clogged nozzles and excessive wear.
2. Wear the protective clothing indicated on the label. Check your protective equipment before, during, and after a pesticide application for wear or damage.
3. Clear the area of other people and animals.
4. Follow label precautions to minimize drift or run off. Spray only when there is little or no wind. Do not spray when rain is imminent.
5. Be prepared for leaks, spills or equipment failures.
6. Check the label to see what precautions are indicated. Post the area if required. Be sure that people entering the area during the re-entry interval are properly protected.
7. Notify area beekeepers far enough in advance of treatments to allow them to protect their bees.

Cleaning Equipment

1. Thoroughly clean mixing, loading and application equipment inside and out after each use.
2. Wear protective clothing while you are cleaning equipment or repairing it.
3. Take care to be sure runoff from rinsing sprayer tanks does not contaminate streams, ponds, marshes, wells or other sensitive areas.

Disposing of Excess Pesticides and Empty Containers

1. Consult the label or your local extension office for other disposal information.
2. Use excess pesticides according to label directions if possible. Follow label instructions for disposal.
3. Empty metal, plastic or glass containers should be pressure-rinsed or triple-rinsed. The rinse water should be directed back into the spray tank. Properly rinsed containers can sometimes be placed in landfills or recycled.
4. Contact your local landfill to determine their policies on disposal of appropriately rinsed pesticide containers or small properly treated volumes of unused, properly identified pesticides.

PESTICIDE EMERGENCIES

POISON CONTROL CENTER (HUMAN OR ANIMAL)

Georgia Poison Control Hotline (Spanish speakers available)

(800) 222-1222

<http://www.aapcc.org/>

SPILLS

(Georgia Environmental Protection Division)

(800) 241-4113

<http://www.gaepd.org/>

Avoid emergencies/Prepare for emergencies.

1. Maintain a communication link at your pesticide storage and mix/load site.
2. NEVER handle 'DANGER' pesticides or fumigants alone.
3. Closely supervise fumigant use. Have protective clothing available in case a rescue is needed.
4. Maintain contact with anyone using a pesticide with the signal word 'DANGER'.
5. Keep Material Data Safety Sheets readily accessible for every pesticide you use.
6. Keep protective clothing readily available wherever pesticides are stored or handled.
7. Have water available to wash pesticides from skin or eyes.
8. Store and handle pesticides in areas where spills will be contained.
9. Assemble and maintain a spill kit wherever you handle pesticides.
10. Make sure that all employees understand how to handle pesticide emergencies.
11. Be familiar with the first aid instructions on the pesticide label.
12. NEVER store pesticides around food or drink, especially avoid storage of pesticides in food or drink containers.

PESTICIDE EMERGENCIES

FIRST AID FOR POISONING

Symptoms of pesticide poisoning: nausea, vomiting, diarrhea, cramps, headache, dizziness, weakness, confusion, sweating, chills, chest pains, difficulty breathing, unconsciousness. If you have any of these symptoms while you are handling pesticides, suspect pesticide poisoning.

1. Stop the pesticide exposure as quickly as possible. **CALL 911 IF SYMPTOMS ARE SERIOUS! CALL POISON CONTROL (800-222-1222) FOR FIRST AID INFORMATION. YOU WILL NEED THE PESTICIDE LABEL.**

2. If the victim is not breathing, administer artificial respiration at once.
3. Consult the pesticide labeling if possible. Directions for first aid will be on the front panel.
4. Otherwise, follow these guidelines:

SKIN: drench skin as quickly as possible with plenty of water. Any moderately clean water can be used if not contaminated with pesticides. Remove contaminated clothing. Wash with soap if available. Dry victim and treat for shock. If skin is burned, cover with clean, loose bandage or cloth. Do not apply ointments to burned skin.

EYE: Wash eye quickly but gently. Rinse eye with clean water for at least 15 minutes.

INHALED: Move victim to fresh air. Warn other nearby people. Loosen clothing that restricts breathing. Administer artificial respiration if necessary.

SWALLOWED: Rinse mouth with plenty of water. Give large amounts of water or milk (up to one quart) to drink. Consult the label before you induce vomiting. Do not give liquids or induce vomiting to anyone who is unconscious or convulsive.

5. **Take the pesticide label with you to the doctor or hospital.** DO NOT transport pesticides in the passenger compartment of the vehicle.

PESTICIDE SPILLS

Assemble a spill kit that contains the following items.

1. Protective equipment indicated on pesticide label.
2. Absorbent material to soak up liquids (cat litter, sand, sawdust, dirt).
3. Scoop to pick up contaminated absorbent material.
4. Container for contaminated absorbent material (e.g., heavy duty plastic bag).

You may dispose of the contaminated absorbent material on labeled sites as indicated on the pesticide label. Do not exceed labeled rates.

Large spills, leaks, pesticide fires: Call Georgia DNR EPD Response Team (800) 241-4113.

Spills on public roads or other public areas: Georgia State Patrol *GSP (*477) on mobile phone.

Smaller spills.

1. DO NOT HOSE DOWN SPILLS!
2. Protect yourself and others.
3. Stop the spill sources.
4. Confine the spill with a dike of earth or other materials. Protect water sources.
5. Absorb liquids with cat litter, sand, earth, etc.
6. Scoop up contaminated materials. Store securely.
7. Neutralize contaminated site with bleach, activated charcoal, hydrated lime, or by removing contaminated soil.
8. Absorb any liquids used during neutralizing.
9. Contaminated absorbent materials or soil may be land-applied according to the pesticide label.

PESTICIDE EMERGENCIES

HEAT STRESS

Avoid heat stress.

1. Acclimate to hot weather or new strenuous activities slowly.
2. Drink plenty of water or sports drinks.
3. Take frequent breaks during hot weather.
4. Plan strenuous activities for the cooler part of the day.

Symptoms of heat stress: sweating, nausea, headache, confusion, loss of coordination, dry mouth, fainting. Severe heat stress (heat stroke) is VERY dangerous.

The EPA Guide to Heat Stress in Agriculture is available through your local Extension office.

FIRST AID FOR HEAT STRESS

1. **CALL 911 IF SYMPTOMS ARE SERIOUS!**
2. Move the victim to a cooler area immediately.
3. Cool the victim as quickly as possible by splashing cool water on them or immersing them in cool water. Do not immerse anyone who is unconscious, convulsive, or confused.
4. Remove all protective equipment or clothing that is keeping the victim too warm.
5. If the victim is conscious, have them drink as much cool water as possible.
6. Keep the victim quiet. Get medical advice.

IMPORTANT TELEPHONE NUMBERS

EMERGENCY NUMBERS

In an emergency dial 911, especially if the person is unconscious, has trouble breathing, or has convulsions.

POISON CONTROL CENTER (HUMAN OR ANIMAL)

National Poison Control Hotline (Spanish speakers available)

(800) 222-1222

Physician: _____

Ambulance: _____

FIRES, SPILLS, LEAKS, ETC.

Georgia DNR Environmental Protection Division Response Team (pesticide fires, spills, leaks) **(800) 241-4113**

County Police or Sheriff: _____

City Police: _____

Georgia Highway Patrol Post (*477) for mobile phones: _____

Fire Department: _____

ENDANGERMENT OF GAME OR FISH

Georgia Department of Natural Resources (Non-game endangered species) **(800) 241-4113**

U.S. Fish and Wildlife Service **(800) 344-9453**

PHONE NUMBERS FOR PESTICIDE INFORMATION (NON-EMERGENCY)

University of Georgia Cooperative Extension's Local County Office

1-800-ASK-UGA1

PESTICIDE INFORMATION

National Response Center – Refers caller to proper government agency for hazardous materials **(800) 424-8802 (Voice/TTY)**

National Pesticide Information Center (NPIC), Oregon State University – General information on toxicology, environmental hazard, etc. (M-F, 11 a.m.-3 p.m. EST) **www.npic.orst.edu, (800) 858-7378**

Pesticide Manufacturer – The telephone number should be listed on the pesticide label

CropLife America – General information about the pesticide industry, www.croplifeamerica.org

IMPORTANT TELEPHONE NUMBERS

PESTICIDE DISPOSAL

Georgia Department of Agriculture (800) 282-5852

EPA Hazardous Waste Hotline (Superfund) (800) 424-9346

HAZARD COMMUNICATION – Workplace Assistance

OSHA (800) 321-6742 TTY (877) 889-5627

Regional IV OSHA Office Alliance in Atlanta (678) 237-0400

EPA SAFE DRINKING WATER HOTLINE – Interprets residue data and gives EPA drinking water regulations. (800) 426-4791

Or call your local Health Department or Sanitarian. County: _____ City: _____

ENFORCEMENT OF PESTICIDE LAWS

Georgia Department of Agriculture, Pesticides Division (404) 656-4958

EPA Region IV Pesticides Section (404) 562-8956

Applicator certification to use restricted-use pesticides (800) 282-5852

Structural pest control certification (800) 282-5852

Safety/Training/Information – Dr. Milton Taylor (UGA Cooperative Extension) (706) 540-4108, mickeyt@uga.edu

WEBSITES WITH PESTICIDE INFORMATION

Ga. Integrated Pest Management (IPM) http://ipm.caes.uga.edu	Pesticide labels/MSDS from a range of companies. Daily updates at www.CDMS.net
University of Georgia Cooperative Extension http://extension.uga.edu	Crop Protection & Turf/Ornamental References – C&P Press www.greenbook.net
Georgia Department of Agriculture - Pesticide Division http://agr.georgia.gov.aspx	National Pesticide Information Retrieval System
Pesticide Licensing http://agr.georgia.gov/licensing.aspx	EPA List of Restricted-Use Pesticides www.epa.gov/opprd001/rup
American Crop Protection Association www.croplifeamerica.org	Pesticide Risks http://extoxnet.orst.edu
Pesticide Action Network North America www.panna.org	EPA Pesticide Safety Programs/Worker Protection Standard www.epa.gov/agriculture/twor.html
U.S. Fish & Wildlife Service: Endangered Species www.fws.gov	EPA Office of Pesticide Programs www.epa.gov/pesticides/
National Pesticide Information Center http://npic.orst.edu	EPA Agriculture Compliance Center www.epa.gov/agriculture/tcom.html
USDA National Organic Program www.ams.usda.gov/nop	Georgia Organics www.georgiaorganics.org

WORKER PROTECTION STANDARD

The U.S. EPA Worker Protection Standard (WPS) requires agricultural employers to provide four basic protections for their employees.

1. Employees must receive pesticide safety training.
2. Information concerning pesticides applied in the work area must be posted in a central location.
3. Employees must be excluded from treated areas or provided proper training and safety equipment if they may be exposed to pesticides.
4. Employers must supply decontamination sites (soap, water, etc.) for workers. Emergency assistance must be available for any employee injured by pesticides. For details, refer to the EPA Worker Protection Standard for Agricultural Pesticides – How to Comply (available at www.epa.gov/pesticides/safety). Additional information is available from the Georgia Department of Agriculture (800-282-5852) or University of Georgia Cooperative Extension (1-800-ASK-UGA1).

ABBREVIATIONS AND EQUIVALENTS

FORMULATIONS¹

a.i. = active ingredient	EC = emulsifiable concentrate	S = sprayable powder
AC = aqueous concentrate	EL = emulsifiable liquid	SC = spray concentrate
AS = aqueous suspension	F = flowable	SP = soluble powder
DF = dry flowable	FC = flowable concentrate	W = wettable powder
DG = dispersible granules	G = granules	WDG = water dispersible granular
B = bait	L = liquid	WDL = water dispersible liquid
D = dust	LC = liquid concentrate	WM = water miscible
E = emulsifiable	M = microencapsulated	WP = wettable powder

¹Numbers preceding abbreviations for liquid formulations equal pounds of active ingredient per gallon (e.g., 4EC = 4 lbs./gal. emulsifiable concentrate); numbers preceding abbreviations for solid formulations equal percent active ingredient by weight (e.g., 50WP = 50 percent wettable powder).

METHOD OR TIME OF APPLICATION

CR = cracking stage	PEI = pre-emergence incorporated	PRE = pre-emergence
LV = low volume	PO = post-emergence	PT = post-transplant
NS = nonselective	POT = post-emergence over-the-top	RCS = recirculating sprayer
PDS = post-emergence directed spray	PP = pre-plant	ULV = ultra low volume ²
PE = pre-emergence on surface	PPI = pre-plant soil incorporated	WICK = rope wick applicator

²Ultra low volume refers to a total spray volume of one-half gallon or less per acre.

ABBREVIATIONS AND EQUIVALENTS

MEASURES AND EQUIVALENTS

tsp.	=	teaspoon			1 teaspoon	=	4.9 milliliters
Tbs.	=	tablespoon	1 Tbs.	=	3 teaspoons	=	14.8 milliliters
fl. oz.	=	fluid ounce	1 fl. oz.	=	2 tablespoons	=	29.6 milliliters
c.	=	cup	1 c.	=	8 fluid ounces	=	236.6 milliliters
pt.	=	pint(s) (1.04 lb. of water)	1 pt.	=	2 cups	=	473.2 milliliters
pt./100	=	pint(s) per 100 gallons	1 pt./100	=	1 teaspoon per gallon		
qt.	=	quart(s) (2.09 lbs. of water)	1 qt.	=	2 pints	=	946.4 milliliters
gal.	=	gallon(s) (8.35 lbs. of water)	1 gal.	=	4 quarts	=	3.7854 liters
oz.	=	ounce			1 ounce	=	28.35 grams
lb.	=	pound	1 lb.	=	16 ounces	=	453.59 grams
in.	=	inch	1 in.	=	1000 mils	=	2.54 centimeters (25,400 microns)
ft.	=	feet	1 ft.	=	12 inches	=	30.48 centimeters
yd.	=	yard	1 yd.	=	3 feet	=	91.44 centimeters
mi.	=	mile	1 mi.	=	5280 feet	=	1609 meters (16.09 kilometers)
sq. in.	=	square inch			1 square inch	=	6.45 square centimeters
sq. ft.	=	square feet	1 sq. ft.	=	144 square inches	=	929.03 square centimeters
A.	=	acre	1 A.	=	43560 square feet	=	0.4047 hectare
cu. in.	=	cubic inch			1 cubic inch	=	16.387 cubic centimeters
cu. ft.	=	cubic feet	1 cu. ft.	=	1728 cubic inches	=	0.0283 cubic meter
cu. yd.	=	cubic yard	1 cu. yd.	=	27 cubic feet	=	0.7646 cubic meter
p.p.m.	=	parts per million	1 p.p.m.	=	1000 p.p. billion	=	1 milligram/kilogram ³
p.s.i.	=	pounds per square inch			1 p.s.i.	=	70.3 gram-force per square centimeter

³ 1 milligram/kilogram or 1 p.p.m. is equal to 1 milligram/liter of water.

SUBMITTING SPECIMENS FOR IDENTIFICATION: *COLLECTION, PREPARATION AND SHIPMENT*

INSECTS

Dan Horton, Extension Entomologist

An important function of the University of Georgia's Extension entomologists is identifying insect and mite specimens submitted by County Extension Agents. In order to obtain a correct identification, the county agent must collect and submit properly preserved specimens.

All county Extension offices are provided small vials containing a preservative, insect identification forms, and mailing tubes. Most specimens encountered are small enough to be placed in a vial containing preservative (alcohol). When possible, it is helpful to collect and submit multiple specimens of each pest for identification.

Insects may be unidentifiable after being crushed or becoming decayed. Large insects such as butterflies, wasps and beetles should first be placed in an insect killing jar and then transferred to a small, crushproof container for mailing.

Never mix moths and butterflies with other insects or put other insects into a killing jar that has previously contained butterflies or moths. Their dust-like scales quickly cover other insects, which greatly complicates proper identification.

Mites, thrips, and scale insects should be sent as you would diseased plants because they are easily damaged when handled and their characteristic appearance on the plant is often crucial to identification. If possible, small caterpillars, grubs, and maggots should be sent live in a sealed paper bag with some of the host material. Sometimes they cannot be identified until they are reared to the adult stage. If these insects cannot be sent in live, place the specimen in a vial with preservative before shipping the sample. All other soft bodied insects, ticks, mites and spiders should be placed in a vial with preservative before shipping the sample.

To obtain rapid, accurate identification of insect specimens, be sure to include the following information:

1. Locality (nearest town and county, street address if available) where specimen was collected.
2. Name of collector of specimen.
3. Date collected.
4. Host plant(s) or whatever the insects were feeding on, if applicable.
5. Stage of growth: seedling, blooming, fruiting, one week before harvest, young animal (less than three months old), mature animal.
6. Degree of infestation.
7. What, if any, chemicals have been applied.

Complete either the Homeowner Insect and Weed Diagnostic Laboratory or Insect ID form as appropriate for the sample. <http://www.ent.uga.edu/extension/insectform.pdf>

SHIPPING INSECT SPECIMENS

Address package to the appropriate clinic and/or specialists. All home and garden samples submitted from homeowners should be submitted to the UGA Homeowner Insect and Weed Diagnostic Laboratory, 210 Cowart Building, College of Agricultural and Environmental Sciences, Georgia Experiment Station, 1109 Experiment Street, Griffin, GA 30223-1797. All insects submitted dealing with row crops, forage, forestry, apiculture, commercial ornamental and turf, commercial household and structural, man, pets, livestock and poultry should be submitted to to one of the following addresses:

Extension Entomology
463 Biological Sciences Building
The University of Georgia
Athens, GA 30602

*(medical, fruit, ornamentals, turf, apiculture,
forest, pets, livestock and poultry pest samples)*

Extension Entomology Rural Development Center
P.O. Box 1209
Tifton, GA 31793

(row crop pest samples)

GUIDELINES FOR SUBMITTING DIGITAL AND PHYSICAL PLANT DISEASE SAMPLES THROUGH THE DISTANCE DIAGNOSTICS THROUGH DIGITAL IMAGING (DDDI) SYSTEM

Elizabeth Little, Plant Pathology Extension Specialist

The UGA Plant Disease Clinics provide diagnostic support for county Extension personnel and the residents of Georgia. Our services include analysis for plant disease or disorders as well as appropriate management recommendations. Our clients include Extension educators, growers, retailers, arborists, golf course managers, researchers, and homeowners. The Plant Disease Clinic works closely with the UGA Cooperative Extension county offices. The goal of our diagnostic services is to promote the most up-to-date integrated pest and disease management practices for clientele in the state of Georgia.

Contact your county office for assistance with your plant disease problem <http://extension.uga.edu/about/county>. If county Extension agents cannot provide an answer to the disease problem, they will often submit the sample to the appropriate plant disease clinic and specialist. All samples must be submitted through the county extension offices.

Instructions for Submitting Physical Samples:

The UGA Plant Disease Clinics use the Distance Diagnostics through Digital Imaging System (DDDI) to track both physical and digital disease submissions. All county Extension offices have access to the DDDI system to submit information on samples before shipping. DDDI is used by the clinics to track when samples are sent and when they arrive. Specialists use this system to return diagnoses to county offices. The DDDI system is a valuable tool for tracking disease outbreaks from year to year.

Fill out a PLANT DISEASE INFORMATION FORM for commercial samples or a HOMEOWNER IPM CLINIC form. The county Extension office should have copies of these forms and the information must be entered into the DDDI system by the county Extension office. The information on these forms is a valuable tool in the diagnostic process. Forms and more information can be found on the clinic website: <http://plantpath.caes.uga.edu/extension/clinic.html>.

If possible, ship specimens Monday, Tuesday or Wednesday. Samples shipped on Thursdays and Fridays usually take longer to reach the Plant Disease Clinic resulting in possible specimen degradation. Specimens may be sent by regular mail, delivery service such as FedEx or UPS, or by state courier. Samples that break down quickly should be shipped by express mail. Weekend deliveries are not accepted. It is advised that you place the specimen in a refrigerator over the weekend if necessary. Place prepared specimen in an appropriate-sized box.

Taking Good Images for the DDDI System:

Images can be submitted with physical samples or as just a digital submission through the DDDI system. Diseases and disorders are often influenced by conditions in the surrounding site. For dieback issues on woody plants, taking images is often vital since entire plants cannot be submitted.

Image submissions should include both close-ups of the problem and the entire plant including surrounding conditions. Images alone may not provide enough information for a complete diagnosis and a follow-up physical sample may be needed, but images are an important part of the diagnostic process.

Preparation of Physical Samples for Submission:

The ability to correctly diagnose plant diseases or disorders is only as good as the quality of the sample and the information provided on the disease submission sheet. Diagnosis of a sample that was improperly collected, packed, and/or shipped is very difficult and, often, impossible.

Place diseased specimens in a plastic bag. Disease diagnosis is usually impossible using a completely dry sample. DO NOT ADD ANY MOISTURE. Place a DRY paper towel in the plastic bag. This will absorb any excess moisture. Fleshy fruit and vegetables should be wrapped separately in paper towels. If whole plants are shipped, seal root balls in a plastic bag to keep the roots moist and to prevent contamination of the foliage. Mushrooms should be wrapped in newspaper and shipped overnight in a box; avoid using plastic bags. KEEP ALL SPECIMENS COOL. DO NOT ALLOW SPECIMENS TO DRY OUT.

SUBMITTING SPECIMENS FOR IDENTIFICATION: COLLECTION, PREPARATION AND SHIPMENT

Plant Symptoms and Specimen Selection:

Wilting, yellowing or general decline of foliage often indicates a problem with the roots or the lower stems. If practical, send the entire plant (leaves, stems, roots). Collect plants or plant parts that have early disease symptoms. Dig up carefully. **DO NOT PULL UP**—because many roots will be lost. If the entire plant cannot be submitted, images of the entire plant and site may be very useful in diagnosing the problem.

Twig and Branch Blights and Cankers. Select specimens that show recent infection. Include healthy tissues connected to diseased tissues. The problem cannot be diagnosed from entirely dead samples.

Foliage Diseases (spots, blights). Select leaves that have early or recent infections. Leaves still attached in groups are better than a few individual leaves. Marginal leaf burn symptoms usually indicate chemical injury or some type of root disorder (physiological, organic or chemical) in which case, it may be necessary to include the roots.

Turf. Remove an 8-12-inch square section of turf from the edge of the problem area so that the sample shows a range of disease symptoms. Include the intact roots with the underlying soil. Place in a plastic bag and seal. Dried out turf is very difficult to diagnose.

Fruit and Fleshy Plant Organs. Diseases of these structures require special attention. Never select a specimen that is exhibiting advanced stages of decay or disease. Select fresh specimens that exhibit early symptoms.

SHIPPING PLANT DISEASE SPECIMENS

When submitting an entire plant for diagnosis, root systems must be bagged separately to prevent soil from coming in contact with above-ground plant parts. Otherwise, place diseased specimens in a plastic bag. **DO NOT ADD ANY MOISTURE**. Place a **DRY** paper towel in the plastic bag with the specimen. This will absorb any excess moisture. Fleshy fruit and vegetables should be wrapped separately. Paper towels are better wrappings, but brown paper and newspaper are good. **KEEP ALL SPECIMENS COOL. DO NOT ALLOW SPECIMENS TO BECOME DRIED OUT AND BRITTLE.**

HOW TO SUBMIT SAMPLES FOR HOMEOWNER PLANT DISEASE DIAGNOSIS

Elizabeth Little, Plant Pathology Extension Specialist

The Plant Pathology Homeowner physical sample submission is now handled through the UGA Distance Diagnostics through Digital Imaging system. To submit a physical sample for a homeowner, navigate to <http://www.dddi.org/uga/> and login using your username and password. Upon login, select “Plant Pathology” from the side menu. The content pane to the right of the side menu will display the available forms for Plant Pathology. Choose “Digital & Physical Plant Pathology Homeowner.”

The content pane will display the client information form, which is identical to the client information form used for digital sample submissions. Select your client from the “Select Existing Client” box, or enter the client’s information in the “Client Information” form. When you have selected the client, or entered the client information, click “Continue” to go to the sample submission form.

The content pane will display the sample submission form. Enter the appropriate information in the form. Within this screen, you can select whether you are submitting a PHYSICAL, DIGITAL or PHYSICAL & DIGITAL sample. Please mark the appropriate choice and proceed by filling out the rest of the required information. Take note that all elements designated with an ‘*’ on the form are required to be completed. If one of the questions does not pertain to your situation, enter “NA” or “Not Applicable.”

When you have completed all the information on the form, click “Submit Form” at the bottom of the submission form. If you have left a required form element blank, you will receive an error message. Upon successful submission of the form, you will receive a success message with your sample tracking number and a link to generate a PDF report of your sample information. You must print the PDF/HTML sample report and enclose it with the sample to be mailed to the lab. If you do not print and enclose the PDF with your sample, your sample may not be diagnosed. Mail your physical sample and printed PDF sample report to the lab.

Your diagnosis will be handled through the UGA DDDI system, as well. Upon diagnosis, you will receive an email with your diagnosis. You may view your diagnosis in the DDDI system at any time subsequent to diagnosis.

******THERE IS A \$10 PROCESSING CHARGE FOR ALL PHYSICAL HOMEOWNER SAMPLES. PLEASE SEND A CHECK PAYABLE TO ‘PLANT DISEASE CLINIC’ ALONG WITH THE SAMPLE.**

SUBMITTING SPECIMENS FOR IDENTIFICATION: COLLECTION, PREPARATION AND SHIPMENT

Ship specimens Mondays, Tuesdays, and Wednesdays. Samples shipped on Thursdays and Fridays usually require longer to reach the Plant Disease Clinic. This often results in complete decay or drying-out of the specimen; therefore, diagnosis is greatly hindered. Place prepared specimen in a mailing tube. If specimen is too large, put it in an appropriate sized box. Fill out as completely as possible a PLANT DISEASE INFORMATION FORM (blue) for commercial samples. Address with appropriate label and send to either the Athens or Tifton Extension Plant Disease Clinics, depending on the crop involved.

Ship the following COMMERCIAL Disease Specimens Corn, Cotton, Peanut, Pecans, Tobacco, Soybeans, Vegetables and Kenaf	► To Tifton Clinic	Tifton Clinic Address UGA Plant Pathology Department Tifton Plant Disease Clinic Room 116 4604 Research Way Tifton, GA 31793
Ship the following COMMERCIAL Disease Specimens Christmas Trees, Floral Crops, Ornamental Trees and Shrubs, Fruits, Legume Forages, Forestry Trees, Small Grains, Turf, Urban Ornamental Landscape, Mushrooms and Wood Rots	► To Athens Clinic	Athens Clinic Address Plant Disease Clinic Dept. of Plant Pathology 2106 Miller Plant Sciences Bldg. University of Georgia Athens, GA 30602
Ship all HOMEOWNER Disease Specimens REGARDLESS OF CROP (no charge for community garden samples)		

NEMATODES

Bob Kemerait, Extension Plant Pathologist

I. WHY SAMPLE: Nematodes can parasitize virtually all crops and ornamental plants and can cause significant economic damage by reducing both yield and quality. Properly taken samples from small field units can reduce production costs by allowing the grower to eliminate nematode control practices where they are not needed and implement control practices where they are needed. Improper sampling or handling of samples can lead to poor recommendations and economic losses that could have been avoided.

II. WHEN TO SAMPLE: The timing of collection of nematode samples is important because nematode populations fluctuate throughout the year. Nematodes may be undetectable during the winter and early spring but increase to very high levels before harvest; following harvest, population levels may decline precipitously. Sampling when population densities are high decreases the risk of failing to detect a damaging species. The best time to collect samples is when living roots are present and nematode populations are high. For most crops, this is generally near harvest.

The optimum time to take samples for nematode assay from various Georgia crops are given below:

CROP	WHEN TO SAMPLE	COMMON NEMATODES
Cotton	September, October, November	Root-Knot, Columbia Lance, Reniform
Fruit Orchards (except peaches)	September, October	Root-Knot
Peaches	September, October (for root-knot) February, March, April (for ring)	Root-Knot, Ring
Peanuts	September, October	Root-Knot
Soybeans	September (group IV) October (groups V, VI) November (group VII)	Root-Knot, Columbia Lance, Reniform, Soybean Cyst
Tobacco	July	Root-Knot
Turfgrass warm season cool season	June, July, August September, October, April	Root-Knot, Lance, Sting, Ring
Vegetables	August, September	Root-Knot

From roughly December through March, most Georgia soils are too cold to support active root growth of warm-season crops and nematode populations exist primarily as eggs. Unfortunately, typical laboratory assays do not detect nematode eggs, so samples collected in the winter frequently fail to detect nematodes when there are actually many nematode eggs present. Failure to detect a species does not necessarily mean that it is not present because the species may be present at low levels that the random sample missed or it may be present only as eggs, which the assay cannot detect. Because of these limitations, samples should not be collected during the winter. Soil moisture should be about right for good seed germination when nematode samples are taken.

III. HOW TO SAMPLE: It is very important that the soil sample be truly representative of the area sampled. The only way to ensure this is to collect the sample from many spots around the field rather than from only 1 or 2 spots. Even if a small problem area is being sampled, soil should still be collected from multiple spots within the area being sampled. Ideally, one soil sample should be taken for every 4-5 acres, but practically, 1 sample may have to represent a much larger area of a field. The sample may represent a section that has homogeneous soil type and conditions and is farmed uniformly. The shape of a field may influence the number of acres that a sample represents. If a very large area is sampled, high-population areas will be diluted by low-population areas so that areas with nematode problems will be more difficult to identify.

Take 20-30 soil cores from random locations throughout the field. One sample should not represent more than 20 acres. If a problem area is being sampled, collect soil from the margin of the affected area. Collect soil to a depth of 8 inches (20 cm) in the root zone of living plants. Sampling depth may be different with certain crops, such as turf. Thoroughly mix the collected soil and put about 1 pint of soil into a plastic bag. **Do not take samples from extremely dry soil. DO NOT ALLOW SAMPLES TO GET HOT OR DRY!** Storing samples in an insulated cooler protects them well. Allowing samples to sit in direct sunlight or in a hot vehicle for even a short time can kill the nematodes in the sample. Nematodes must be alive for the extraction procedure to work. Killing the nematodes in the sample may result in failure to detect nematodes. Send samples early in the week so that they do not spend the weekend in transit.

NEMATODES

IV. SHIPPING SOIL SAMPLES FOR NEMATODE ASSAY: All samples for nematode assay must be submitted through your local county Extension office. Your county Extension office will send the samples to the Extension Nematology Laboratory, 2350 College Station Road, The University of Georgia, Athens, GA 30602. The results of the assay will be returned to you through your county Extension office. Samples for problem diagnostics submitted through the county Extension office of sample origin will be analyzed at no charge. Samples for purposes other than problem diagnostics submitted through the county Extension office of sample origin will be charged \$12 per sample. All other samples, including samples submitted from out of state NOT submitted through the county Extension office of sample origin, will be charged \$25 per sample.

V. SUMMARY OF HOW TO COLLECT AND SUBMIT A SOIL SAMPLE FOR A NEMATODE ASSAY

1. Collect a soil sample for nematode assay.
 - a. Take 20-30 soil cores from random locations throughout a field. If a problem area is being sampled, collect soil from the margin of the affected area.
 - b. Collect soil to a depth of 8” (20 cm) in the root zone of living plants. Sampling depth may be different with certain crops, such as turf.
 - c. Thoroughly mix the collected soil and put about 1 pint of soil into a plastic bag. Seal tightly.
 - d. Keep samples cool. Do not allow samples to dry out.
2. Fill out a “NEMATODE ASSAY FORM” for each sample. Supply all information requested. You MUST list present, past, and future crop to assist in identifying nematode problems and making management recommendations. Also list variety grown. Variety information is critical for soybeans and tobacco.
3. Carefully label plastic bags on the outside with a permanent marker.
4. Your county Extension office will send the sample to the Extension Nematology Laboratory in Athens. The results of the assay and recommendations will be returned to you through your county Extension office. Keep a record of which nematodes are found in which fields.

WEEDS

Patrick E. McCullough, Extension Agronomist-Weed Science

Correct identification may be required to ensure the proper choice of control methods. Weed specimens may be identified for you by this procedure:

1. Collect a representative specimen, preferably with flowers and fruit, but definitely with leaves, stem and roots.
2. Place specimen between sheets of newspaper and mail in a padded envelope. DO NOT send specimens wrapped in wet paper towels and sealed in plastic bags. (Aquatic plants may be shipped in moist paper towels in a zip lock bag.)
3. Send a letter with at least this information:
 - a. Associated desirable plants, type of turfgrass or crop.
 - b. Degree of infestation and size of the weed.
 - c. If control suggestions are required.

SHIPPING WEED SPECIMENS FOR IDENTIFICATION

Send the specimen to the weed scientist who has responsibilities for weed control on the site or crop where the weed was found:

Dr. Patrick McCullough
Crop and Soil Sciences
1109 Experiment Street
UGA-Griffin Campus
Griffin, GA 30223-1797

Responsibilities
Forages, Noncropland
Turfgrasses (commercial)

Dr. Stanley Culpepper
Horticulture Building
P.O. Box 748
Tifton, GA 31793

Responsibilities
Cotton, Vegetables
Small Grains, Pecans

Dr. Eric Prostko
Horticulture Building
P.O. Box 748
Tifton, GA 31793

Responsibilities
Corn, Sorghum
Peanuts, Soybeans
Canola

Dr. Gary Burtle
Plant Science Building
P.O. Box 748
Tifton, GA 31793

Responsibilities
Aquatic Weeds,
Fish

Mr. Wayne Mitchem
Mountain Horticultural
Crops
Research & Extension
Center
455 Research Drive
Fanning Bridge Road
Mills River, NC 28759

Responsibilities
Apples, Peaches
Grapes, Muscadines,
Pecans

Dr. Mark Czarnota
Horticulture
1109 Experiment Street
UGA-Griffin Campus
Griffin, GA 30223-1797

Responsibilities
Blueberries
Christmas Trees
Ornamentals

Lisa Ames
UGA Homeowner Insect
and Weed
Diagnostic Laboratory
210 Cowart Bldg.
UGA-Griffin Campus
1109 Experiment Street
Griffin, GA 30223-1797

Responsibilities
Home Gardens
Home Lawns

SUBMITTING SPECIMENS FOR IDENTIFICATION: COLLECTION, PREPARATION AND SHIPMENT

FISH

Gary J. Burtle, Animal and Dairy Scientist

GUIDELINES FOR SUBMISSION FOR DIAGNOSTIC SERVICE

In the case of fish kills suspected to be the result of diseases, parasites, insecticides, and other chemicals, fish specimens may have to be examined to confirm the problem. It is very important that the fish arrive at the laboratory in a usable condition.

A. Diseases and Parasites:

The Veterinary Diagnostic Laboratories located at the College of Veterinary Medicine, Athens and Tifton, as well as the Extension Fisheries Specialist, offer services in the area of fish problems. Assistance is available to veterinarians, county Extension agents, fish farmers, or other interested individuals. Specimens of fish should be submitted in the following manner:

1. Live fish showing signs of disease are always preferred for examination. Small livefish should be placed in a 5-gallon plastic bag half-full of water and topped off with air or, preferably, oxygen. Seal the top of the bag. This is the most desirable sample to deliver to a lab. An aerated container may also be used to hold water and fish during transport.
2. Dead fish should be placed in plastic bags without water and sealed. These bags should be placed in an insulated shipping container with an ice pack for shipment. For fish diseases, Do Not Freeze!! Fish must be freshly dead for a diseased sample to be useable. When pesticide kills are suspected, fish may be frozen prior to shipment (see section B below).
3. Preserved fish or fish organs should be placed in 10% formalin (10 parts formalin + 90 parts water) in a plastic container. In some case, 70% ethyl alcohol may be used as a preservative. Use this method only after calling a laboratory for instruction.
4. Call the appropriate laboratory before the shipment is dispatched to ensure personnel will be available to take care of the specimens when they arrive. Fees are charged for Veterinary Diagnostic Laboratory services.

Direct courier is the only way to ensure that specimens will arrive at the laboratory in a usable condition. Commercial transportation, bus, UPS, mail, etc., are usually unsatisfactory as methods of sending live or fresh fish specimens to the laboratories. The results from the laboratory are only as good as the specimen submitted.

Regardless of the method chosen for submission of fish samples, it is important that a detailed written history be submitted including: name and address, water temperature, amount of water in tank or pond, number of fish and the species, feeding schedule and type of feed, any antibiotic or chemical therapy, changes in color or swimming ability of fish, duration of illness, and number of fish lost. In all aquaculture cases, report dissolved oxygen, nitrite, total ammonia, Ph, alkalinity and chloride if possible. A sample of pond water (at least 125 milliliters) should be sent along with the fish. Submit 2 but no more than 5 fish from the affected population in the sample for fish disease analysis.

Samples should be transported to the laboratory by the fastest means possible. A visit to the farm by specialists may be necessary for better understanding of a fish kill, but the best information may be obtained on the day the fish kill began.

The Athens Veterinary Diagnostic Laboratory is located at the College of Veterinary Medicine, Room 501 DW Brooks Drive, Athens, Georgia 30602; GPS Co-Ordinates: Latitude 33.940590 Longitude -83.374870. Laboratory hours are 8 am-5 pm, Monday-Friday. The telephone number is 706-542-5568, call to request UPS shipping labels. For immediate service, an appointment is needed.

The Tifton Veterinary Diagnostic and Investigation Laboratory is located at the intersection of I-75 and Brighton Road, Tifton, GA. The contact telephone number is 229-386-3340. Call to request UPS shipping label. For immediate service an appointment is needed. Call 229-386-3364, gburtle@uga.edu, Dr. Gary Burtle, for assistance. Use the Distance Diagnostic Digital Imaging System when possible to submit images of fish showing disease signs.

B. Insecticides and Other Chemicals (analysis by Agricultural and Environmental Services Laboratory, Athens):

1. Live fish should be collected, wrapped in tin foil, and frozen before shipping. Obtain information about the identity of the suspected chemical.
2. Frozen fish (foil wrapped) should be packed in plastic bags without water and sealed. Place bags in an insulated shipping container along with sufficient ice packs for shipment.
3. Call the Pesticide & Hazardous Waste Laboratory (AEL), 2300 College Station Road, Athens, Georgia 30602-4356, at 706-542-9023, to ensure personnel will be available to take care of the specimens when they arrive and to discuss fees for service.
4. Direct courier is the best way to ensure specimens will arrive at the laboratory in a usable condition. Commercial transportation, such as a bus or UPS is satisfactory; that is, as long as the transit time is short enough to ensure the fish will arrive still frozen.
5. A minimum of 30 grams (1 oz) of fish must be submitted for analysis.

FISH HABITAT: WATER SAMPLING PROCEDURES

Containers:

1. Plastic 500 mL bottle for all analyses except pesticides and heavy metals.
2. Glass 1000 mL amber bottle with tin foil lined lid for pesticides and heavy metals analyses. Two samples should be submitted: one each for pesticides and heavy metals. These bottles are available from the Agricultural and Environmental Services Laboratory, Athens.

Method of Sampling (as soon as possible after a fish kill):

1. Samples should be collected at multiple locations in the pond and pooled for the sample submission. Sample pond water from 6" below the water surface and about 1 foot above the pond bottom in at least 3 locations around the pond. Pour the samples into a clean plastic bucket, then fill the 1,000 mL amber glass containers for analysis (See the AEL Fee Schedule for sample handling tips). Refrigerate but DO NOT FREEZE glass bottles.
2. Water should not be sampled near any inflows that might dilute the sample, but should represent the area of fish death.
3. Care should be taken not to contaminate samples with mud, plant or insect material. Contact the Extension Fisheries Specialist before submitting a water sample for analysis to discuss the identity of the suspected chemical.
4. If pollution of a public waterway is involved, contact the Georgia Department of Natural Resources, pollution hotline, 1-800-241-4113.

WATER SAMPLES FOR ALGAL TOXIN ANALYSIS

The Agricultural and Environmental Services Laboratories (AESL) has existing tests for fishponds (W1 and W18) that help characterize conditions that may be conducive for algal growth. A new test protocol has been developed that includes these tests as well as algal genus and species identification (Test 1). If this test confirms that toxic algae are present at greater than 2,000 cells/mL, additional testing on chemical characterization of the toxin as well as quantification of the toxin level is highly recommended (Test 2). Sample volume requirements for the tests are the following:

Test 1. Water quality and algal identification—two 125 ml, plastic or Nalgene containers wrapped with aluminum foil.

Test 2. Toxin identification and concentration—one 125 ml, plastic or Nalgene container wrapped with aluminum foil.

Water Sample Collection for Test 1 (two 125 ml):

- Collect water samples from several different areas around the pond as far from the bank as possible during the early afternoon (if possible).
- Hold the container(s) under water and let it fill completely.
- Mix all of the collected water together in one large, clean container (ex. bucket/pail) that has been pre-rinsed with water in the pond.
- Pour water from the composite sample into 2 plastic or Nalgene bottles provided for this purpose. Cap tightly. Each bottle holds 125 ml. One bottle is sufficient for water quality test, and the other bottle for algae test.
- Wrap each bottle with aluminum foil to keep light from promoting algal growth during transit.

Water Sample Collection for Cyanobacteria (for toxin screening, 125 ml), Test 2:

- Collect surface water sample(s) from the downwind side of the pond during the early afternoon. This is typically where a scum will develop if a cyanobacteria bloom is present.
- Hold the plastic or Nalgene container at the surface and let it fill completely.
- Wrap the bottle with aluminum foil to keep light from promoting algal growth during transit.
- Ship samples, check payment, and submission form by UPS overnight to:
Soil, Plant, and Water Laboratory, University of Georgia, 2400 College Station Road, Athens, GA 30602

VERTEBRATES

Mike Mengak, Wildlife Specialist

(Hand carry or mail specimen to Mike Mengak, Wildlife Specialist, Warnell School of Forestry and Natural Resources, The University of Georgia, Athens, Georgia 30602 – Telephone Number (706) 583-8096, FAX Number (706) 542-8356, Email mmengak@uga.edu).

LIVE SPECIMENS

Live organisms may be held for several days pending identification and later released. The key is to provide air, moisture, water, and, sometimes, food. Keep from direct sun, excessive heat and freezing temperatures. All wildlife can carry potentially harmful diseases and care should be taken when handling live animals. Most, including snakes, are protected by law. A permit from the Georgia Department of Natural Resources is required before collecting nearly all specimens.

Snakes and Lizards

Place in a bag of tight-weave cloth or container with a tight-fitting, perforated lid. Include a handful of damp leaves or moss. Keep at room temperature and out of the sun. Specimens can survive without food for a week or more. Place snakes in a container with water for a few hours every few days. Spray water in container with lizards; they will lap water drops.

Frogs, Toads, and Salamanders

Place in a cloth bag with plenty of damp leaves or moss. Sprinkle bag with water as necessary to keep moist.

Aquatic Salamanders and Tadpoles

Care for as live fish.

DEAD SPECIMENS

Rodents and Other Small Vertebrates

Small mammals taken from traps and other dead vertebrates, such as reptiles and amphibians, can be preserved in 10% formalin solution (1 part formalin to 9 parts water). Seventy to eighty percent (70-80%) alcohol will also do as a preservative. Inject body cavity or pierce in several places. Place in plastic bottle with a tight-fitting lid. Pack jar in mailing tube or well-made cardboard box. Contact package service or postal service prior to shipping specimens.

Dry animal parts, such as skulls or pieces of skin, can be placed in mailing tubes. Pack with crumpled paper. Accurate identification is easier with whole specimens in good condition. Skulls (cleaned and free of insects or tissue) are best for identification of mammals.

DIGITAL PHOTOS

Often digital photography provides enough information for an identification. You can photograph many kinds of small animals – alive and dead. You can easily photograph harmless snakes, frogs, turtles, lizards, etc. Use a setting that will show pattern. **Use adequate light and a neutral background.** Take several pictures from various angles. For snakes and lizards, photograph head, face, belly and back, showing all lines or patterns. Mail or email the photo to the wildlife specialist.

PESTICIDES, FUMIGANTS, TOXICANTS

Use of poisons may be restricted to licensed pesticide applicators only. Always consult the label of a current product for expiration data and legal restrictions on use and application. Always conform to pesticide labels but use caution if working with older formulations or products – the EPA registration may have expired.

Current information on pests and pesticide products can be found by searching EPA websites, state registration websites, other online sources or contacting your local county agent.

Additional information on pesticide use can be found at www.kellysolutions.com/ga/searchbypest.asp.

PESTICIDE SAFETY AND OTHER PESTICIDE INFORMATION

Milton Taylor, Associate Coordinator, Pesticide Safety Education Program (PSEP)

PESTICIDE POISONING—Symptoms of pesticide poisoning may include headache, pin-point pupils, blurred vision, weakness, nausea, cramps, diarrhea, and chest discomfort. If symptoms occur during or within 24 hours after mixing, loading, application, or any accidental exposure, stop work at once and take care of individuals who may have been poisoned. Be familiar with the label first-aid statements prior to finding someone in trouble, but the basic rule to remember is, “Dilute the pesticide.” If pesticide is spilled on the skin, immediately remove contaminated clothing and wash the area gently but thoroughly with large amounts of soap and clean lukewarm water. If pesticide gets in the eye, flush the eye for 15 minutes with a gentle stream of clean water or eyewash solution. If pesticide is inhaled, move to open, clean air and have the person lay down. If pesticide is ingested rinse out the mouth and follow the pesticide label directions for first aid. If the situation indicates, give CPR. **Immediately contact your physician, local emergency room, or poison control center (1-800-222-1222) and transport the victim to the nearest medical care facility. Take the pesticide label with you or have others get it to the facility. Do not transport the pesticide container in the vehicle with the victim** or allow other people or objects to become contaminated by the pesticide.

Failure to follow pesticide label precautions can lead to lethal consequences for pesticide handlers, especially with overexposure to organophosphate or carbamate insecticides/nematicides. **Follow all label safety precautions.** Be especially aware of proper hygiene during mixing, loading, and application. More than 90 percent of occupational exposure is through the hands and forearms. Use chemical resistant gloves (nitrile, butyl rubber, etc.). Rubber boots prevent acute exposure from spills and chronic exposure from accumulation of residues in materials of boots and shoes. **The Personal Protective Equipment (PPE) on the pesticide label is not a suggestion – it is the legally required minimum protection for pesticide use.**

PESTICIDE SIGNAL WORDS—In order from most dangerous to least: **Danger Poison** accompanied by skull and crossbones means *a few drops to a teaspoon can kill*; **Danger** indicates **eye and skin damage concerns are greater than acute lethal toxicity** (even though it can kill at small doses); **Warning** indicates moderate toxicity **where one to two tablespoons can kill** and **eye and skin damage** are of moderate concern; **Caution** indicates slight toxicity where it takes a pint or more to kill and eye and skin effects are mild or slight. Pay particular attention to labels on pesticides displaying a Warning signal word for they often are of serious concern for multiple routes of entry.

CLASSIFICATION OF PESTICIDES—Pesticides that the U.S. Environmental Protection Agency determines need additional regulatory restrictions to avoid unreasonable adverse effects on humans (handlers), other organisms, or the environment are classified as **Restricted Use**. Restricted Use pesticides may only be purchased and applied by certified licensed applicators or under their direct supervision. Lower risk pesticides are classified as “General Use.” General Use pesticides may be purchased by the general public. All pesticides must be strictly applied according to their label directions.

RECORD KEEPING—In Georgia licensed pesticide contractors must keep a record of all pesticide applications that are made as a part of their business. Any licensed Commercial Pesticide Applicator who is not operating under a Pesticide Contractor’s License must keep a record of all restricted-use pesticide applications. Licensed Private Applicators are required to keep records of their use of restricted-use pesticides unless they fall under EPA’s Worker Protection Standard Regulations, when all applications must be recorded. Georgia requires all records of pesticide application include the date and time of application; the name of person for whom it was applied; the location of application site; the crop or target to which it was applied; the acreage, size of area treated, or total amount of pesticide applied; the target pest; the pesticide used and the application rate; the type of equipment used; the name of the applicator; a notation of any unexpected occurrence at or during application, such as spillage, exposure of humans or non-target animals, or drift, and any corrective or emergency action taken; and the names, concentrations and quantities of all pesticides disposed of and the manner of their disposition.

LICENSING OF APPLICATORS—The Georgia Department of Agriculture has specific pesticide licensing and recertification requirements. Restricted Use Products (RUP) may only be purchased and applied by licensed certified applicators or persons under their direct supervision. Commercial applicators are required to pass a core test and one or more category tests to become a certified licensed applicator. The license lasts for five years and requires the applicator to achieve specific numbers of continuing education credits/hours at least 90 days prior to the license expiration date. Private applicators must complete a training program with their local County Extension Agent and certify that they are engaged in the production of an agricultural or forestry commodity. They must achieve three credit hours of continuing education at least 90 days prior to their license expiration date. Check with your County Agent for licensing, document requirements, and continuing education programs.

PESTICIDE LEGISLATION, REGULATIONS AND CERTIFICATIONS

Milton Taylor, Associate Coordinator, PSEP

INTRODUCTION

Pesticide production, transportation, distribution, sale, use, application, storage and disposal in Georgia are regulated under both federal and Georgia laws. The federal laws are the Insecticide, Fungicide, and Rodenticide Act and the Food Quality Protection Act. The state laws are the Georgia Pesticide Use and Application Act of 1976 and the Georgia Pesticide Control Act of 1976. The federal laws, are enforced by the administrator of the Environmental Protection Agency (EPA). The Georgia laws are enforced by the Commissioner of Agriculture through the Pesticides Division of the Georgia Department of Agriculture.

Many features of the Georgia laws are necessary to comply with FIFRA and FQPA as amended and requirements laid down by EPA. The Georgia statutes authorize the Georgia Department of Agriculture to perform certain necessary functions that benefit the pesticide industry, pesticide users and consumers.

USE INCONSISTENT WITH LABEL IS UNLAWFUL

Pesticides that are shipped, distributed or sold in this country must be registered with EPA and bear the proper label. In Georgia they must also be registered with the Pesticides Division of the Georgia Department of Agriculture. The amended FIFRA makes it unlawful to “use any registered pesticide in a manner inconsistent with its labeling.” The Georgia Pesticide Control Act of 1976 makes it unlawful “for any person to use, or cause to be used, any pesticide in a manner inconsistent with its labeling...” FIFRA also makes it unlawful to make any recommendation for a pesticide use that is not in compliance with the label. Specific deviations from the label are permissible in narrowly defined fashions. One may:

- 1) Apply a pesticide at any dosage, concentration or frequency less than that specified on the label.
- 2) Apply a pesticide against any pest not specified on the labeling if the crop, animal or site is listed and if the labeling does not prohibit such a use.
- 3) Use any application method not prohibited by the labeling, e.g., aerial application.
- 4) Mix a pesticide with fertilizer if not prohibited by the label.
- 5) Use a pesticide differently from the label in conformance with FIFRA Sections 5 (Experimental Use Permits), 18 (Emergency Exemptions for Governmental Agencies), and 24 (Special Local Needs Registration).

Federal and state laws regulate use of the particular product or trade name, not merely the active ingredient or the type of formulation. Even though two products utilize the same active ingredient in a similar formulation, it is unlawful to use a particular brand for a use that is not included on the label. For example, Roundup(TM) and Rodeo(TM) utilize the same active ingredient in a similar formulation, but it is unlawful to use Roundup(TM) to control aquatic weeds, as this use is not included on the label.

RESTRICTED USE PESTICIDES (RUP)

Restricted use pesticides are more toxic than unrestricted pesticides. Restricted use pesticides must be clearly identified. The words “Restricted Use Pesticide” will appear at the top of the pesticide label. To use RUPs in Georgia, you or your supervisor must be licensed by the Georgia Department of Agriculture. An overview of the pesticide licensing process in Georgia follows.

CERTIFICATION AND LICENSING

Who needs a pesticide applicator’s license?

If you wish to purchase or use a restricted-use pesticide (RUP), you or your supervisor must have a pesticide applicator’s license from the Georgia Department of Agriculture. Any business that operates as a pesticide contractor must have at least one employee with a commercial pesticide applicator’s license.

PESTICIDE LEGISLATION, REGULATIONS AND CERTIFICATIONS

CERTIFICATION AND LICENSING

What is the difference between a private license and a commercial license?

Private licensees may apply RUPs and they can supervise employees who use RUPs to produce agricultural commodities on the licensee's property or the property of your employer. Private pesticide licensees may only apply RUPs to someone else's property if they are not paid for their service. An agricultural commodity includes any plant, plant part, animal or animal product produced primarily for sale (including general use pesticides).

Commercial licenses allow one to apply pesticide to the property of others for money. If you are a pesticide contractor (see below), at least one employee must have a commercial pesticide license to apply any pesticide for a fee.

Do all of my employees have to have a pesticide license?

No. Only the supervisor is required to have a license. Keep in mind that the license-holder is responsible for the actions of everyone that he or she supervises.

What do I need to start a pesticide applicator's business?

You will need a commercial pesticide applicator's license, a pesticide contractor's license, and you must register power application equipment with the Georgia Department of Agriculture. If you wish to start a business to control structural pests (e.g., termites, roaches), you should contact the Georgia Department of Agriculture at (800) 282-5852 to request an application packet. You must have a four-year degree in entomology (or a related field) or two years of experience.

How often will I have to take the test?

You will only have to retake the tests if you allow your license to expire.

Private applicators must receive three hours of recertification credit in five years. You must either complete recertification 90 days before your license expires or repeat the certification exercise.

Commercial applicators must have six or more hours of recertification in five years, depending on the specific category or categories they have. You must complete your recertification 90 days before your license expires or retake the tests. Check the Georgia Department of Agriculture web site for recertification opportunities www.kellysolutions.com/ga/.

How can I find how many recertification hours I have?

Check the Georgia Department of Agriculture web site <http://www.kellysolutions.com/ga/>.

Is my pesticide license valid in other states?

Georgia has reciprocal agreements with Alabama, Florida, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee. If you have a private pesticide applicator's license from Georgia, you may use RUP in any of these other states. If you have a commercial license from any of the cooperating states, you may obtain a reciprocal license from the others without taking their certification tests. Contact the Department of Agriculture for the state in which you are interested.

Who needs a pesticide contractor's license?

Any company or individual that applies pesticides for a fee must have a pesticide contractor's license. Contact the Georgia Department of Agriculture (404-656-4958). There is no test, but you must pay an annual fee of \$55 and demonstrate proof of financial responsibility. You must have at least one certified commercial applicator employed full-time, even if you do not use RUP.

What do aerial applicators need?

The business must have a pesticide contractor's license. All pilots must meet all FAA and Georgia aeronautical requirements and have a commercial pesticide applicator license. Mississippi and Georgia have a reciprocal agreement concerning aerial application, which includes plant agriculture, aquatic, forestry, and right-of-way.

Where can I get more information?

- 1) Your local Extension office, <http://extension.uga.edu/about/county>
- 2) Georgia Department of Agriculture (800-282-5852)
- 3) UGA Pesticide Safety Education Program Coordinator (Milton Taylor, 706-540-4108 or mickeyt@uga.edu)
- 4) www.ent.uga.edu/pesticide.htm

PESTICIDE LEGISLATION, REGULATIONS AND CERTIFICATIONS

How do I get a pesticide license?

To obtain private or commercial pesticide licenses, you must follow these steps:

1. **Private Pesticide Applicator Licenses** are obtained under the direction of your local Cooperative Extension Office. To get a private license, contact your local extension office, <http://extension.uga.edu/about/county>. You will have to complete a training exercise. **Unless you produce an agricultural commodity, you do not qualify for a private license.**
- 2a. **Georgia Commercial Restricted Use Pesticide License Study Guides** may be obtained from the University of Georgia, College of Agricultural and Environmental Sciences, Office of Communications & Creative Services, (706) 542-2956, <http://ugaextensionstore.com>
- 2b. **Testing** for Commercial Pesticide Licenses follows after mastering the information in your study guide(s). You will be required to demonstrate your competency by successfully passing the appropriate category exam(s) with score(s) of 70% or higher. Commercial Pesticide Applicator License testing is administered by your local University System of Georgia Technical College for a fee of \$45 <https://www.gapestexam.com/TestingCenters.cfm>.
3. **Licensing.** After successfully passing the appropriate category exam(s) and paying a \$90 licensing fee to the Georgia Department of Agriculture, you will be issued your license(s). GA Dept Ag, 1-800-282-5852 or (404) 656-3645

COMMERCIAL PESTICIDE APPLICATOR LICENSE FEES

Category, Subject	Category Study Guide	General Standards Study Guide	Technical College	Georgia Department of Agriculture	Total Cost
Category 21, Plant Agriculture	15.00	30.00	45.00	90.00	160.00
Category 22, Animal Agriculture	10.00	30.00	45.00	90.00	155.00
Category 23, Forest	15.00	30.00	45.00	90.00	165.00
Category 24, Ornamental & Turf	25.00	30.00	45.00	90.00	175.00
Category 25, Seed Treatment	10.00	30.00	45.00	90.00	156.00
Category 26, Aquatic	10.00	30.00	45.00	90.00	156.00
Category 27, Right-of-Way	10.00	30.00	45.00	90.00	157.00
Category 27, Sewer Line Chemical Pest Control (Metam-Sodium)	10.00	30.00	45.00	90.00	150.00
Category 31, Public Health	15.00	30.00	45.00	90.00	162.00
Category 32, Regulatory (for government employees only)	10.00	30.00	45.00	90.00	157.00
Category 33, Demonstration & Research	Free	30.00	45.00	90.00	150.00
Category 34, Aerial	15.00	30.00	45.00	90.00	150.00
Category 35, Industrial, Institutional & Health Related	15.00	30.00	45.00	90.00	162.00
Category 36, Wood Treatment	10.00	30.00	45.00	90.00	157.00
Category 37, Antimicrobial	10.00	30.00	45.00	90.00	160.00
Category 38, Agricultural Commodity Fumigation	10.00	30.00	45.00	90.00	157.00
Category 39, Antifouling Paints	5.00	30.00	45.00	90.00	155.00
Category 41, Mosquito Control	30.00	30.00	45.00	90.00	175.00

PESTICIDE LEGISLATION, REGULATIONS AND CERTIFICATIONS

PESTICIDE REGISTRATION

Producers occasionally face pests for which there are no registered pesticides. These situations are likely to become more common as international trade expands. However, there are some programs that can help.

Emergency exemptions. The EPA will allow emergency exemptions (Section 18) to use unregistered pesticide under special circumstances. You will need to work with the Cooperative Extension Service and the Georgia Department of Agriculture to obtain an emergency exemption. Visit www.epa.gov/opprd001/section18

Minor use registrations (IR-4). Minor crops and minor uses often lack needed pesticides. IR-4's Minor Use Registrations Program may be able to register critical minor-use pesticides. Visit www.IR4.rutgers.edu for details or contact Stanley Culpepper at 229-386-3328, stanley@uga.edu.

WASTE DISPOSAL

Local landfills have the right to refuse any pesticide, no matter how it is presented. The best method to dispose of mixed pesticides or rinse water is to apply them on the crops or sites for which they are labeled. It is very important to contact your local landfill in advance to determine if it will accept small quantities of unused pesticide that has been absorbed in cat litter and bagged. Have in-hand copies of pesticide(s) labels you would like your local landfill to accept when you contact them.

Triple-rinsed (or equivalent), used containers can often be disposed of in permitted sanitary landfills without an ID number or further regulation.

Georgia Environmental Protection Division (EPD) permits landfill disposal of small quantities of certain concentrated pesticides as long as they are absorbed and bagged. Under EPD guidelines, up to 2.2 pounds of a Category I, Highly Toxic pesticide may be taken to a sanitary landfill. Liquid formulations must first be absorbed by kitty litter or similar materials and contained in plastic bags. Up to one gallon of liquid Category II, Moderately Toxic pesticide may be taken to a sanitary landfill per visit. If you have more than one gallon, but less than 220 pounds (about 25 gallons), you may take it to a sanitary landfill, but not in a liquid form. It must be absorbed and bagged as described above. If in one month you generate more than 220 pounds of toxic pesticide waste or more than 2.2 pounds of acutely hazardous pesticide waste, you must contact EPD for special instructions.

For current information on compliance, location of permitted sanitary landfills and technical assistance contact Georgia Environmental Protection Division Hazardous Waste Management Program (404) 656-2833. In emergencies call the EPD Response Team at (800) 241-4113 (continuous service). Both EPD and the Georgia Department of Agriculture Pesticides Division (800-282-5852) must be notified of fires, spills, etc. that might endanger the public or the environment.

OSHA AND THE HAZARD COMMUNICATIONS STANDARD

The purpose of the OSHA Standard Act of Congress, 1987, was to provide employers and employees with information regarding hazardous chemicals, including certain pesticides. The basic document involved with this information procedure is the Material Safety Data Sheets or MSDS.

Basic manufacturers and importers are required by OSHA to provide the immediate customer a single MSDS with each shipment of hazardous chemicals. Dealers and formulators are required to have lists of what chemicals are considered hazardous. Employers who use such hazardous chemicals must keep the MSDS on file and available to workers. The employer must teach all workers to read the sheets as part of the safety training program. Visit www.osha.gov.

PESTICIDE LEGISLATION, REGULATIONS AND CERTIFICATIONS

PESTICIDE RECORD KEEPING REQUIREMENTS (RUP, WPS, AND PESTICIDE CONTRACTORS)

Records of applications of Restricted Use Pesticides (RUP) must be kept for two years from the date of application. The pesticide label will identify a RUP on the front panel. The information should be recorded within 14 days of application. We recommend indefinite electronic archiving of all pesticide use records. Records of proper pesticide use will protect you if you face legal action concerning pesticide liability.

Georgia regulations require that all pesticide contractors keep records of ALL pesticide applications, RUP and general use. Record the following information.

- the date and time of the application
- the pesticide brand or product name
- the EPA registration number
- the crop, commodity, stored product, or site treated
- the total amount of pesticide applied
- size of the area treated
- name and license number of the applicator
- location of the applicator
- rate of pesticide application
- target pest
- application equipment
- method of pesticide disposal
- accidents/pesticide spills and corrective actions

For more information about recordkeeping visit, www.ams.usda.gov/science/sdpr.htm

Federal and state Worker Protection Standard and Pesticide Contract Applicator applications records are largely redundant. Federal requirements are shown for reference.

All applicators must record the following information for federal RUPs:

- the month, day, and year of the application
- the pesticide brand or product name
- the EPA registration number
- the crop, commodity, stored product, or site treated
- the total amount of RUP applied
- size of the area treated
- name and certification number of the certified applicator
- location of the application

The law provides four options for recording the location:

- identify the county, range, township, and section
- maps or written description
- a map and numbering system as used by Natural Resources Conservation Service or Consolidated Farm Service Agency
- a legal property description

There is no required form. There is no reporting requirement. Instead, records must be submitted if requested by:

- USDA
- Georgia Department of Agriculture
- Licensed health-care professionals who require the information to treat a person who may have been exposed to the RUP for which the record is maintained. In this case, the applicator may submit the record “information” rather than the record itself.

PESTICIDE LEGISLATION, REGULATIONS AND CERTIFICATIONS

There are special guidelines for recording a spot treatment application. A spot treatment is defined as treating an area during one 24-hour period that is less than one-tenth of an acre. Greenhouse and nursery applications are NOT spot treatments. When making a spot treatment of a RUP, applicators must record:

- pesticide brand or product name
- EPA registration number
- total amount applied
- the location designated as “spot treatment” (e.g., ‘plot adjacent to spray shed’)
- date of application

The law provides for penalties for failure to keep RUP records. For the first violation, the penalty is not to exceed \$500. For subsequent violations, penalties will not be less than \$1000, unless it is determined that a good-faith effort had been made to comply.

The Worker Protection Standard requires you to record the following information concerning applications of ALL pesticides, RUP and general use.

- location and description of treated area
- product name, EPA registration number, and active ingredient(s)
- time and date of application
- restricted entry interval (REI)

WPS requires that you keep this information for 30 days after the REI expires. However, WPS have been requested as evidence of proper pesticide use long after the 30 day mandate. We recommend that you maintain computerized records indefinitely.

PESTICIDE RATE AND DOSAGE CALCULATIONS

Milton Taylor, Associate Coordinator, PSEP

HOW TO CALCULATE PESTICIDE DILUTIONS AND DOSAGES FOR LARGE AREAS

Pesticides for use in sprays are generally available as wettable or soluble powders and as liquid concentrates. These must be diluted, usually with water, before use. Other diluents, such as deodorized kerosene, may be used for special applications.

The precise amount of water applied to an acre (or other given area) is of modest concern as long as gallonage falls within a recommended range, delivers the recommended amount of pesticide, provides adequate coverage, and does not result in excessive runoff or drift. If you know the area (acres, sq. ft., etc.) or units (trees, cows, etc.) covered by a given amount of spray you can determine the dosage or rate of active ingredient each receives by adding the proper quantity of pesticide to that amount of water. Dusts and granules are applied without dilution by the user. Therefore the amount applied per acre or unit is much more critical because you have no other way of controlling the dosage or rate of active ingredient.

The amount of active ingredient in liquid concentrates is expressed in pounds per gallon. In granules, dusts, wettable or soluble powders, and other solids it is nearly always expressed as percent by weight. Application rates are usually expressed as amount of pesticide product but some- times they may be expressed as pounds of active ingredient or actual toxicant. Actual toxicant and active ingredient are practically synonymous.

1. To find the pounds of wettable powder (WP), dust (D) or granules (G) per acre to obtain the desired pounds of active ingredient (a.i.) per acre:

$$\text{lbs. of WP, D or G per acre} = \frac{\text{lbs. a.i. desired} \times 100}{\% \text{ a.i. in WP, D, or G}}$$

2. To find the pints of liquid concentrate per acre to obtain the desired pounds of active ingredient (a.i.) per acre: pints of liq.

**If you want the answer in gallons, quarts, or fluid ounces substitute 1, 4, or 128 respectively for 8.*

$$\text{conc. per acre} = \frac{\text{lbs. a.i. desired} \times 8^*}{\text{lbs. a.i. per gallon of liq. conc.}}$$

3. To find the amount of wettable powder (WP) or liquid concentrate to use in a given amount of spray:

amt. of WP or liq conc. = no. of acres treated with amount of spray X desired amount of WP or liq. conc. per acre*

**Trees, animal, etc. can be substituted for acres.*

4. To find the pounds of wettable powder needed to obtain a desired percentage of active ingredient in water:

$$\text{lbs. of WP} = \frac{\text{gals. of spray desired} \times \% \text{ a.i. desired} \times 8.3^{**}}{\% \text{ a.i. in WP}}$$

5. To find the gallons of liquid concentrate needed to obtain a desired percentage of active ingredient in water:

***One gallon of water weighs approximately 8.3 pounds. If another diluent is used the weight per gallon of the other diluent should be substituted for 8.3.*

$$\text{gal. of liq. conc.} = \frac{\text{gals. of spray desired} \times \% \text{ a.i. desired} \times 8.3^{**}}{\text{lbs. a.i. per gal. of liq. conc.} \times 100}$$

PESTICIDE RATE AND DOSAGE CALCULATIONS

PESTICIDE CONVERSION TABLE FOR LARGE AREAS

LIQUID FORMULATIONS

Amount of Commercial Product to Add to Spray Tank for Each Acre Treated

FORMULATION LBS./GAL. ACTIVE INGREDIENT	Desired Rate Per Acre of Active Ingredient, Lbs.															
	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1	1.1	1.5	2	2.5	3	4	6	9
1.5	10 oz	17 oz	26 oz	34 oz	43 oz	51 oz	64 oz	85 oz	96 oz	128 oz	171 oz	213 oz	256 oz	341 oz	512 oz	768 oz
2	8 oz	13 oz	19 oz	26 oz	32 oz	38 oz	48 oz	64 oz	72 oz	96 oz	128 oz	160 oz	192 oz	256 oz	384 oz	576 oz
3	5 oz	9 oz	13 oz	17 oz	21 oz	26 oz	32 oz	43 oz	48 oz	64 oz	85 oz	107 oz	128 oz	171 oz	256 oz	384 oz
4	4 oz	6 oz	10 oz	13 oz	16 oz	19 oz	24 oz	32 oz	36 oz	48 oz	64 oz	80 oz	96 oz	128 oz	192 oz	288 oz
6	2.6 oz	4.3 oz	6.4 oz	9 oz	11 oz	13 oz	16 oz	21 oz	24 oz	32 oz	43 oz	53 oz	64 oz	85 oz	128 oz	192 oz
6.7	2.3 oz	3.8 oz	5.7 oz	7.6 oz	9.6 oz	11.5 oz	14.3 oz	19.1 oz	21 oz	29 oz	38 oz	48 oz	57 oz	76 oz	115 oz	172 oz
7	2.2 oz	3.7 oz	5.5 oz	7.3 oz	9.1 oz	11 oz	13.7 oz	18 oz	20 oz	27 oz	37 oz	46 oz	55 oz	73 oz	110 oz	165 oz
8	2 oz	3.2 oz	4.8 oz	6.4 oz	8 oz	9.6 oz	12 oz	16 oz	18 oz	24 oz	32 oz	40 oz	48 oz	64 oz	96 oz	144 oz

WETTABLE POWDER FORMULATIONS

Pounds of Commercial Product to Add to Spray Tank for Each Acre Treated

% ACTIVE INGREDIENT	Desired Rate Per Acre of Active Ingredient, Lbs.																
	0.2	0.3	0.4	0.5	0.6	0.8	0.8	1	2	2	3	3	4	4	5	8	10
50	0.4	0.6	0.8	1	1.2	1.5	1.6	2	2	3	4	5	6	8	10	16	20
75	0.3	0.4	0.5	0.7	0.8	1	1.1	1.3	2	2	3	3	4	5.3	6.6	10.7	13.33
80	0.3	0.4	0.5	0.6	0.8	0.9	1	1.2	2	2	3	3	4	5	6.2	10	12.5

PESTICIDE RATE AND DOSAGE CALCULATIONS

PESTICIDE CONVERSION TABLE FOR LARGE AREAS (continued)

GRANULES AND DUSTS
Pounds of Commercial Product to Apply Per Acre

% ACTIVE INGREDIENT	Desired Rate Per Acre of Active Ingredient, Lbs.					
	1	2	3	4	5	10
2.5	40	80	120	160	200	400
5	20	40	60	80	100	200
10	10	20	30	40	50	100
15	6.6	13.3	20	26.6	33.3	66.6
20	5	10	15	20	25	50

CONVERSION TABLES FOR SMALL AREAS

LIQUID FORMULATIONS¹

Amount of Commercial Product to Add to Spray Tank to Treat 1000 Sq. Ft.

FORMULATION LBS./GAL. ACTIVE INGREDIENT	Desired Rate Per Acre of Active Ingredient, Lbs.							
	0.25	0.5	1	2	4	8	10	12
0.5	3 Tbs ¹ (43.4) ³	3 oz ² (86.8)	6 oz (173.7)	11 oz 1 Tbs (347.4)				
1	1 Tbs 1 tsp (21.7)	3 Tbs (43.4)	3 oz (86.8)	5 oz 1 Tbs (173.7)				
2	2 tsp (10.8)	1 Tbs 1 tsp (21.7)	3 Tbs (43.4)	3 oz (86.8)	5 oz 1 Tbs (173.7)	11 oz 1 Tbs (342.4)		
4	1 tsp (5.4)	2 tsp (10.8)	1 Tbs 1 tsp (21.7)	3 Tbs (43.4)	3 oz (86.8)	6 oz (173.7)	7 oz 2 tsp (217.1)	8 oz 4 tsp (260.6)

¹ approximate values

² refers to level measure

³ figure in parentheses refers to milliliters

PESTICIDE RATE AND DOSAGE CALCULATIONS

CONVERTING LARGE VOLUME RECOMMENDATIONS TO SMALL VOLUMES OR AREAS

Frequently, pesticide recommendations are given only for large volume applications, i.e. amount per 100 gallons or per acre, but only a small amount is needed. Conversion of liquids to smaller quantities is relatively easy and precise because suitable equipment such as measuring spoons are readily available. While scales sensitive enough to handle small quantities of solid materials are available, it is often more practical to use volumetric measures. Various conversion tables have been prepared on the premise that there are 200 to 300 teaspoons (roughly 2 to 3 pints) per pound of solid pesticide product. These tables are grossly inaccurate because of the wide variation in bulk density among solid pesticide formulations. For instance, a pint of almost any insecticide wettable powder will weigh much less than a pint of fungicide that has a high metal content. Greater accuracy can be obtained if one first determines the weight of a given volume of the solid material and then calculates the volumetric measure. This will usually provide acceptable accuracy but it is still not as accurate as actually weighing a solid formulation. When coupled with a little simple arithmetic the following formulas will enable you to convert large volume recommendations to smaller quantities.

1. To find the amount of liquid concentrate per gallon when label recommendations are given in pints per 100 gallons:

$$\text{teaspoons/gallon} = \text{recommended pints per 100 gallons} \times 1^*$$

or

$$\text{teaspoons/gallon} = \text{recommended pints per 100 gallons} \times 0.96$$

or

$$\text{milliliters/gallon} = \text{recommended pints per 100 gallons} \times 4.73^*$$

2. To find the amount of wettable powder (WP) or other solid formulation per gallon when label recommendations are given as pounds per 100 gallons:

$$\text{teaspoons/gallon} = \text{recommended lbs./100 gals.} \times \text{cups in 1 lb. of formulation} \times 0.053^*$$

or

$$\text{teaspoons/gallon} = \text{recommended lbs./100 gals.} \times \text{Tbs. in 1 ounce of formulation} \times 0.53^*$$

or

$$\text{grams/gallon} = \text{recommended lbs./100 gals} \times 4.54^*$$

3. To find the amount of liquid concentrate to apply per 1,000 square feet when label recommendations are given as pints per acre:

$$\text{teaspoons/1,000 sq. ft.} = \text{recommended pints/acre} \times 2.20^*$$

or

$$\text{milliliters/1,000 sq. ft.} = \text{recommended pints/acre} \times 10.9^*$$

4. To find the amount of dust (D), granules (G) or wettable powder (WP) to apply per 1,000 square feet when label recommendations are given as pounds per acre:

$$\text{lbs./1,000 sq. ft.} = \text{recommended lbs./acre} \times 0.023^*$$

or

$$\text{Tbs./1,000 sq. ft.} = \text{recommended lbs./acre} \times \text{cups in 1 lb. of formulation} \times 0.37^*$$

or

$$\text{Tbs./1,000 sq. ft.} = \text{recommended lbs./acre} \times \text{Tbs. in 1 lb. of formulation} \times 0.023^*$$

or

$$\text{grams/1,000 sq. ft.} = \text{recommended lbs./acre} \times 10.4^*$$

*These values have been rounded off to facilitate calculations.

CALIBRATION METHOD FOR HYDRAULIC BOOM AND BAND SPRAYERS, AND OTHER LIQUID APPLICATORS

Gary L. Hawkins, Extension Engineer
Glen C. Rains, Extension Engineer

The procedure below is based on spraying 1/128 of an acre per nozzle or row spacing and collecting the spray that would be released during the time it takes to spray the area. Because there are 128 ounces of liquid in 1 gallon, this convenient relationship results in ounces of liquid caught being directly equal to the application rate in gallons per acre.

Calibrate with clean water when applying toxic pesticides mixed with large volumes of water. Check uniformity of nozzle output across the boom. Collect from each for a known time period. Each nozzle should be within 10 percent of the average output. Replace with new nozzles if necessary. When applying materials that are appreciably different from water in weight or flow characteristics, such as fertilizer solutions, etc., calibrate with the material to be applied.

Exercise extreme care and use protective equipment when active ingredient is involved.

Step 1. Determine type of application to be made and select appropriate procedure from Table 1. For example, for a Herbicide Broadcast, use Procedure A.

Table 1. Corresponding procedures for different spray applications.

TYPE OF APPLICATION	PROCEDURE	COVERAGE BASIS
	Herbicide, Insecticide, Nematicide, Fungicide, or Liquid Fertilizer	
Broadcast	A	Broadcast (gal/acre)
Band	B	Broadcast (gal/acre of band)
Row (See note)	C (Use this procedure when rates are given for row treatment)	

Note: Determine and use average row spacing for modified row patterns. In skip row patterns, use width of area covered per row as row spacing.

Step 2. Determine and use average row spacing for modified row patterns. In skip row patterns, use width of area covered per row as row spacing.

(A) Broadcast Application: Outlets or nozzles must be evenly spaced. Measure outlet (nozzle, etc.) spacing. Find this spacing in left column of Table 2 and read the corresponding calibration distance. For example, for a 19-inch spacing the distance would be 214.9 feet.

(B) Band Application: Measure band width. Find this band width in the left column of Table 2 and read the corresponding calibration distance. For example, for a 12-inch band, the distance would be 340.3 feet.

(C) Row Application: Measure row spacing for evenly spaced rows. Find this row spacing in the left column of Table 2 and read the corresponding calibration distance from the column on the right. For example, for a 38-inch row spacing, the distance would be 107.5 feet. (See note above for modified and skip rows.)

CAUTION: AGRICULTURAL CHEMICALS CAN BE DANGEROUS. IMPROPER SELECTION OR USE CAN SERIOUSLY INJURE PERSONS, ANIMALS, PLANTS, SOIL, OR OTHER PROPERTY. BE SAFE. SELECT THE RIGHT CHEMICAL FOR THE JOB. HANDLE IT WITH CARE. FOLLOW THE INSTRUCTIONS ON THE CONTAINER LABEL AND INSTRUCTIONS FROM THE EQUIPMENT MANUFACTURER.

Step 3. Measure and mark calibration distance in a typical portion of the field to be sprayed.

Step 4. With all attachments in operation (harrows, planters, etc.) and traveling at the desired operating speed, determine the number of seconds it takes to travel calibration distance. Be sure machinery is traveling at full operating speed the full length of the calibration distance. Mark or make note of engine RPM and gear. Machine must be operated at same speed for calibration.

CALIBRATION METHOD FOR HYDRAULIC BOOM AND BAND SPRAYERS, AND OTHER LIQUID APPLICATORS

Step 5. With sprayer sitting still and operating at same throttle setting or engine RPM as used in Step 4, adjust pressure to the desired setting. Machine must be operated at same pressure used for calibration.

Step 6. For Procedure A, Step 2, broadcast application, collect spray from one nozzle or outlet for the number of seconds required to travel the calibration distance.

For Procedure B, Step 2, band application, collect spray from all nozzles or outlets used on one band width for the number of seconds required to travel the calibration distance.

For Procedure C, Step 2, row application, collect spray from all outlets (nozzles, etc.) used for one row for the number of seconds required to travel the calibration distance.

Table 2. Calibration distances with corresponding widths.

ROW SPACING, OUTLET SPACING OR BAND WIDTH (Whichever Applies) (Inches)	CALIBRATION DISTANCE (feet)
48**	85.1
46	88.8
44	92.8
42	97.2
40	102.1
38	107.5
36	113.4
32	127.6
30	136.1
24	170.2
20	204.2
19	214.9
18	226.9
14	291.7
12	340.3
10	408.4
8	510.5

To determine distance for spacing or band width not listed, divide the spacing or band width expressed in feet into 340.3. Example: for a 13" band the calibration distance would be 340 divided by 13/12 = 314.1.

** To increase calibration accuracy for a wide nozzle spacing, multiply calibration distance by a factor (for example, 2); then, divide the fluid amount collected by the same factor for GPA. For narrow nozzle spacings with long calibration distances, divide calibration distance by a factor (for example, 4); then, multiply the fluid amount collected by the same factor for GPA.

Step 7. Measure the amount of liquid collected in fluid ounces. The number of ounces collected is the gallons per acre rate on the coverage basis indicated in Table 1. For example, if you collect 18 ounces, the sprayer will apply 18 gallons per acre. Adjust applicator speed, pressure, nozzle size, etc. to obtain recommended rate. If speed is adjusted, start at Step 4 and recalibrate. If pressure or nozzles are changed, start at Step 5 and recalibrate.

Step 8. To determine amount of pesticide to put into a sprayer or applicator tank, divide the total number of gallons of mixture to be made (tank capacity for a full tank) by the gallons per acre rate from Step 7 and use recommended amount of pesticide for this number of acres.

CALIBRATION METHOD FOR HYDRAULIC BOOM AND BAND SPRAYERS, AND OTHER LIQUID APPLICATORS

Band Application

Use the recommended **broadcast** pesticide rates to make tank mixtures for band applications when calibrating with procedure (B) of this method. The number of gallons per acre determined in Step 7 are the gallons that will be applied to each acre of actually treated band.

To determine the gallons of spray mixture required to make a band application on a field, the number of acres that will be in the actually treated band must be determined. When all treated bands are the same width and all untreated bands are the same width, which is usually the case, the acres in the actually treated band can be calculated by placing the width of the treated band over the sum of the widths of the treated band and the untreated band, and multiplying this fraction times the number of acres in the field. Example - How many acres will actually be treated in a 30 acre field if a 12" band of chemical is applied over the drill of rows spaced 36" apart. The treated band width is 12". The untreated band width is $(36" - 12") = 24"$. Acres actually treated will be $12" \div (12" + 24")$ times 30 acres equals 10 acres. The amount of mixture required will be 10 times the number of gallons per acre from Step 7. The amount of chemical required will be 10 times the recommended broadcast rate for one acre.

Check rate recommendations carefully as to type of application, broadcast, band or row, and type of material specified, formulated product, active ingredient, etc.

Calculating Formulation Requirements For Active Ingredient Rates.

To determine amount of liquid pesticide required for a rate given in pounds of active ingredient per acre, divide recommended rate by pounds active ingredient per gallon stated on label. Example – Pesticide label states 4 lb active ingredient (AI) per gallon and recommends 1/2 lb ai per acre. Amount of pesticide required: $1/2 \text{ lb ai per acre} \div 4 \text{ lb ai per gal} = 1/8 \text{ gal per acre}$.

To determine amount of wettable powder required for a rate given in pounds active ingredient per acre, divide recommended rate by percent active ingredient stated on label. Example - Pesticide label states powder is 50% active ingredient. Two pounds of active ingredient is recommended per acre. Amount of pesticide powder required: $2 \text{ lb ai per acre} \div 0.5 \text{ ai per lb} = 4 \text{ lb per acre}$

CALIBRATION METHOD FOR BOOMLESS BROADCAST SPRAYERS

Gary L. Hawkins, Extension Engineer

Glen C. Rains, Extension Engineer

All sprayers should be calibrated often to ensure that pesticide is being applied at the correct rate. Most broadcast applications are made with a boom arrangement where the nozzle tips are spaced evenly along the boom. However, in some situations this may be impossible or undesirable, so a cluster nozzle or a single nozzle with a wide spray pattern may be used.

Calibrate with clean water when applying toxic pesticides mixed with large volumes of water. When applying materials that are appreciably different from water in weight or flow characteristics, such as fertilizer solutions, calibrate with the material to be applied. Exercise extreme care and use protective equipment when active ingredient is involved.

The following instructions outline a simple method to calibrate a boomless broadcast sprayer.

Step 1. Determine spray width. The spray width is the distance between successive passes through a field. This is usually given in the manufacturers' literature for a specific nozzle. If you are unable to find this in the catalogs, use 80-85% of the wetted spray width.

Step 2. Using the spray width in Step 1, determine the calibration distance from Table 1.

Step 3. Measure and mark calibration distance on typical terrain to be sprayed.

Step 4. With all attachments in operation and traveling at the desired operating speed, determine the number of seconds it takes to travel the calibration distance. Be sure machinery is traveling at full operating speed the full length of the calibration distance. Mark or make note of engine RPM and gear. Machine must be operated at same speed for calibration.

Step 5. With sprayer sitting still and operating at same throttle setting or engine RPM as used in Step 4, adjust pressure to the desired setting. Machine must be operated at same pressure used for calibration.

Step 6. Collect spray from all nozzles or outlets for the number of seconds required to travel the calibration distance.

Table 1. Calibration distances with corresponding widths.

SWATH WIDTH (feet)	CALIBRATION DISTANCE (feet)
40	85.1
38	89.5
36	94.5
32	106.3
30	113.4
28	121.5
24	141.8
20	170.2
18	189
16	212.7
12	283.6
10	340.3
8	425

To determine distance for swath width not listed, divide the swath width expressed in feet into 340.3 and multiply by 10.

Example: For 13 feet swath the calibration distance would be 340.3 divided by 13 multiplied by 10 = 261.8.

CALIBRATION METHOD FOR BOOMLESS BROADCAST SPRAYERS

Step 7. Measure the amount of liquid collected in fluid ounces.

Step 8. Divide the total number of fluid ounces by 10 to obtain gallons per acre applied. For example, if you collect 180 ounces, the sprayer will apply 18 gallons per acre. Adjust applicator speed, pressure, nozzle size, etc. to obtain recommended rate. If speed is adjusted, start at Step 3 and recalibrate. If pressure or nozzles are changed, start at Step 5 and recalibrate.

Step 9. To determine amount of pesticide to put into a sprayer or applicator tank, divide the total number of gallons of mixture to be made (tank capacity for a full tank) by the gallons per acre rate from Step 8 and use recommended amount of pesticide for this number of acres.

CAUTION: AGRICULTURAL CHEMICALS CAN BE DANGEROUS. IMPROPER SELECTION OR USE CAN SERIOUSLY INJURE PERSONS, ANIMALS, PLANTS, SOIL, OR OTHER PROPERTY. BE SAFE: SELECT THE RIGHT CHEMICAL FOR THE JOB. HANDLE IT WITH CARE. FOLLOW THE INSTRUCTIONS ON THE CONTAINER LABEL AND INSTRUCTIONS FROM THE EQUIPMENT MANUFACTURER.

CALIBRATION METHOD FOR GRANULAR APPLICATIONS

Gary L. Hawkins, Extension Engineer
Glen C. Rains, Extension Engineer

Applicators used in granular applications should be calibrated to ensure uniformity and accuracy of the application. A more accurate and uniform application can reduce the quantity of an active ingredient required for a given degree of control, which benefits the environment as well as the producer.

Several factors influence the amount of granular material applied to a given area. Granular material is usually metered with an adjustable orifice. The amount of material that flows through the orifice per revolution relies on orifice opening size and may rely on rotor speed. A wide variation in product characteristics, such as size, density, and shape, requires that a calibration be made for every chemical applied. Also changes in climatic conditions, such as temperature and humidity, can result in a different flow rate.

CAUTION: Calibration is done using the chemical to be applied. Protective equipment, such as rubber gloves, should be used to avoid contact with the chemicals to be applied.

Granular application is usually done in combination with another operation, such as planting or cultivating. The applicator may be ground driven or driven with a small electric motor. The following procedure will give the pounds (total weight) of material applied per acre broadcast or row basis as indicated. A weight scale incremented in ounces is required for this procedure.

Step 1. Determine type of application to be made and select appropriate procedure from Table 1. Example - Broadcast - Procedure A.

Table 1. Corresponding procedures for different spray applications.

TYPE OF APPLICATION	PROCEDURE	COVERAGE BASIS (VOLUME OF APPLICATION)
Broadcast	A	Broadcast (lbs/acre)
Band	B	Broadcast (lbs/acre of band)
Row (See note)	C (Use this procedure when rates are given for row treatment)	

Note: Determine and use average row spacing for modified row patterns. Use width of area covered per row as row spacing in skip row patterns for broadcast rates

Step 2. Using procedure A, B, or C below as selected in Step 1, determine appropriate calibration distance from Table 2.

(A) Broadcast Application: Outlets must be evenly spaced. Measure outlet spacing. Find this spacing in left column of Table 2 and read the corresponding calibration distance. Example - for a 19" spacing the distance would be 214.9 feet.

(B) Band Application: Measure band width. Find this band width in the left column of Table 2 and read the corresponding calibration distance. Example - for a 12" band, the distance would be 340.3.

(C) Row Application: Measure row spacing for evenly spaced rows. Find this row spacing in the left column of Table 2 and read the corresponding calibration distance from the column on the right. Example - for a 38" row spacing, the distance would be 107.5 feet.

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Step 3. Measure and mark calibration distance in a typical portion of the field to be applied.

CALIBRATION METHOD FOR GRANULAR APPLICATIONS

Step 4. With all attachments in operation (harrows, planters, etc.) and traveling at the desired operating speed, determine the number of seconds it takes to travel calibration distance. Be sure machinery is traveling at full operating speed the full length of the calibration distance. Mark or make note of engine RPM and gear. Machine must be operated at same speed for calibration.

Step 5. **Multiply the number of seconds required to travel calibration distance by 8.** This is the number of seconds to collect.

Step 6. With applicator sitting still and operating at same speed as used in Step 4, adjust gate openings to desired setting. Check uniformity of outlets across the swath or rows. Collect from each outlet for a known time period. Each outlet should be within 5 percent of the average outlet output.

Table 2. Calibration distances with corresponding widths.

ROW SPACING, OUTLET SPACING OR BAND WIDTH (Whichever Applies) (Inches)	CALIBRATION DISTANCE (feet)
48*	85.1
46	88.8
44	92.8
42	97.2
40	102.1
38	107.5
36	113.4
32	127.6
30	136.1
24	170.2
20	204.2
19	214.9
18	226.9
14	391.7
12	340.3
10	408.4
8	510.5

To determine distance for spacing or band width not listed, divide the spacing or band width expressed in feet into 340.3.

Example: for a 13-inch band the calibration distance would be 340 divided by 13/12 = 314.1.

* To increase calibration accuracy for a wide outlet spacing, multiply calibration distance by a factor (for example, 2); then, divide Step 8 material collected by the same factor for pounds per acre. For narrow spacings with long calibration distances, divide calibration distance by a factor (for example, 4); then, multiply Step 8 by the same factor for pounds per acre. Keep in mind that application accuracy will decrease when factoring narrow outlet or band spacings.

Step 7. **For procedure (A), Step 2, broadcast application, collect from one outlet for the number of seconds indicated in Step 5.

For procedure (B), Step 2, band application, collect from all outlets used on one band width for the number of seconds indicated in Step 5. For procedure (C), Step 2, row application, collect from all outlets used for one row for the number of seconds indicated in Step 5.

**** For ground driven equipment, multiply the calibration distance by 8 and collect from each outlet while traveling the calibration distance; then divide step 8 material collected by 8 for pounds per acre.**

CALIBRATION METHOD FOR GRANULAR APPLICATIONS

Step 8. Weigh the amount of material collected in ounces. The number of ounces collected is the pounds per acre rate on the coverage basis indicated in Table 1. For example, if you collect 18 ounces using procedure (A) or (B), the applicator will apply 18 pounds per acre on a broadcast coverage basis. Adjust applicator speed, gate opening, etc. to obtain recommended rate.

Step 9. Applicators should be checked for proper calibration every 4-8 hours of use. Simply repeat steps 7 and 8. If there is a difference of more than 5 percent of original calibration, check the system.

Band Application

Use the recommended **broadcast** pesticide rates to make tank mixtures for band applications when calibrating with Procedure B of this method. The number of gallons per acre determined in Step 7 are the gallons that will be applied to each acre of actually treated band.

To determine the gallons of spray mixture required to make a band application on a field, the number of acres that will be in the treated band must be determined. When all treated bands are the same width and all untreated bands are the same width, which is usually the case, the acres in the treated band can be calculated by placing the width of the treated band over the sum of the widths of the treated band and the untreated band, and multiplying this fraction times the number of acres in the field. Example - How many acres will actually be treated in a 30 acre field if a 12-inch band of chemical is applied over the drill of rows spaced 36-inches apart. The treated band width is 12 inches. The untreated band width is (36 inches – 12 inches) = 24 inches. Acres actually treated will be 12 inches divided by (12 inches + 24 inches) times 30 acres equals 10 acres. The amount of mixture required will be 10 times the number of gallons per acre from Step 7. The amount of chemical required will be 10 times the recommended broadcast rate for one acre. Check rate recommendations carefully as to type of application, broadcast, band or row, and type of material specified, formulated product, active ingredient, etc.

Calculating Formulation Requirements For Active Ingredient Rates.

To determine amount of liquid pesticide required for a rate given in pounds of active ingredient per acre, divide recommended rate by pounds active ingredient per gallon stated on label. Example – Pesticide label states 4 lb active ingredient (AI) per gallon and recommends 1/2 pound AI per acre. Amount of pesticide required: $1/2 \text{ lb AI per acre} \div 4 \text{ lb AI per gal.} = 1/8 \text{ gal per acre.}$

To determine amount of wettable powder required for a rate given in pounds active ingredient per acre, divide recommended rate by percent active ingredient stated on label. Example - Pesticide label states powder is 50% active ingredient. Two pounds of active ingredient is recommended per acre. Amount of pesticide powder required: $2 \text{ lbs AI per A} \div 0.5 \text{ AI per lb} = 4 \text{ lb per acre}$

CALIBRATION OF BACKPACK SPRAYERS 1000 Sq Ft Method

Gary L. Hawkins, Extension Engineer
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Backpack sprayers are often used to treat ornamental or small areas of turf. Herbicide recommendations are based on amount per acre and amount per 1000 sq ft. Regardless of the type of sprayer used to apply herbicides, the speed, pressure and nozzle height must be kept constant for accurate application. The backpack sprayer may require some modification so that it is better suited for application. A pressure gauge mounted on the tank side of the shutoff valve will allow continuous monitoring of the tank pressure, which must remain uniform. Optimum pressure control can be achieved by inserting a pressure regulator between the pressure gauge and nozzle. To prevent dripping after the shutoff valve is closed, use a quick, positive pressure shutoff valve or a strainer with a check valve. Nozzle clogging, a problem associated with the use of wettable powders (as well as dry flowable [DF] and water dispersible granular [WDG] formulations) can be reduced by inserting a 50 mesh in-line strainer and keeping the solution constantly agitated. The following is a procedure of 1000 sq ft.

Step 1. Measure the length and width of the test area to be sprayed. Then calculate the area to be covered.

Test Area is: lengthft X width _____ ft = _____ sq ft _____

Step 2. Fill sprayer with water and spray the test area. Record the amount of water to refill the sprayer.

Volume (ounces) per test area _____

Step 3. Find the label rate of material to be applied per 1000 sq ft.

Rate _____per 1000 ft²

Step 4.
$$\frac{1000 \text{ ft}^2 \times \text{Volume (ounces) per test area}}{\text{Test Area (ft}^2\text{)}} = \text{Volume (ounces) per 1000 ft}^2$$

Step 5. Calculate the area covered per tank as follows:

$$\frac{\text{Tank volume (ounces) x 1000 ft}^2}{\text{Volume per 1000 ft}^2} = \text{Area covered per tank (ft}^2\text{)}$$

Step 6. Calculate amount of material to add to tank.

$$\frac{\text{Area per tank (ft}^2\text{)} \times \text{Label rate per 1000 ft}^2}{1000} = \text{Amount to add (rate units)}$$

CALIBRATION OF BACKPACK SPRAYERS 1000 Sq Ft Method

Solutions derived from the above may need to be converted to a smaller unit in order to accurately measure the pesticide accurately. The following conversion will help simplify this problem.

Conversions:

VOLUME		WEIGHT	
gallons x 128	= fluid ounces (fl oz)	lb x 16 wt oz x	= weight ounces (wt oz)
pints x 16	= fluid ounces (fl oz)	28.35 grams x 1000	= grams (g)
fl oz x 29.57	= milliliters (ml)		= milligrams (mg)
gallons x 4	= quarts (qts)		
quarts x 2	= pints (pts)		
fl oz x 2	= Tablespoons (Tbs)		
tsp x 3	= Tablespoons (Tbs)		
tsp x 5	= milliliters (ml)		

An example of using this conversion chart. If the rate calls for 0.25 gallons of material then converting to ounces would be done as follows: 1 gallon has 128 ounces, so multiply 0.25 gallons by 128 to get 32 ounces. So, you would need to measure out 32 ounces for your application. The same thing for a weight. If you need 0.25 pounds, then multiply 0.25 by 16. This is calculated as 0.25 pounds times 16 to get 4 weight ounces of material.

CALIBRATING TURFGRASS SPRAYERS (Gallons per 1000 Sq Ft)

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Glen C. Rains, Extension Engineer

Low-pressure boom sprayers are used frequently for applying chemicals on large areas such as golf courses and recreational areas. Application rates for turf are normally given in gallons per 1000 sq ft. Calibrating a boom sprayer is not as difficult as it sounds. Calibrate your sprayer often to compensate for nozzle wear, pump wear and speed changes.

Calibrate with clean water. Check uniformity of nozzle output across the boom. Collect from each for a known time period. Each nozzle should be within 10 percent of the average output. Replace with new nozzles if necessary. When applying materials that are appreciably different from water in weight or flow characteristics, such as fertilizer solutions, calibrate with the material to be applied. Exercise extreme care and use protective equipment when active ingredient is involved.

Step 1. Determine the Effective Swath Width (W) per Nozzle

For boom spraying, the effective spray width of each nozzle (W) is equal to the distance in inches between two nozzles.

Step 2: Determine Travel Speed (MPH)

To determine the travel speed, measure a known distance. Use fence posts or flags to identify this distance. A distance over 200 feet and a tank at least half full are recommended. Travel the distance determined at your normal spraying speed and record the elapsed time in seconds. Repeat this step and take the average of the two measurements.

Use the following equation to determine the travel speed in miles per hour:

$$\text{Travel Speed (MPH)} = \frac{\text{Distance (feet)} \times 0.68}{\text{Time (seconds)}}$$

(0.68 is a constant to convert feet/second to miles/hour)

Step 3. Determine Nozzle Flow Rate (GPM)

With the sprayer parked, operate the sprayer at the same pressure level and catch the output from each nozzle in a measuring jar for one minute (or collect output for half a minute and then double the ounces collected) to determine the nozzle flow rate in ounces per minute (OPM) Then, convert the final average output in OPM to gallons per minute (GPM) using the following equation:

$$\text{GPM} = \text{OPM}/128 \text{ (1 Gallon = 128 ounces)}$$

Step 4. Determine the Actual Application Rate in Gallons per 1000 sq ft

Use the following equation to determine the gallons per acre application rate:

$$\text{Gallons per 1000 sq ft} = \frac{136 \times \text{gpm (per nozzle)}}{\text{MPH} \times W}$$

GPM: average nozzle flow rate in gallons per minute

MPH: travel speed in miles per hour

W: distance between two nozzles in inches

136 a constant to convert units to gallons per 1000 ft²

Step 5. Calculate the area covered per tank as follows:

$$\frac{\text{Tank Volume (gallons)} \times 1000}{\text{Application Rate (gallons per 1000 ft}^2)} = \text{Area covered per tank (ft}^2)$$

Step 6. Calculate amount of material to add to tank.

$$\frac{\text{Area covered per tank (ft}^2) \times \text{Material rate per 1000 ft}^2}{1000} = \text{Amount to add (rate units)}$$

HAND SPRAYER CALIBRATION FOR ORNAMENTAL AND TURF

Gary L. Hawkins, Extension Engineer

Glen C. Rains, Extension Engineer

Hand sprayers are often used to treat ornamental or small areas of turf. The directions on many ornamental pesticide product labels say to “spray until foliage is wet” or perhaps “spray until runoff.” Unfortunately, these directions are subject to each applicator’s interpretation of what “wet” or “runoff” is.

Recommendations are based on amount per 100 gallons. This is the dilution ratio for the chemical applied. Use the following to convert 100 gallon rate to bed area rate.

1. Measure the length and width of the area to be sprayed. Then calculated the area to be covered.

Bed Area is: length ____ X width ____ = ____ ft²

2. Fill sprayer with water and spray the area. Record the amount of water to refill the sprayer.

Gallons per bed area _____

3. Obtain the rate of material to be applied per 100 gallons.

Rate _____

$$4. \quad \frac{\text{Rate} \times \text{Gallons per bed area}}{100} = \text{Amount per bed area}$$

5. Calculate the total amount of material to be used for the application (total bed area) as follows:

$$\frac{\text{Amount per bed area} \times \text{Area to be sprayed}}{\text{Bed area (ft}^2\text{)}} = \text{Amount of material}$$

6. Total solution to prepare is:

$$\frac{\text{Gallons per bed area} \times \text{Area to be sprayed (ft}^2\text{)}}{\text{Bed area (ft}^2\text{)}} = \text{Total Solution}$$

Solutions derived from the above may need to be converted to a smaller unit in order to accurately measure the pesticide. Refer to the conversion section to help simplify this problem.

Conversions:

Volume		Weight	
gallons x 128	= fluid ounces (fl oz)	lb x 16 wt oz x	= weight ounces (wt oz)
pints x 16	= fluid ounces (fl oz)	28.35 grams x 1000	= grams (g)
fl oz x 29.57	= milliliters (ml)		= milligrams (mg)
gallons x 4	= quarts (qts)		
quarts x 2	= pints (pts)		
fl oz x 2	= Tablespoons (Tbsp)		
tsp x 3	= Tablespoons (Tbsp)		
tsp x 5	= milliliters (ml)		

An example of using this conversion chart. If the rate calls for 0.25 gallons of material then converting to ounces would be done as follows: 1 gallon has 128 ounces, so multiply 0.25 gallons by 128 to get 32 ounces. So, you would need to measure out 32 ounces for your application. The same thing for a weight. If you need 0.25 pounds, then multiply 0.25 by 16. This is calculated as 0.25 pounds times 16 to get 4 weight ounces of material.

AIRBLAST SPRAYER CALIBRATION — ORCHARD AND VINEYARD

Gary L. Hawkins, Extension Engineer
Glen C. Rains, Extension Engineer

Calibration is the process of measuring and adjusting the gallons per acre of spray actually applied. Sprayers need to be calibrated to meet the coverage needs of the orchards to be sprayed and to facilitate precise dosing of each material. A sprayer should be set up to apply a gallon per acre rate at a desired speed and pressure. In-orchard calibration frequently indicates a need for adjustments to achieve the target gallons per acre.

Speed of travel of a sprayer is a vital factor in obtaining the number of gallons of spray per acre desired. Change in gallons per acre (GPA) applied is inversely proportional to the change in speed. If speed is doubled, the gallons per acre will be halved. Thus, if nozzles have been installed and pressure set to provide a gallon per acre rate at a certain speed, the sprayer should apply the GPA rate at that speed.

To determine the travel speed, measure a known distance. Use fence posts or flags to identify this distance. A distance over 100 feet and a tank at least half full are recommended. Travel the distance determined at your normal spraying speed and record the elapsed time in seconds. Repeat this step and take the average of the two measurements. Use the following equation to determine the travel speed in miles per hour:

$$\text{Travel Speed (MPH)} = \frac{\text{Distance (feet)} \times 0.68}{\text{Time (seconds)}}$$

(0.68 is a constant to convert feet/second to miles/hour)

Calculating Gallons per Minute (GPM) Output

The gallons per minute output required for a sprayer traveling along both sides of each row spraying from one side for a desired gallon per acre rate can be calculated with the following equation:

$$\text{GPM Required} = \frac{\text{GPA (required)} \times \text{MPH (determined)} \times \text{Row Spacing (feet)}}{990 \text{ (spraying one side)}}$$

(If one pass is made between rows spraying from both sides of the sprayer, use 495 as constant.) GPA = Gallons per Acre MPH = Miles per Hour

To check actual GPM output:

1. Fill sprayer with water. Note the level of fill. If a material with considerably different flow characteristics than water is to be sprayed fill the sprayer with this material.
2. Operate the sprayer at the pressure that will be used during application for a measured length of time. A time period of several minutes will increase accuracy over a time period of 1 minute. A suggested time is 5 - 10 minutes.
3. Measure the gallons of liquid required to refill sprayer to the same level it was prior to the timed spray trial with the sprayer in the same position as when it was filled initially. The actual GPM can be calculated as follows:

$$\text{GPM (actual)} = \frac{\text{Gallons to refill sprayer tank}}{\text{minutes of spray time}}$$

4. Calculate the GPA being applied spraying from one side on both sides of row by the sprayer.

$$\text{GPA (actual)} = \frac{\text{GPM (actual)} \times 990 \text{ (spraying one side)}}{\text{MPH} \times \text{Row Spacing (feet)}}$$

If the actual GPA is slightly different from the required GPA, the actual GPA can be increased or decreased by increasing or decreasing spray pressure on sprayer models that have provisions for adjusting pressure. Only small output changes should be made by adjusting pressure. Major changes in output should be done by changing nozzles or ground speed.

Nozzle Setup

Nozzle arrangement and air guide or director vane settings should place most of the spray in the top half of the plants, where most of the foliage and fruit are located. Air blast sprayers are typically set up to apply 2/3 to 3/4 of the spray to the top half, and 1/3 to 1/4 to the bottom half (Figure 3). This targeted spraying is accomplished by placing more or larger nozzles on manifolds in the area that supplies spray to the upper half of trees and setting the air directors on the fan outlet to direct the air stream accordingly. Plant growth and target pest habits should be considered in determining the setup for specific applications.

PESTICIDE RESISTANCE MANAGEMENT

Milton Taylor, Associate Coordinator PSEP

Pest resistance is the genetic process enabling pest populations (insects, mites, fungi, bacteria, weeds) to change so they survive previously lethal pesticide exposures. Commonly, this is either by physiological changes that facilitate detoxification of specific toxins or behavioral modification such as avoidance of exposure. Pest resistance is a major challenge wherever pesticide use is common. Detoxification pathways can render specific toxins useless. Via cross resistance, materials of similar chemistry, those that share the same toxic mode of action, are often compromised. Thus resistance in peach brown rot to one triazole fungicide (FRAC 3) or codling moth resistance to one organophosphate insecticide (IRAC 1B) very often means other materials in those chemical classes will also be ineffective. Pests acquire pesticide resistance when frequent or repetitive use eliminates most individuals in a population that are susceptible to a toxin. A very low frequency of abnormal, genetically controlled physiological traits are normally present in most pest populations, but are maladapted so these traits remain rarities. However, if individuals bearing these normally inconsequential, non-competitive traits can survive frequent pesticide use, they will prosper where pesticide use favors their survival. Over generations, the genetics of entire populations of heavily sprayed pests will shift, so that resistant or tolerant individuals become common. The most effective means of mitigating the acquisition of pest resistance is through integrated pest management (IPM), which limits pesticide use to as-needed sprays. IPM limits pesticide use to times when other factors, such as adverse weather or mortality caused by natural enemies such as parasites, predators or diseases of the pests, do not provide sufficient pest control. IPM is commonly complemented by resistance management in the form of rotation of effective pesticides that are of unlike modes of action. Resistance Action Committees, select toxicologists interested in mitigating or slowing the development of pesticide resistance, have assigned numerical designations to materials which share a common mode of action. If users will alternate the use of effective materials that have unlike numbers, they will rotate modes of action, which typically slows the development of pesticide resistant pests. The individual committees are designated as Insecticide/Miticide Resistance Action Committee (IRAC), Fungicide Resistance Action Committee (FRAC) and Herbicide Resistance Action Committee (HRAC).

PROTECT HONEY BEES FROM PESTICIDES

Keith S. Delaplane, Extension Entomologist

Roughly one-third of the human diet can be traced to bee pollination. Bees pollinate an estimated 16% of the world's flowering plants. The annual value of bee pollination in the U.S. is more than \$15 billion and for Georgia in particular \$367 million. Georgia ranks second nationally in queen bee and packaged bee production, and 14th in honey production.

Many pesticides are extremely hazardous to honey bees, but damage can be minimized if the pesticide user and the beekeeper cooperate and take proper precautions.

THE PESTICIDE USER'S ROLE

1. Use pesticides only when needed.
2. Select one of the least hazardous pesticides that will effectively control target pests, especially on flowering plants that attract bees.
3. Use the least hazardous method of application. Granules are usually harmless to honey bees. Liquid applications drift less than dusts and are less likely to kill bees in nearby untreated areas. Whenever possible, minimize drift by applying pesticides with ground-application equipment rather than with airplanes.
4. Do not apply pesticides when honey bees are active in the field. Applications of effective materials of short residual are best. Late evening or night applications are least likely to kill bees.
5. Do not apply insecticides when crops are in bloom. In orchards, manage orchard-floor vegetation to minimize bloom of orchard-floor cover species. Minimize use of any pesticides during bloom as even non-insecticides may have adverse but sub-lethal effects on pollinators.
6. Avoid pesticide drift into apiaries or areas where crops or wild plants are flowering. With crops that require heavy pesticide applications, plant them in non-sensitive areas if possible.
7. Notify nearby beekeepers several days before you apply a pesticide.

THE BEEKEEPER'S ROLE

1. Whenever possible, locate colonies away from areas of heavy pesticide use.
2. Conspicuously post your name, address, email and phone number at your apiary and tell nearby farmers where your hives are located.
3. Know which pesticides are commonly used in your area and be prepared to confine or remove your bees if you are notified that a pesticide will be applied. Commonly used pesticides are grouped according to hazard in the following list.

If you cannot move hives in time to avoid a pesticide application, you can cover each hive with a plastic sheet at night and in the early morning to confine the bees and protect them from short-residual pesticides. However, heat builds up rapidly once the plastic is exposed to the sun and it must be removed. Wet burlap, can be used as an alternative for a day or more. This may be impractical for large numbers of hives. Colonies that are repeatedly exposed to pesticides in Groups I or II of the list below should be relocated.

COMMONLY USED PESTICIDES GROUPED ACCORDING TO THEIR RELATIVE HAZARDS TO HONEY BEES¹

Group I - Hazardous	Group II - Moderately Hazardous	Group III - Relatively Nonhazardous	
abamectin (Agri-Mek) acephate (Orthene, Address) avemectin (AVID) azinphosmethyl (Guthion) bifenthrin (Capture) carbaryl (Sevin, Sevin XLR-Plus) chloropyrifos (Dursban, Lorsban) clofentezine (Apollo) cyfluthrin (Baythroid) cyhalothrin (Warrior) clothianidin cypermethrin (Ammo) deltamethrin (Decis) diazinon (Diazinon) dichlorvos (DDVP, Vapona) dicrotophos (Bidrin) dimethoate (Cygon, Dimethoate, Rebelate) emamectin (Proclaim) endosulfan (Thiodan) esfenvalerate (Asana) fenpropathrin (Danitol) fenthion (Baytex) fipronil hexythiazox (Savey) imidacloprid (Provado) indoxacarb (Avaunt) lambda-cyhalothrin (Warrior) methamidophos (Monitor) methidathion (Supracide) methiocarb (Mesurol) methomyl (Lannate) methyl parathion (Pennacp-M) naled (Dibrom) ² oxamyl (Vydate) permethrin (Ambush, Pounce) phorate (Thimet EC) phosmet (Imidan) phosphamidon (Dimecron) propoxur (Baygon) resmethrin (Synthrin) tebufenozide (Confirm) thiamethoxam tralomethrin (Scout) zeta-cypermethrin (Fury, Mustang)	aldicarb (Temik) carbaryl (Sevin XLR formulation only) carbophenothion (Trithion) chlorethoxyfos (Fortress 5G) coumaphos (Co-Ra I) cypermethrin (Ammo) cyromazine (Trigard) diatomaceous earth (Diatect) disulfoton (Di-Syston) DSMA emamectin benzoate (Proclaim) ethoprop (Mocap) fonofos (Dyfonate) malathion methyl demeton (Metasystox) MSMA neem (Azatin, Neemix) oxydemeton-methyl (Metasystox R) paraquat perthane pymetrozine (Fulfill) pyriproxyfen (Esteem) ronnel (Co-Ral, Korlan) spinosad (Spin Tor) temephos (Abate) terbufos (Counter) thiamethoxam (Actara, Platinum) thiodicarb (Larvin)	acetamiprid (Assail) allethrin (Pynamin) amitraz (Mitac) amitrole azadirachtin (Align) azoxystrobin (Abound) <i>Bacillus thuringiensis</i> (Biobit, DiPel, Full-Bac, Javelin, MVP) ³ Beauveria (Mycotrol) benomyl (Benlate) binapacryl (Morocide) bordeaux mixture bromoxynil capsaicin (Hot Pepper Wax) captan carbaryl (Sevin G, Bait G) carbofuran (Furadan G) chloramben chlorbenzide (Mitox) chlorobenzilate (Acaraben) chlorothalonil (Bravo) ⁴ copper compounds (Kocide) copper oxychloride sulphate copper 8-quinolinolate copper sulfate (Monohydrated) cryolite (Cryolite, Kryocide) cyromazine (Trigard) dalapon dazomet (Mylone) demeton (Systox) dexton diazinon (Diazinon G) dicamba (Banvel D) dichlone (Phygon) dicofol (Kelthane) diflubenzuron (Dimilin) dimite (DMC) dinocap (Karathane) diquat disulfoton (Di-Syston G) dodine (Cyprex) dyrene endothall EPTC (Eptam) ethion (Ethion) ethoprop (Mocap G)	fenbutatin-oxide (Vendex) fenhexamid (Elevate) ferbam fluvalinate (Spur) folpet (Phaltan) Garlic Barrier genite 923 glyodin (Glyoxide) kaolin (Surround) malathion (Malathion G) mancozeb (Dithane M-45) maneb (Dithane M-22) MCPA metaldehyde (Metaldehyde Bait) methoxychlor (Marlate) metiram (Polyram) - F monuron (Telvar) myclobutanil (Rally) nabam (Parzate) nemagon nicotine sulfate oxythioquinox (Morestan) propargite (Omite) pyrethrum (natural) pyrimidinamine (Vanguard) rotenone ryania silvex simazine (Princep) soap (M-Pede) sulfur tebufenozide (Confirm) TDE (Rhothane) tetradifon (Tedion) thioquinox (Eradex) thiram (Arasan) toxaphene trichlorfon (Dylox) trifloxystrobin (Flint) zineb (Dithane) ziram 2,4-D 2,4-DB 2,4,5-T

¹ List derived in part from Johansen, C.A. and Mayer, D.F. Pollination Protection. 1990, Wicwas Press; Bulletin E-5 3-W, Hunt, G.J., Purdue University; Environmental Entomology 33(5):1151-1154.
² Naled (Dibrom) has short residual activity and kills only the bees contacted at time of treatment or shortly thereafter. It is usually safe to use when bees are not in flight; it is not safe to use around colonies.
³ Not all *Bacillus thuringiensis* insecticides are safe for bees. The label for XenTari® (Valent BioSciences), with active ingredient *B. thuringiensis aizawai*, reads “This product is highly toxic to honey bees exposed to direct treatment. Do not apply this product while bees are actively visiting the treatment area.”
⁴ Beekeepers should manage hives to avoid exposure to chlorothalonil. Data from 2010 suggest that chlorothalonil fungicide expresses toxicity in honey bee brood in the context of crop applications at time of bloom. Additionally, lethal synergies occur between this product and the miticide fluralanil used to control varroa mite in bee hives.

CORN: CORN INSECT CONTROL

David Buntin, Research/Extension Entomologist and John All, Research Entomologist

PEST	MATERIAL AND FORMULATION	MOA	AMOUNT PER ACRE OR PER 1000 FT OF ROW	LB. ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Preplant treatment for soil insects	<i>bifenthrin</i> Brigade, Discipline, Fanfare, others 2EC	3A	3-4 fl oz	0.047-0.062	24 H/ 30 D	Use bifenthrin for grubs, wireworms, seedcorn maggot, and cutworms. Broadcast using 20 gpa before planting and immediately incorporate into top 3" of soil. Plant crop as soon as possible after treatment. May be tank mixed with preplant herbicides.
	<i>chlorpyrifos</i> Lorsban, Chlorpyrifos, Lorsban Advanced 3.755 (cutworms, armyworms only)	1B	2 pt	1	24 H/ 35 D	Use chlorpyrifos for cutworm and armyworm control in conservation tillage areas. Broadcast using 20 gpa before planting. Plant crop as soon as possible after treatment.
Soil Insects At-planting: wireworm, grubs, S. corn rootworm, seed corn maggot, fire ants (Also see sections for billbugs, cutworms, lesser cornstalk borer, and mid-season root- worms for these pests)	SEED TREATMENTS					All these materials at the listed rates provide helpful control, but may not provide complete protection if population pressure is great. Risk of severe infestation is greater in reduced/no tillage, fallow land, following sod, poor soil conditions for seedling growth, and late-planted corn. NOTE: Poncho and Cruiser are commercially applied seed treatments. The low rate may not provide good protection under severe infestations. These products also suppress aphids and chinch bugs on seedlings. Both insecticides available in combination with various fungicides under several brand names. Avicta Complete Corn contains Cruiser 500. Acceleron for corn contains Poncho 250 and Acceleron with VITIVO contains Poncho 500. NOTE: At-planting treatment rates are for 1000 ft of row in 30-40" rows. Per acre rates vary with row spacing; See labels for per acre rates for specific row spacing and for row spacings fewer than 30" apart. NOTE: Apply Counter 20G as a T-band or in-furrow. Counter will interact with ALS-inhibiting herbicides like Accent, Beacon, Option to cause severe plant injury. See corn weed section of this handbook and product labels for specific herbicide interactions and precautions. NOTE: Phorate / Thimet (phorate) 20G also are labeled but not listed. Apply as a band application only; in-furrow applications may cause plant injury and stand loss. Due to the risk of plant injury, Counter 15G is a better choice. Phorate / Thimet will interact with ALS-inhibiting herbicides as noted for Counter. NOTE: Apply Lorsban 15G at planting as a T-band or in-furrow. For wireworms apply in-furrow or use an insecticide seed treatment with T-band applications. Lorsban 15G is compatible with ALS-inhibitor herbicides. See corn weed section of this handbook and product labels for specific herbicide interactions and precautions. NOTE: Apply Force 3G and bifenthrin products as a open-furrow T-band or in-furrow. Force and bifenthrin do not interact with ALS herbicides.
	<i>clothianidin</i> Poncho 250 Poncho 500 Poncho 1250	4C	0.25 mg (ai)/seed 0.5 mg (ai)/seed 1.25 mg (ai)/seed	- - -	12 H/ --	
	<i>imidacloprid</i> Gaucho 600, Attendant 600, Axxess, others	4C	0.6 mg (ai)/seed 1.34 mg (ai)/seed	- -	12 H/ --	
	<i>thiamethoxam</i> Cruiser 250 (5FS) Cruiser 1250 (5FS) Cruiser 500 (5FS)	4C	0.25 mg (ai)/seed 1.25 mg (ai)/seed 0.5 mg (ai)/seed	- - -	12 H/ --	
	AT-PLANTING TREATMENT					
	<i>bifenthrin</i> Brigade, Capture, Fanfare, Discipline, others 2EC	3A	0.15-0.3 fl oz/1000 ft of row	0.0023-0.0046/ 1000 ft lb (ai)/A varies with row spacing	24 H/ 30 D	
	Capture LFR 1.5		3.4-13.6 fl oz/A OR 0.2-0.78 fl oz/1000 ft of row	0.04-0.16 lb (ai)/A		
	Capture 1.15G, similar products		6.4-8 oz /1000 ft	Varies with row spacing		
	<i>chlorethoxyfos + bifenthrin</i> Smart Choice 5G Smartbox	11B + 3A	3-3.5 oz / 1000 ft of row	Varies	48 H/ --	
	<i>chlorpyrifos</i> Lorsban 15G	1B	8 oz / 1000 ft	Varies	12 H/ 35 D	
<i>tefluthrin</i> Force 3G Force CS	3A	4-5 oz /1000 ft of row 0.46-0.57 fl oz/1000 ft row	Varies	12 H/ --		
<i>terbufos</i> Counter 20G	1B	4.5-6 oz / 1000 ft	Varies	48 H/ 30 D		

CORN INSECT CONTROL

PEST	MATERIAL AND FORMULATION	MOA	AMOUNT PER ACRE OR PER 1000 FT OF ROW	LB. ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Soil Insect Mid-season: Western corn rootworm	AT-PLANTING TREATMENT					Western corn rootworm can be a problem in non-rotated corn in northern and central Georgia. Hybrids with Bt-rootworm traits are available and are effective against mid-season rootworms but are NOT effective against other soil insects. Bt-rootworm traits have a 20% refuge requirement. <u>At-Planting Treatments:</u> Apply at-planting in a 6-7" band or T-band (if label permits) over the open seed furrow in front of the planter press wheel. Counter and Force can be applied in-furrow. For no-till where <u>no</u> incorporation is obtained with the press wheel, use Lorsban , or Counter in-furrow at indicated rates. NOTE: Rates are for 30-40" row. See label for rates for specific row spacing. Most products cannot be used at the listed rate in less than 30 inch rows without exceeding the maximum labeled amount/A. See label for narrow rows. NOTE: Poncho 1250 is available as a commercially applied seed treatment. Provides suppression only of western corn rootworms. NOTE: Counter may interact with ALS herbicides like Accent and Beacon to cause plant injury. See corn weed control section of this handbook and product labels for herbicide interactions and precautions.
	<i>chlorthoxyfos + bifenthrin</i> Smart Choice 5G Smartbox	11B + 3A	3-3.5 oz/1000 ft of row	Varies	48 H/ --	
	<i>chlorpyrifos</i> Lorsban 15G	1B	8 oz/1000 ft	Varies	12 H/ 35 D	
	<i>clothianidin</i> Poncho 1250	4C	1.25 mg (ai)/seed	-	12 H/ --	
	<i>tefluthrin</i> Force 3G Force CS	3A	4-5 oz /1000 ft of row 0.46-0.57 fl oz/1000 ft row	Varies	12 H/ --	
<i>terbufos</i> Counter 20G	1B	4.5-6 oz/1000 ft	Varies	48 H/ 30 D		
Soil Insects: Billbug, Sugarcane beetle	SEED TREATMENTS/AT-PLANTING TREATMENT					Beetles feed on seedling plants at or below soil line causing dead or dead-hearted plants. Generally problems are worse in reduced tillage, when a winter cover crop is used. Billbugs are often associated with nutgrass infestation and sugarcane beetle is often associated with bahiagrass infestation. <u>At-Planting treatments:</u> Apply Counter as a T-band application. Apply Capture LFR in-furrow or in a 5-7" open furrow T band for sugarcane beetle control. Poncho 1250 and Cruiser 1250 are available only as a commercial seed treatment. Poncho 500 may also provide suppression of billbug. Poncho 250 also provides fair-good control of sugarcane beetle. NOTE: Counter may interact with ALS herbicides like Accent and Beacon to cause plant injury. See corn weed control section of this handbook and product labels for herbicide interactions and precautions. <u>Post-emergence control:</u> Stand loss of 5-10% justifies control. Direct liquid sprays at base of plant using at least 25 gal/A of spray. Generally rescue treatments for sugarcane beetle are not effective.
	<i>bifenthrin</i> Capture LFR	3A	3.4-6.8 fl oz	0.04-0.08 lb ai	12 H/ --	
	<i>clothianidin</i> Poncho 500 Poncho 1250 NipsIt Inside	4C	0.50 mg (ai)/seed 1.25 mg (ai)/seed See label	- - -	12 H/ --	
	<i>terbufos</i> Counter 20G	1B	4.5-6 oz/1000 ft	Varies	48 H/ 30 D	
	<i>thiamethoxam</i> Cruiser 1250	4C	1.25 mg (ai)/seed	-	12 H/ --	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015 0.015	24 H/ 21 D	
	<i>lambda cyhalothrin</i> Karate Z 2.08 Warrior, Lambda T, Silencer, others (1CS)	3A	1.92 fl oz 3.84 fl oz	0.03 0.03	24 H/ 21 D	

CORN INSECT CONTROL

PEST	MATERIAL AND FORMULATION	MOA	AMOUNT PER ACRE OR PER 1000 FT OF ROW	LB. ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Soil Insects Lesser cornstalk borer	PREPLANT/SEED TREATMENTS/AT-PLANTING					Lesser cornstalk borer larvae tunnel into the seedling plant below the soil line causing dead or dead-hearted plants. Larvae spin silken tubes at plant base. Hot, dry conditions, clean tillage, and late planting favor infestations. Difficult to control after planting; at-planting treatments are most effective. At-Planting: Apply Lorsban 15G as a T-band and incorporate around seed. Post-emergence: Direct spray at full rate in a band around base of plants and lightly incorporate. Apply before larvae enter plants. A rescue treatment once larvae tunnel into plants is rarely effective. NOTE: Hybrids with Bt traits also may provide useful control.
	<i>chlorpyrifos</i> Lorsban 15G	1B	8 oz/1000 ft	Varies	24 H/ 21 D	
	<i>clothianidin</i> Poncho 500 Poncho 1250 NipsIt Inside	4C	0.5 mg (ai)/seed 1.25 mg (ai)/seed See label	- - -	12 H/ --	
	<i>chlorpyrifos</i> Lorsban, Nufos, other 4E, Chlorpyrifos 4E	1B	2 pt	1	24 H/ 35 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015 0.015	24 H/ 21 D	
	<i>lambda cyhalothrin</i> Karate Zeon 2.08 Warrior, Silencer, Lambda, others 1	3A	1.92 fl oz 3.84 fl oz	0.03 0.03	24 H/ 21 D	
Chinch bug	AT-PLANTING					At-planting treatments: Low (250) rates of Poncho and Cruiser seed treatments as applied at planting for soil insect control may suppress chinch bugs for up to 25 days after planting. Poncho 500, 1250 and Cruiser 1250 may control chinch bugs for several weeks after planting. Counter 20G for suppression of light to moderate infestations. Post-emergence treatments: Treat if bugs become numerous and wilting leaves are noticed. Usually not important after seedling stage. Chinch bug infestations are difficult to control. Treatment after boot stage is rarely effective.
	<i>clothianidin</i> Poncho 250 Poncho 500 NipsIt Inside 5	4C	0.25 mg (ai)/seed 0.5 mg (ai)/seed See label	- - -	12 H/ --	
	<i>terbufos</i> Counter 20G	1B	4.5-6 oz/1000 ft	Varies	48 H/ 30 D	
	<i>thiamethoxam</i> Cruiser 250 Cruiser 1250	4C	0.25 mg (ai)/seed 1.25 mg (ai)/seed	- -	12 H/ --	
	<i>chlorpyrifos</i> Lorsban, Nufos, other 4E, Chlorpyrifos 4EC Lorsban 75WG	1B	2 pt 1.33 lb	1 1	24 H/ 35 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015 0.015	24 H/ 21 D	
	<i>lambda cyhalothrin</i> Karate Z 2.08 Warrior, Lambda T, Silencer, others (1CS)	3A	1.92 fl oz 3.84 fl oz	0.03 0.03	24 H/ 21 D	

CORN INSECT CONTROL

PEST	MATERIAL AND FORMULATION	MOA	AMOUNT PER ACRE OR PER 1000 FT OF ROW	LB. ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Aphids (foliar treatments)	<i>bifenthrin</i> Brigade, Capture, Fanfare, Discipline, others 2EC	3A	2.1-6.4 fl oz	0.05-0.10	24 H/ 30 D	Aphids seldom require control on field corn in Georgia. Natural enemies, mainly lady beetles, usually move in and rapidly control aphid infestations. During silking and tasseling, treat if aphids are so abundant they appear likely to interfere with pollination. NOTE: Poncho and Cruiser seed treatments as applied at planting for soil insect control will control aphids on seedling corn for up to 30 days after planting.
	<i>dimethoate</i> Dimethoate 2.67EC Dimethoate 4E, 400	1B	0.5 pt 2-3 pt	0.25 0.5-0.75	48 H/ 42 D	
	<i>esfenvalerate</i> Asana XL, Adjourn 0.66EC	3A	5.8-9.6 fl oz	0.03-0.05	12 H/ 21 D	
	<i>flupyradifurone</i> Sivanto 200SL	4D	7-10.5 fl oz	0.091-0.137 fl oz	4H/ 21 D	
Armyworms: True armyworm Fall armyworm	<i>alpha-cypermethrin</i> Fastac 0.83	3A	1.8-3.8 fl oz	0.012-0.025	12 H/ 30 D	Reduced tillage and grassy weeds favor infestations. <u>Seedling plants</u> , treat if 25% of plants show defoliation including window-panning type defoliation and larvae are present. Treat within 48 hours. <u>Whorl stage plants</u> , treat when 30% of the plants are infested. Use ground equipment and apply at least 20 gal of finished spray/A directed down into the whorls. Nozzles with large droplet size will aid in control. NOTE: Bt-corn, especially YieldGard-CB, generally is not effective against true armyworm. See seed dealer for refuge requirements of Bt corn hybrids.
	<i>bifenthrin</i> Brigade, Capture, Fanfare, Discipline, others 2EC	3A	2.1-6.4 fl oz	0.033-0.01	24 H/ 30 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1.0EC	3A	2.8 fl oz	0.022	12 H/ 21 D	
	<i>chlordaniliprole</i> Prevathon 0.43 (Fall armyworm only)	28	14-20 fl oz	0.047-0.09	4 H/ 21 D	
	<i>chlorpyrifos</i> Lorsban, Nufos, others 4E Chlorpyrifos 4EC Lorsban 75WG	1B	1-2 pt 2 pt 1.33 lb	0.5-1 1 1	24 H/ 35 D	
	<i>deltamethrin</i> Delta Gold 1.5EC	3A	0.8 fl oz	0.009	12 H/ 21 D	
	<i>esfenvalerate</i> Asana XL, Adjourn 0.6 6EC (True armyworm only)	3A	9.6 fl oz	0.05	12 H/ 21 D	
	<i>flubendiamide</i> Belt 4	28	2-3 fl oz	0.0625-0.094	12 H/ 28 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015 0.015	24 H/ 21 D	
	<i>lambda cyhalothrin</i> Karate Z (2.08) Warrior, Lambda T, Silencer, others (1CS)	3A	1.92 fl oz 3.84 fl oz	0.03 0.03	24 H/ 21 D	
	<i>methomyl</i> Lannate 2.4 LV Lannate 90SP	1A	0.75-1.5 pt 0.5 lb	0.225-0.45 0.45	48 H/ 21 D	
<i>methoxyfenozide</i> Intrepid 2F (True armyworm only)	18	4-16 fl oz	0.06-0.25	24 H/ 30 D		

CORN INSECT CONTROL

PEST	MATERIAL AND FORMULATION	MOA	AMOUNT PER ACRE OR PER 1000 FT OF ROW	LB. ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Armyworms: True armyworm Fall armyworm (continued)	<i>spinetoram</i> Radiant 1SC	5	3-6 fl oz	0.234-0.0469	4 H/ 28 D	
	<i>spinosad</i> Tracer 4SC	5	1.67-3.3 oz	0.038-0.075	4 H/ 28 D	
	<i>zeta-cypermethrin</i> Mustang Maxx, Respect	3A	4 fl oz	0.025	12 H/ 30 D	
Corn earworms, Fall armyworms (In ears)	Do not treat					Corn earworm and fall armyworm in ears are difficult to control. Usually not economical to keep these insects out of the ears using insecticides. Bt-trait in Genusity, VT Triple PRO, Agrisure Viptera, and SmartStax will reduce infestation and ear/kernel damage by corn earworm and fall armyworm. Other single Bt traits usually are not effective in preventing ear damage.
	Bt-trait corn Genusity VT Triple PRO Agrisure Viptera Optimum Leptra	11A	Insecticide produced in plant			
Cutworms	<i>alpha-cypermethrin</i> Fastac EC 0.83	3A	1.8-3.8 fl oz	0.012-0.025	12 H/ 30 D	Several species including black, dingy and variegated cutworms. Reduced tillage conditions, plant residue, winter cover crops and winter grassy weeds favor infestation. Pre-plant broadcast application within 2 weeks of planting may provide helpful control of large cutworms. Use intermediate to highest rate listed. Most products can be tank mixed with a pre-plant herbicide. At planting apply insecticide as a band or T-band over the row. Check label for specific banding directions. NOTE: Poncho 1250 as applied at planting for soil insect control also will reduce cutworm damage. NOTE: Some Bt traits are effective at preventing cutworm damage.
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1.6 fl oz	0.013	12 H/ 21 D	
	<i>bifenthrin</i> Bifenthrin, Capture, Discipline, Fanfare 2EC	3A	PPI & PRE: 3-4 fl oz/A (0.047-0.062 lb AI) POST: 2.1-6.4 fl. oz/A (0.033-0.10)	0.033-0.10	24 H/ 30 D	
	<i>chlorpyrifos</i> Lorsban, Nufos, other 4E Chlorpyrifos 4EC Lorsban 75WG	1B	1-2 pt 2 pt 1.33 lb	0.5-1 1 1	24 H/ 35 D	
	<i>cyfluthrin</i> Tombstone 2	3A	1.6 fl oz	0.025	12 H/ 21 D	
	<i>deltamethrin</i> Delta Gold 1.5EC	3A	0.8 fl oz	0.009	12 H/ 21 D	
	<i>esfenvalerate</i> Asana XL, Adjourn 0.66EC	3A	9.6 fl oz	0.05	12 H/ 21 D	
	<i>flubendiamide</i> Belt 4SC (black cutworm only)	28	2-3 fl oz	0.0625-0.094	12 H/ 28 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015 0.015	24 H/ 21 D	
	<i>lambda cyhalothrin</i> Karate Z 2.08 Warrior, Lambda T, Silencer, others 1CS	3A	1.28-1.6 fl oz 1.92-3.2 fl oz	0.02-0.025 0.02-0.025	24 H/ 21 D	
	<i>permethrin</i> others 3.2EC	3A	4-6 fl oz	0.1-0.15	12 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Maxx, Respect 0.8EC	3A	2.8-4 fl oz/A or 0.16 fl oz/1000 ft	0.014-0.025	12 H/ 30 D	

CORN INSECT CONTROL

PEST	MATERIAL AND FORMULATION	MOA	AMOUNT PER ACRE OR PER 1000 FT OF ROW	LB. ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
European corn borer, Southwestern corn borer	<i>bifenthrin</i> Bifenthrin, Capture, Fanfare, Discipline, others 2EC	3A	2.1-6.4 fl oz	0.033-0.10	24 H/ 30 D	EUROPEAN CORN BORER: Insecticides must be applied before larvae bore into stalks. Whorl stage (1st generation), treat if numerous egg masses are found in the field (treat just as eggs hatch) or when 50% of the plants have leaf feeding and live, small larvae are found. Tasseling stage (2nd generation), treat when the corn is in the early-tasseling stage and moths are active in the field. SOUTHWESTERN CORN BORER: Currently restricted to northwestern Georgia. Infestations usually worse in late-planted fields. Comments on European corn borer also apply to southwestern corn borer. NOTE: Bt-corn borer traits are very effective against both borer species. See seed dealer for refuge requirements of Bt corn hybrids. NOTE: Blackhawk/Tracer is most effective against small larvae.
	Bt-trait corn	11A	Insecticide produced in plant			
	<i>chlorantraniliprole</i> Prevathon 0.43		14-20 fl oz	0.047-0.09	4 H/ 21 D	
	<i>chlorpyrifos</i> Lorsban, Nufos, other 4E Chlorpyrifos 4EC Lorsban 75WG	1B	1-2 pt 2 pt 1.33 lb	0.5-1 1 1	24 H/ 35 D	
	<i>flubendiamide</i> Belt 4	28	2-3 fl oz	0.0625-0.094	12 H/ 28 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.28-1.54 fl oz 3.20-3.84 fl oz	0.0125-0.015 0.0125-0.015	24 H/ 21 D	
	<i>lambda cyhalothrin</i> Karate Z 2.08 Warrior, Lambda T, Silencer, others 1CS	3A	1.6-1.92 fl oz 3.2-3.84 fl oz	0.025-0.003 0.025-0.003	24 H/ 21 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	4-16 fl oz	0.06-0.25	24 H/ 30 D	
	<i>spinosad</i> Blackhawk (36%)	5	1.67-3.3 oz	0.038-0.075	4 H/ 28 D	
Grasshoppers	<i>alpha-cypermethrin</i> Fastac EC 0.83	3A	2.7-3.8 fl oz	0.017-0.025	12 H/ 30 D	Generally a problem in reduced tillage and along field margin. Products listed are most effective against small to medium sized nymphs. Adults are difficult to control.
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	2.1-2.8 fl oz	0.0165-0.022	12 H/ 21 D	
	<i>bifenthrin</i> Bifenthrin, Capture, Discipline, Fanfare 2EC	3A	2.1-6.4 fl. oz	0.033-0.10	24 H/ 30 D	
	<i>chlorpyrifos</i> Lorsban, Nufos, other 4E Chlorpyrifos 4EC Lorsban 75WG	1B	0.5-2 pt 0.5-2 pt 1.33 lb	0.25-1 0.25-1 1	24 H/ 35 D	
	<i>cyfluthrin</i> Tombstone 2	3A	2.1-2.8 fl oz	0.033-0.044	12 H/ 21 D	
	<i>deltamethrin</i> Delta Gold 1.5EC	3A	1.5 fl. oz	0.018	12 H/ 21 D	
	<i>esfenvalerate</i> Asana XL, Adjourn 0.66EC	3A	5.8-9.6 fl oz	0.03-0.05	12 H/ 21 D	

CORN INSECT CONTROL

PEST	MATERIAL AND FORMULATION	MOA	AMOUNT PER ACRE OR PER 1000 FT OF ROW	LB. ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Grasshoppers (continued)	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.02-1.54 fl 3A3AG RG AW G	0.01-0.015 0.01-0.015	24 H/ 21 D	
	<i>lambda cyhalothrin</i> Karate Z 2.08 Warrior, Lambda T, Silencer, others (1CS)	3A	1.28-1.92 fl. oz 2.56-3.84 fl oz	0.02-0.03 0.02-0.03	24 H/ 21 D	
	<i>zeta-cypermethrin</i> Mustang Maxx, Respect 0.8EC	3A	2.72-4 fl oz	0.017-0.025	12 H/ 30 D	
Beetle Adults: Cereal Leaf beetles, Flea beetles, Japanese beetle, Corn rootworm adults	<i>alpha-cypermethrin</i> Fastac EC 0.83	3A	2.7-3.8 fl oz	0.017-0.025	12 H/ 30 D	<p><u>LEAF FEEDING</u> by CEREAL LEAF BEETLES, FLEA BEETLES, JAPANESE BEETLES: Leaf feeding on whorl stage plants usually in late spring. Cereal leaf beetles move out of maturing small grain fields and infest nearby corn fields. Usually only border rows are damaged and may need control. Treat if beetles become numerous and their feeding damage exceeds 25% leaf area loss.</p> <p><u>SILK FEEDING</u> by JAPANESE BEETLE, CORN ROOTWORM ADULTS: Feeding on silks by beetles during pollination. Treat if 2 or more Japanese beetles or 5 or more rootworm beetles are present AND most silks are being clipped to within an inch of the ear tip.</p> <p>NOTE: During pollination, Sevin has a bee caution. Notification of beekeepers in the area may be needed. See label for details.</p>
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	2.1-2.8 fl oz	0.0165-0.022	12 H/ 21 D	
	<i>bifenthrin</i> Bifenthrin, Capture, Fanfare, Discipline, others 2EC	3A	2.1-6.4 fl oz	0.033-0.10	24 H/ 30 D	
	<i>carbaryl</i> Sevin XLR Plus Sevin 4F	1A	1.25-2.5 lb 1-2 qt	1-2 1-2	12 H/ 48 D	
	<i>cyfluthrin</i> Tombstone 2	3A	1.6-2.8 fl oz	0.025-0.044	12 H/ 21 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.02-1.54 fl oz 2.56-3.84 fl oz	0.01-0.015 0.01-0.015	24 H/ 21 D	
	<i>lambda cyhalothrin</i> Karate Z 2.08 Warrior, Lambda T, Silencer, others (1CS)	3A	1.28-1.92 fl oz 2.56-3.84 fl oz	0.02-0.03 0.02-0.03	24 H/ 21 D	
	<i>permethrin</i> others 3.2EC	3A	4-6 fl oz	0.1-0.15	12 H/ 21 D	
	<i>zeta-cypermethrin</i> Mustang Maxx, Respect 0.8EC	3A	2.72-4 fl oz	0.017-0.025	12 H/ 30 D	
Spider Mites	<i>bifenthrin</i> Bifenthrin, Capture, Fanfare, Discipline, others 2EC	3A	5.12-6.4 fl oz	0.08-0.10	24 H/ 30 D	<p>MITES: Treat if infestations become widespread, leaf discoloration is evident, and 1-2 lower leaves are dying. <i>Bifenthrin</i> products: Use 6.4 fl oz rate alone OR use 5.1 fl oz rate tank mixed with dimethoate at 0.5 lb (AI)/A.</p>
	<i>dimethoate</i> Dimethoate 2.67EC Dimethoate 4E, 400	1B	Tank mix with bifenthrin at 0.5 lb (ai)/A		48 H/ 42 D	
	<i>etoxazole</i> Zeal 72WSP	10B	1-3 oz	0.045-0.135	12 H/ 21 D	

CORN INSECT CONTROL

PEST	MATERIAL AND FORMULATION	MOA	AMOUNT PER ACRE OR PER 1000 FT OF ROW	LB. ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Spider Mites (continued)	<i>hexythiazox</i> Onager 1	10A	10-24 fl oz	0.078-0.1875	12 H/ 30 D	Apply at first sign of mites before population begins to build.
	<i>propargite</i> Comite II 6	12C	1.5-2.25 pt	1.125-1.6875	13 H/ 30 D	Only apply to dry foliage. Do not tank mix; do not use an oil-based surfactant. See table for additional restrictions.
	<i>spiromesifen</i> Oberon 2SC Oberon 4SC,	23	5.7-8.5 fl oz 2.85-8 fl oz	0.087-0.13 0.087-0.25	13 H/ 30 D	Use 8.5 fl oz rate for large infestations. A NIS adjuvant is beneficial.
Stink bugs	Brown Stink Bugs					<p>SEEDLING STAGE: Treat if 5% of seedling plants have damage and stink bugs are present. Poncho 250, 500 and 1250 will suppress stink bug damage to seedlings for a few weeks after planting.</p> <p>EAR STAGE: Corn is most sensitive to stink bug injury during ear formation before silking. Treat if 25% (1/4) of plants in the ear zone are infested with stink bugs.</p> <p>KERNEL FILL: During kernel filling bugs feed through the husk damaging individual kernels. Treat if 50% (1/2) of ears are infested.</p> <p>NOTE: Use pyrethroids (Baythroid, Capture, Delta Gold, Fastac, Mustang, Karate, Warrior, Declare, Proaxis, Tombstone) if southern green stink bug is present. These products are less effective against brown stink bug.</p> <p>NOTE: Bidrin as used on cotton is not registered for use on corn.</p>
	<i>bifenthrin</i> Bifenthrin, Capture, Discipline, Fanfare, others 2EC	3A	6.4 fl oz	0.10	12 H/ 30 D	
	<i>bifenthrin + zeta cypermethrin</i> Hero Speed	3A	10.3 fl oz 4.7 fl oz	<i>bifenthrin</i> 0.10 <i>bifenthrin</i> 0.10	12 H/ 30 D	
	Green/Southern Green Stink Bugs					
	<i>alpha-cypermethrin</i> Fastac EC (0.83)	3A	3.2-3.8 fl oz	0.020-0.025	12 H/ 30 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	2-2.8 fl oz	0.015-0.022	12 H/ 21 D	
	<i>bifenthrin</i> Bifenthrin, Capture, Discipline, Fanfare 2EC	3A	3.2-6.4 fl oz	0.05-0.10	24 H/ 30 D	
	<i>cyfluthrin</i> Tombstone 2	3A	2.1-2.8 fl oz	0.033-0.044	12 H/ 21 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.28-1.54 fl oz 3.20-3.84 fl oz	0.0125-0.015 0.0125-0.015	24 H/ 21 D	
	<i>lambda cyhalothrin</i> Karate Z (2.08) Warrior, Lambda T, Silencer, others (1CS)	3A	1.6-1.92 fl oz 3.2-3.84 fl oz	0.025-0.03 0.025-0.03	24 H/ 21 D	
<i>zeta-cypermethrin</i> Mustang MAX, Respect 0.8EC	3A	3.2-4 fl oz	0.02-0.025	12 H/ 30 D		

CORN INSECT CONTROL

PEST	MATERIAL AND FORMULATION	MOA	AMOUNT PER ACRE OR PER 1000 FT OF ROW	LB. ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS	
Thrips	SEEDLING CONTROL						
	<i>clothianidin</i> Poncho 500 Poncho 1250 NipsIt Inside 5	4C	0.50 mg (ai)/seed 1.25 mg (ai)/seed See label	- - -	12 H/ --	Treat if field is heavily infested and new leaves show excessive damage. Rarely causes yield loss on field corn. Seed treatments provide suppression only; low (250) rate usually not effective. NOTE: Blackhawk/Tracer 4SC as applied for fall armyworm may provide helpful control.	
	<i>thiamethoxam</i> Cruiser Extreme 1250	4C	1.25 mg (ai)/seed	-	12 H/ --		
	FOLIAR TREATMENT						
	<i>chlorpyrifos</i> Lorsban, Chlorfos, Chlorpyrifos 4E	1B	1-2 pt	0.5-1	24 H/ 35 D		
Premixed or Co-Packed Insecticides: Products listed are available as premixes or co-packages of two insecticide active ingredients. User should check mixture labels for active ingredient, specific use rates, target pests, and precautions.							
BRAND NAME (ACTIVE INGREDIENTS)		RANGE OF FORMULATION RATES					
Besiege (<i>lambda-cyhalothrin, cloranthraniliprole</i>)		5-10 fl oz/A					
Cobalt Advanced (<i>chlorpyrifos, gamma-cyhalothrin</i>)		6-38 fl oz/A					
Consero (<i>spinosad, gamma-cyhalothrin</i>)		2-3 fl oz/A					
Hero (<i>zeta-cypermethrin, bifenthrin</i>) Steed (<i>zeta-cypermethrin, bifenthrin</i>)		2.6-10.3 fl oz/A 2.5-4.7 fl oz/A					
Stallion (<i>chlorpyrifos, zeta-cypermethrin</i>)		3.75-11.75 fl oz/A					
Bt-TRAITS FOR CORN: Most corn hybrids now contain one or more Bt traits. Some traits target caterpillar pests including corn borers, cutworms, fall armyworm and corn earworm in the whorl, and corn earworm and fall armyworm in the ears. Hybrids with two or three stacked traits for caterpillar control will be available for the 2011 season. Hybrids also may contain one or more Bt traits for control of western corn rootworms that attack roots during mid-season. Bt-rootworm traits are effective against mid-season rootworms but are NOT effective on seedlings against southern corn rootworm or other soil insects such as wireworms and white grubs. Depending on specific traits, refuge requirements for hybrids with Bt traits are either 20% or 50% of the corn acreage on a farm. Check with seed supplier for a complete list of resistant management restrictions. A table listing various combinations of Bt traits and relative efficacy against pests in Georgia is in the Insect Control section of the current Georgia Corn Production Handbook and on the Georgia Grain web page.							

INSECTICIDE USE RESTRICTIONS FOR FIELD CORN

David Buntin, Research/Extension Entomologist and John All, Research Entomologist

INSECTICIDE	BRAND NAME	DAYS TO GRAIN HARVEST	DAYS TO GRAZING OR SILAGE HARVEST	RESTRICTED ENTRY INTERVAL (REI, HOURS)	MAXIMUM AMOUNT ALLOWED PER ACRE PER CROP	REMARKS
<i>alpha-cypermethrin</i>	Fastac EC	30	60	12	11.4 fl oz	
<i>bifenthrin</i>	Brigade, Capture, Bifenthrin, Discipline, Fanfare 2E	30	30	24	19.2 fl oz	
<i>beta cyfluthrin</i>	Baythroid XL 1EC	21	0	12	11.2 fl oz (4 applications)	Only 1 application from early dent to 21 days before harvest
<i>carbaryl</i>	Sevin, Carbaryl 4	48	14	12	8 qt	Bee caution. Beekeeper notification may be needed. See label for details.
<i>chlorantraniliprole</i>	Coragen 1.67SC Prevathon 0.43	14	14	4	15.4 fl oz	Do not apply less than 7 days apart.
<i>chlorpyrifos</i>	Lorsban 15G	35	14	12	13.5 lb	
<i>chlorpyrifos</i>	Lorsban 4E, others	35	14	24	15 pt	
<i>chlorethoxyfos + bifenthrin</i>	Smart Choice 5G	at-planting only	--	48	1 application/year	In-furrow only. Do not apply as a surface band application. Registration in Georgia expected by 2013.
<i>clothianidin</i>	Poncho 600 sold as Poncho 250 and Poncho 1250	- ¹	- ¹	0	seed treatment	Commercially applied. See label for plant back restrictions
<i>cyfluthrin</i>	Tombstone 1	21	21	12	11.2 fl oz	Only 1 application from early dent to 21 days before harvest.
<i>deltamethrin</i>	Delta Gold 1.5EC	21	12 21 for fodder	12	8.1 fl oz (5 applications)	Do not apply less than 21 days apart.
<i>dimethoate</i>	Dimethoate	42	14	48	3 applications	Do not apply during pollen shed
<i>esfenvalerate</i>	Asana XL, Adjourn	21	- ¹	12	48 fl oz	Do not apply more than 0.25 lb (ai) per acre per season
<i>flubendiamide</i>	Belt (4.0)	28	1	12	12 fl oz/A (4 applications)	
<i>gamma cyhalothrin</i>	Declare 1.25, Proaxis 0.5	21	21	24	0.48 pt 0.96 pt	See label for additional restrictions.
<i>hexythiazox</i>	Onager	30	20	12	1 application	15-20 gpa by ground or 5 gpa by air; see label.
<i>lambda cyhalothrin</i>	Warrior, Silencer 1 Karate Z 2.08	21	21	24	0.96 pt 0.48 pt	See label for restrictions.
<i>methoxyfenozide</i>	Intrepid 2F	21	21	4	64 fl oz	
Oberon 4SC					See label	
<i>permethrin</i> (foliar)	Permethrin	30	0	12	24 fl oz	
<i>methomyl</i>	Lannate 2.4LV, 90SP	21	3	48	2.25 lb ai	
<i>phorate</i>	Phorate, Thimet 20G	30 ²	30	48	1 application; 6.5 lb/A	Do not apply in-furrow or after cultivation

INSECTICIDE USE RESTRICTIONS FOR FIELD CORN

INSECTICIDE	BRAND NAME	DAYS TO GRAIN HARVEST	DAYS TO GRAZING OR SILAGE HARVEST	RESTRICTED ENTRY INTERVAL (REI, HOURS)	MAXIMUM AMOUNT ALLOWED PER ACRE PER CROP	REMARKS
<i>propargite</i>	Comite II	30	30	7 days	1 application	Only apply to dry foliage, Do not tank mix, do not use an oil-based surfactant. Use minimum of 20 GPA by ground and 5 GPA for aerial applications.
<i>spinosad</i>	Tracer 4SC Blackhawk 36%	28	7	4	6 fl oz 8.3 oz	Most effective against small larvae.
<i>spiromesifen</i>	Oberon 2SC	30	5	12	17 fl oz and 2 applications	Use at least 10 GPA by ground and 5 GPA by air.
<i>terbufos</i>	Counter 20G	30 ²	30 ²	48	6.5 lb	Make only 1 application.
<i>tefluthrin</i>	Force 3G	¹	¹	0	1 application	Granules must be incorporated into soil.
<i>thiamethoxam</i>	Cruiser 5FS	¹	--	12	Seed treatment	Commercially applied; see label for plant back restrictions. Some formulations may contain fungicides.
<i>zeta-cypermethrin</i>	Mustang Maxx, Respect	30	60	12	16 fl oz	

¹Not listed.

²Not listed for at-planting application.

CORN NEMATODE CONTROL

Bob Kemerait, Extension Plant Pathologist

CHEMICAL	Rate/A	REMARKS AND PRECAUTIONS
AVICTA Duo Corn (seed treatment)		AVICTA Duo Corn is a combination of abamectin and thiamethoxam
Counter 15G	7	*Apply in furrow as row treatment. DO NOT exceed 8.7 lb/A regardless of row spacing. ALS-inhibiting herbicides should not be used if Counter 15G has been applied to the corn at planting. REI is 48 hours. REI is increased to 72 hours in areas where average rainfall is less than 2" a year. Do not graze or cut for forage within 30 days of treatment.
Counter 20G	5.25	Apply in-furrow as row treatment. DO NOT exceed 6.5 lb/A regardless of row spacing. ALS-inhibiting herbicides should not be used if Counter 20G has been applied to the corn at planting. REI is 48 hours. REI is increased to 72 hours in areas where average rainfall is less than 2 inches a year. Do not graze or cut for forage within 30 days of treatment.
PONCHO VOTIVO (seed treatment)		PONCHO VOTIVO is a systemic insecticide and biological seed treatment for use on corn to control insect pests and plant pathogenic nematodes listed on the label to include lance, root-knot, stubby-root, stunt, and sting nematodes.
Telone II	3 gal	Apply Telone II at least 7 days prior to planting by injecting 12" below the soil surface. REI is 5 days post application.

*NOTE: Granules should be incorporated for best results.

FIELD CORN DISEASE CONTROL

Bob Kemmerait, Extension Plant Pathologist

PEST	FUNGICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Southern Corn Leaf Blight, Northern Corn Leaf Blight	NOTE: Use of fungicides to manage southern corn leaf blight is rarely needed in recent years. However, 2008 and 2009 were severe years for northern corn leaf blight. With the emergence of northern corn leaf blight as an important disease of corn in Georgia beginning in 2008, growers should recognize that fungicides can be an effective tool to minimize losses associated with this disease.				
	<i>benzovindiflupyr</i> (solatenol) + <i>azoxystrobin</i> + <i>propiconazole</i> Trivapro A + B	7 + 3 + 11	Trivapro A (solatenol) 4 fl oz/A Trivapro B (<i>azoxystrobin</i> + <i>propiconazole</i>) 10.5 fl oz/A		Trivapro A: Maximum total rate/season 14 fl oz/A Trivapro B: Maximum total rate/season: 56 fl oz/A DO NOT ADD an adjuvant or crop oil after the V8 stage and prior to the VT stage
	Domark		4-6 fl oz/A	12 H/ --	Do not apply more than 6 fl oz/A in order to reduce the potential for resistance. Do not apply Domark after corn growth stage 3 (milk). Do not use adjuvants in sprays made between V-8 and VT growth stage.
	Evito 480 SC		2-5.7 fl oz/A	12 H/ --	Do not apply Evito after the R4 (early dough) stage or within 30 days of harvest. Maximum rate is 22.8 fl oz/A/season.
	Evito T		4-9 fl oz/A	12 H/ --	Do not apply Evito after the R4 (early dough) stage or within 36 days of harvest. Maximum rate is 18 fl oz/A/season.
	<i>flutriafol</i> + <i>fluoxastrobin</i> Fortix		4-6 fl oz/A	12 H/ --	Apply a maximum of two applications per season no later than growth stage R4 (early dough stage). Do not apply Fortix within 80 days of harvest or through chemigation. Maximum rate is 12 fl oz/A/season.
	<i>fluxapyroxad</i> + <i>pyraclostrobin</i> Priaxor		4-8 fl oz /A	12 H/ --	Priaxor is a combination of fluxapyroxad and pyraclostrobin. Do not apply within 21 days of harvest to field corn and make no more than 2 applications per season. Maximum rate is 16 fl oz/A/season.
	<i>picoxystrobin</i> Approach		3-4 fl oz/A & 6-12 fl oz/A	12 H/ --	There should be no more than 2 sequential applications of Approach before shifting to a fungicide of a different mode of action. The 3-4 fl oz/A rate is for early season disease suppression (V3-V7) while the 6-12 fl oz/A rate is typically applied between the VT and R3 growth stages. Do not apply Approach within 7 days of grain harvest or 0 days before harvest for foliage. Maximum rate is 36 fl oz/A/season.
	<i>picoxystrobin</i> + <i>cyproconazole</i> Approach Prima		3.4 fl oz/A & 3.4-6.8 fl oz/A	12 H/ --	There should be no more than two sequential applications of Approach Prima before shifting to a fungicide of a different mode of action. The 3.4 fl oz/A rate is for early season disease suppression (V3-V7) while the 3.4-6.8 fl oz/A rate is typically applied between the VT and R3 growth stages. Do not apply Approach Prima within 30 days of grain harvest or 21 days before harvest for foliage. Maximum rate is 6.8 fl oz/A/season.
	Quadris		9.2-15.4 fl oz/A	4 H/ --	Do not apply Quadris within 7 days of harvest. Maximum rate is 123 fl oz/A/season.
	Quilt		7-14 fl oz/A	12 H/ --	Do not apply Quilt within 30 days of harvest. Maximum rate is 56 fl oz/A/season.
Quilt Xcel		10.5-14 fl oz/A	12 H/ --	Do not apply Quilt Xcel within 30 days of harvest. Maximum rate is 56 fl oz/A/season.	
Stratego		10-12 fl oz/A	12 H/ --	Do not apply Stratego within 30 days of harvest. Maximum rate is 24 fl oz/A/season.	
<i>strobilurin</i> Headline		9-12 fl oz/A	12 H/ --	Do not apply Headline within 7 days of harvest. Maximum rate is 72 fl oz/A/season.	

FIELD CORN DISEASE CONTROL

PEST	FUNGICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Southern Corn Leaf Blight, Northern Corn Leaf Blight (continued)	<i>strobilurin+triazole</i> Headline AMP		10 fl oz/A	12 H/ --	Maximum rate is 57.6 fl oz/A/season. Do not apply Headline AMP within 20 days of harvest for grain or within 7 days of harvest for forage/silage.
	Tebuconazole 3.6F		4-6 fl oz/A	12 H/ --	Do not apply tebuconazole within 21 days of harvest for forage or within 36 days of harvest for grain.
	<i>tebuconazole + azoxystrobin</i> Custodia	3 + 11	9-12.9 fl oz/A	12 H/ 21 D	Apply in a protective spray schedule or when weather conditions favor disease. Apply on a 7-14 day schedule. Do not use and adjuvant or crop oil after V* stage and prior to VT. Maximum rate is 51.7 fl oz/A/season.
	<i>tetraconazole + azoxystrobin</i> Affiance	3 + 11	10-17 fl oz/A	12 H/ 7 D	Maximum rate is 17.06 fl oz/A/year. Limit of 2 applications per year Early applications: V4-V8 Regular applications: V8=R3 (do not apply with adjuvants between V8 and VT) Do not apply after R3 (brown silk) Can be applied in chemigation (0.1-0.25") Do not harvest for silage within 21 days of application.
	Tilt		2-4 fl oz/A	12 H/ --	Do not apply Tilt within 30 days of harvest. Maximum rate is 16 fl oz/A/season.
	<i>trifloxystrobin + prothioconazole</i> Stratego YLD		4-5 fl oz/A	12 H/ --	Stratego YLD should not be applied to field corn within 14 days of harvest. Maximum rate is 10 fl oz/A/season.
Southern Rust, Common Rust	NOTE: Growers do not need to apply fungicides to control common rust as this disease causes little damage. However, southern rust, especially in severe years, can cause heavy yield losses. For best results, fungicide applications should be initiated before disease enters the field or as soon as southern rust is detected after careful scouting.				
	<i>benzovindiflupyr (solatenol) + azoxystrobin + propiconazole</i> Trivapro A + B	7 + 3 + 11	Trivapro A (solatenol) 4 fl oz/A Trivapro B (<i>azoxystrobin + propiconazole</i>) 10.5 fl oz/A		Trivapro A: Maximum total rate/season 14 fl oz/A Trivapro B: Maximum total rate/season: 56 fl oz/A DO NOT ADD an adjuvant or crop oil after the V8 stage and prior to the VT stage
	Domark		6 fl oz/A	12 H/ --	Do not apply more than 6 fl oz/A in order to reduce the potential for resistance. Do not apply Domark after corn growth stage 3 (milk). Do not use adjuvants in sprays made between V-8 and VT growth stage" Maximum rate is 6 fl oz/A/season.
	Evito 480 SC		2-5.7 fl oz/A	12 H/ --	Do not apply Evito after the R4 (early dough) stage or within 30 days of harvest. Maximum rate is 11.4 fl oz/A/season.
	Evito T		4-9 fl oz/A	12 H/ --	Do not apply Evito after the R4 (early dough) stage or within 36 days of harvest. Maximum rate is 18 fl oz/A/season.
	<i>flutriafol+fluoxastrobin</i> Fortix		4-6 fl oz/A	12 H/ --	Apply a maximum of two applications per season no later than growth stage R4 (early dough stage). Do not apply Fortix within 80 days of harvest or through chemigation. Maximum rate is 12 fl oz/A/season.
	<i>fluxapyroxad+pyraclostrobin</i> Priaxor		4-8 fl oz /A	12 H/ --	Do not apply within 21 days of harvest to field corn and make no more than 2 applications per season. Maximum rate is 16 fl oz/A/season.
	<i>picoxystrobin</i> Approach		3-4 fl oz/A & 6-12 fl oz/A	12 H/ --	There should be no more than 2 sequential applications of Approach before shifting to a fungicide of a different mode of action. The 3-4 fl oz/A rate is for early season disease suppression (V3-V7) while the 6-12 fl oz/A rate is typically applied between the VT and R3 growth stages. Do not apply Approach within 7 days of grain harvest or 0 days before harvest for foliage. Maximum rate is 36 fl oz/A/season.

FIELD CORN DISEASE CONTROL

PEST	FUNGICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Southern Rust, Common Rust (continued)	<i>picoxystrobin + cyproconazole</i> Approach Prima		3.4 fl oz/A & 3.4-6.8 fl oz/A	12 H/ --	There should be no more than 2 sequential applications of Approach Prima before shifting to a fungicide of a different mode of action. The 3.4 fl oz/A rate is for early season disease suppression (V3-V7) while the 3.4-6.8 fl oz/A rate is typically applied between the VT and R3 growth stages. Do not apply Approach within 30 days of grain harvest or 21 days before harvest for foliage Maximum rate is 6.8 fl oz/A/season.
	Quadris		6.2-9.2 fl oz/A	4 H/ --	Do not apply Quadris within 7 days of harvest. Maximum rate is 123 fl oz/A/season.
	Quilt Xcel		10.5-14 fl oz/A	12 H/ --	Do not apply Quilt Xcel within 30 days of harvest. Maximum rate is 56 fl oz/A/season.
	Quilt		10.5-14 fl oz/A	12 H/ --	Do not apply Quilt within 30 days of harvest. Maximum rate is 56 fl oz/A/season.
	Stratego		7-10 fl oz/A	12 H/ --	Do not apply Stratego within 30 days of harvest. Maximum rate is 24 fl oz/A/season.
	Stratego YLD		4-5 fl oz/A	12 H/ --	Stratego YLD is a combination of trifloxystrobin and prothioconazole. Stratego YLD should not be applied to field corn within 14 days of harvest. Maximum rate is 10 fl oz/A/season.
	<i>strobilurin</i> Headline		6-9 fl oz/A	12 H/ --	Do not apply Headline within 7 days of harvest. Maximum rate is 72 fl oz/A/season.
	<i>strobilurin+triazole</i> Headline AMP		10 fl oz/A	12 H/ --	Maximum rate is 57.6 fl oz/A/season. Do not apply Headline AMP within 20 days of harvest for grain or within 7 days of harvest for forage/silage.
	Tebuconazole 3.6F		4-6 fl oz/A	12 H/ --	Do not apply tebuconazole within 21 days of harvest for forage or within 36 days of harvest for grain. NOTE: Please see individual labels for tebuconazole products for specific information on use on field corn.
	<i>tebuconazole + azoxystrobin</i> Custodia	3 + 11	9-12.9 fl oz/A	12 H/ 21 D	Apply in a protective spray schedule or when weather conditions favor disease. Apply on a 7-14 day schedule. Do not use and adjuvant or crop oil after V* stage and prior to VT. Maximum rate is 51.7 fl oz/A/season.
	<i>tetraconazole + azoxystrobin</i> Affiance	3 + 11	10-17 fl oz/A	12 H/ 7 D	Maximum rate is 17.06 fl oz/A/year. Limit of 2 applications per year Early applications: V4-V8 Regular applications: V8=R3 (do not apply with adjuvants between V8 and VT) Do not apply after R3 (brown silk) Can be applied in chemigaton (0.1-0.25") Do not harvest for silage within 21 days of application.
	Tilt		4 fl oz/A	12 H/ --	Do not apply Tilt within 30 days of harvest. Maximum rate is 16 fl oz/A/season.

FIELD CORN WEED CONTROL

Eric P. Prostko, Extension Agronomist-Weed Science

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS AI/A		
PREEMERGENCE					
<i>acetochlor</i> Warrant 3ME	15	3 pt	1.125	12 H/ Grazing and Forage = 40 D	Can be applied PRE or POST (up to 30" tall corn). Controls (residual) most annual grasses (except Texas panicum) and certain broadleaf weeds. Under cool, wet weather conditions, stunting or crop injury expressed as malformed, knotted, twisted top growth may occur. Do not apply Warrant if these conditions are forecast within 10 days of application. Warrant may be tank-mixed with atrazine or glyphosate or Liberty. For the following soil types, do not apply Warrant within 50 feet of any well where the depth to ground water is 30 feet or less: sands <3% OM; These restrictions do not apply for areas more than 50 feet from a well or if groundwater is more than 30 feet below land surface. Warrant has no POST activity. Before using Warrant PRE, check with seedsman about potential hybrid sensitivity.
<i>metolachlor</i> Stalwart C Parallel Me-Too- Lachlor-II	15	1-1.33 pt	1-1.33	24 H/ Grazing or Forage = 30 D	Can be applied PPI, PRE or POST (up to 40" tall). With PPI/PRE applications, a formulation that contains a crop safener is preferred. Controls (residual) most annual grasses (except Texas panicum) and certain broadleaf weeds. Fair to good control of yellow nutsedge. Under cool, wet weather conditions, stunting or crop injury expressed as malformed, knotted, twisted top growth may occur. Corn normally outgrows early season injury. Metolachlor may be tank-mixed with atrazine, glyphosate, or Liberty. Available in several premixes with atrazine (Bicep II Magnum, Cinch ATZ, Lexar, Lumax, Parallel Plus, Stalwart Xtra). The generic formulations of metolachlor (Parallel, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials. When applied POST, a maximum rate of 2 pt/A can be used. The total amount of metolachlor that can be applied in a single season cannot exceed 3.33 pt/A on coarse soil types. Before using Dual PPI or PRE, check with seedsman about potential hybrid sensitivity.
<i>S-metolachlor</i> Dual Magnum 7.62E Dual II Magnum 7.64E Cinch 7.64E	15	1-1.33 pt 1-1.33 pt 1-1.33 pt	0.96-1.27	24 H/ Grazing or Forage = 30 D	
<i>atrazine</i> (numerous trade names) 80W 90DG 4L	5	2.5-3 lb 2.25-2.66 lb 2-2.5 qt	2-2.4 2-2.4 2-2.5	12 H/ Grazing = 21 D Forage = 60 D	Can be applied PPI, PRE or POST (12" tall). Good to excellent control of most annual broadleaf weeds. Does not usually provide adequate control of Texas panicum or fall panicum. Atrazine will often fail to provide extended control of crabgrass and late season control of sicklepod and morningglories. Atrazine may be tank-mixed with Liberty, glyphosate, metolachlor, acetochlor, or pyrooxasulfone. Do not use more than 2.5 lbs ai/A/year of atrazine.
<i>pyrooxasulfone</i> Zidua 85WG	15	1.5-2.75 oz	0.079-0.146	12 H/ --	Can be applied PRE, or early postemergence (V4 stage). Provides residual control of certain annual grasses and broadleaf weeds including Palmer amaranth. Can be tank-mixed with atrazine, glyphosate, and Liberty. When applying PRE, use the low rate (1.5 oz/A) on coarse soils. No more than 2.75 oz/A can be applied per year on coarse soils. Pre-slurry in water before mixing into larger spray tank. Before using Zidua PRE, check with seedsman about potential hybrid sensitivity.
<i>pyrooxasulfone + fluthiacet</i> Anthem 2.15SE	15 + 14	5-8 oz	0.082-0.13 + 0.002-0.004	12 H/ Grain = 70 D Forage = 30 D	Can be applied PRE or early postemergence (V4 stage). Provides residual control of certain annual grasses and broadleaf weeds. Can be tank-mixed with atrazine, glyphosate, or Liberty. On coarse textured soils, use the 5 oz/A rate. No more than 9 oz/A/year can be applied on coarse soils. POST applications (4-6 oz/A) will cause leaf burn/speckling. When applied POST do not tank-mix with Lorsban. Also available in pre-mix with atrazine sold as Anthem ATZ. Rotation restrictions: corn and soybean = 0 months; cotton, peanut, and wheat = 4 months. Before using Anthem PRE, check with seedsman about potential hybrid sensitivity. Rain-free period = 1 hour.

FIELD CORN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS AI/A		
CHEMIGATION					
<i>metolachlor</i> Stalwart C Parallel Me-Too-Lachlor-II	15	Refer to PRE section for rates		24 H/ --	May be applied by injection through center pivot irrigation systems. Use at normal rates recommended for conventional methods of application. Apply after planting but before crop emergence. Requires proper system calibration and safety devices (check valves, cutoff switches, etc.) to provide effective weed control and prevent environmental contamination. The generic formulations of metolachlor (Parallel, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.
<i>s-metolachlor</i> Dual Magnum Dual II Magnum Cinch	15	Refer to PRE section for rates		24 H/ --	
<i>pendimethalin</i> Prowl 3.3 EC	3	Refer to PRE section for rates			
POSTEMERGENCE: OVER-THE-TOP					
<i>atrazine</i> (numerous trade names) 80W 90DG 4L	5	1.88-2.5 lb 1.67-2.22 lb 1.5-2 qt	1.5-2	12 H/ Grazing = 21 D Forage = 60 D	Refer to herbicide table and label for specific information. Use low rate for broadleaf weeds. Use high rate for mixed infestations of grasses and broadleaf weeds. Application with crop oil or crop oil concentrate (1% v/v) will improve control. Can be applied up to 12" tall corn. Poor control may result on sicklepod more than 2" tall and on grasses beyond the 2 leaf stage. Do not apply with fluid fertilizer. If no atrazine was applied preemergence, apply no more than 2 lb/ai/A. If a preemergence treatment was used, do not exceed a total of 2.5 lb/ai/A calendar year.
<i>pendimethalin</i> Prowl/Pendimax 3.3EC Prowl H ₂ O 3.8 ACS + <i>atrazine</i> (numerous trade names) 4L*	3 + 5 + +	1.8-2.4 pt 2 pt + 1.5-2 qt	0.75-1 0.95 + 1.5-2	24 H/ --	Refer to herbicide table and label for specific product. Apply over-the-top after corn emergence but when weeds are less than 1" tall. For control of seedling grasses apply when no more than ½" tall. Consistency of control is contingent on timing of rainfall or irrigation after application. Do not use with fluid fertilizers after crop emergence. Pendimethalin or tank mixtures including pendimethalin may cause crop injury expressed as restricted root growth and crop stunting. Potential for injury is greatest on sand or loamy sand soils under cool, wet conditions. Plant corn at least 1.5" deep when using pendimethalin. Can be applied up to 12" tall corn.
<i>bentazon</i> Basagran/Broadloom 4SC	6	1.5-2 pt 1.2-1.6 pt	0.75-1	48 H/ Grazing = 12 D	Controls yellow nutsedge, cocklebur, bristly starbur, and certain other broadleaf weeds. Adjust rate according to weed size as noted on the label. A second application within 7-10 days will often be required for yellow nutsedge control. Add a crop oil concentrate at 1% v/v. Rain-free period is 4 hours.
<i>carfentrazone</i> Aim 2EC	14	0.50-1 oz	0.008-0.016	12 H / Leaf Collars = 14 D	For the control of pigweed, annual morningglory species (except smallflower), and tropical spiderwort. Can be applied over the top of corn until the V8 stage of growth. Aim will cause crop injury in the form of leaf speckling and necrosis but this injury will not affect yield. Use in combination with a crop oil concentrate at 1% v/v (1 gal/100 gal). Aim can be tank-mixed with gly phosate (GR corn hybrids only), 2,4-D, atrazine, and Accent. Refer to label for a more complete list of approved tank-mixes. Rain-free period is 6-8 hours.

FIELD CORN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS AI/A		
POSTEMERGENCE: OVER-THE-TOP					
2,4-D (numerous trade names) 3.8 lb/gal	4	0.5-1 pt	0.24-0.48	48 H/ 7 D	Refer to herbicide table and label for specific product . May be applied over-the-top of the crop and weeds until corn is 5-8" tall. Use only as a directed spray after corn is 8" tall. Do not apply after tassels appear. No spray additive is required. Corn is most subject to injury if it is rapidly growing and if soil moisture and temperature conditions are high or from over-the-top applications. If soil moisture levels and temperatures are high, use no more than 0.25 lb/ai/A. To minimize drift hazards where 2,4-D sensitive crops are present, use amine formulations and observe drift control precautions noted on label.
<i>pendimethalin</i> Prowl/Pendimax 3.3EC Prowl H ₂ O 3.8 ACS <i>trifluralin</i> (numerous trade names) 4 lb/gal	3	1.2-1.8 pt 1.5 pt 1-1.5 pt	0.5-0.75 0.71 0.5-0.75	24 H/ --	CULTI-SPRAY TECHNIQUE (Postemergence Incorporated) These treatments will provide <u>residual</u> control of annual grasses, including Texas panicum. <u>They will not control existing grasses.</u> They should be used to augment other weed control tactics. When using either of the treatments, the following steps must be followed: 1. The herbicides must be applied to weed-free soil. 2. Corn brace roots must be protected by soil thrown to the base of the stalk with a sweep or rolling cultivator prior to application. 3. The herbicides can be applied over-the-top or post-directed, depending on corn size. 4. A shallow, follow-up cultivation is required after application to minimize herbicide loss. Rainfall or irrigation amounts of 0.5-1" can be used instead of mechanical cultivation. 5. Apply pendimethalin when the corn is at least 4" tall until layby. Apply trifluralin when the corn is in the 2 true leaf stage until it reaches 30" in height.
<i>dicamba</i> Banvel (4 lb/gal) Clarity Sterling Vision, etc.	4	8 oz	0.25	24 H/ Grazing or forage = milk stage or later	May be applied either over-the-top up to 8" corn then as a directed spray. Directed sprays are less likely to result in crop injury or drift hazards and will improve weed coverage in larger corn. Refer to label. Do not use crop or petroleum oils. DO NOT apply after corn is 36". tall or within 15 days of tassel emergence, whichever occurs first. Where dicamba-sensitive crops such as cotton, soybeans, tobacco and vegetables are near treatment area, observe the following precautions to minimize drift hazards: 1. Use coarse sprays and spray pressure of less than 20 psi. 2. Apply only as a directed spray. 3. DO NOT apply if maximum daily temperature is expected to exceed 85°F. 4. DO NOT apply if winds exceed 5 mph and are blowing in the direction of the sensitive crop. Rain-free period is 4 hours.
<i>dicamba + diflufenzopyr</i> <i>+ isoxadifen</i> Status 56WDG	4 + 19	5-10 oz	0.125-0.25 + 0.05-0.10 0.175-0.350	24 H/ Grain = 72 D Forage = 32 D	Will control many annual broadleaf weeds. Include a NIS at 0.25% v/v and AMS at 5-17 lbs/100 gals. Can be applied from 4" tall corn (V2) to 36" tall corn (V10). Status can also be tank-mixed with Round Up or Liberty when used on RR or LL corn hybrids only. The normal use rate when tank-mixed with these herbicides is 5 oz/A. Status should not be tank-mixed with Dual Magnum, Harness, Outlook, Surpass, Lorsban, 2,4-D, or Stinger. Rotational crops can be planted 120 days after application with the following exception: When Status is applied at 5 oz/A or less and field receives at least 1" of rainfall or irrigation, the following crops can be planted 30 days after application: alfalfa, cereal grain crops, cotton, grain sorghum, soybeans. Field corn can be re- planted 7 days after application. Pre-slurry in water before mixing into larger spray tank. Rain-free period is 4 hours.

FIELD CORN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS AI/A		
POSTEMERGENCE: OVER-THE-TOP					
<i>halosulfuron</i> Profine Sanda 75 DF	2	0.67 oz	0.032	12 H/ Forage = 30 D	Controls many annual broadleaf weeds and nutsedge. Can be applied over-the-top from spike stage through layby stage of corn. Use higher rates for nutsedge control and larger weeds. Can be tank-mixed with Banvel, Accent, 2,4-D, Buctril, Beacon and atrazine. The use of a non-ionic surfactant or crop oil is recommended. May be applied in a split application but do not exceed 2.67 oz/acre/year. Rotational restrictions include the following: barley, oats, rye, wheat-2 months; cotton-4 months; peanuts-6 months; soybeans-9 months; onions-18 months. Refer to product label for additional crop rotation information. Pre-slurry in water before mixing into larger spray tank. Rain-free period is 4 hours.
<i>nicosulfuron</i> Accent 75DF Accent Q 54.5 WG (includes crop safener)	2	0.67 oz 0.9 oz	0.031	4 H/ Forage = 30 D	Controls many annual and perennial grasses, including johnsongrass. DO NOT apply to corn treated with Counter insecticide due to severe crop injury or mortality. Can be applied over-the-top of corn up to 20" tall or before the V6 stage (whichever is more restrictive) and post-directed up to 36" tall. A nonionic surfactant (0.25% v/v) or crop oil concentrate (1% v/v) is required. Do not apply Accent within 7 days to corn treated with foliar applied organophosphate insecticides or with herbicides containing bentazon or 2,4-D. DO NOT apply organophosphate insecticides within 3 days after applying Accent. Refer to manufacturer's label for sprayer cleanup. DO NOT apply within 30 days of harvest. Accent Q formulation contains a crop safener (isoxadifen). Rotational restrictions include the following: soybeans-0.5 months; winter wheat, barley, rye-4 months; oats-8 months; cotton, sorghum, peanuts, tobacco-10 months. Pre-slurry in water before mixing into larger spray tank. Rain-free period is 4 hours.
<i>nicosulfuron + rimsulfuron</i> + <i>crop safener</i> Steadfast Q 37.7WDG	2	1.5 oz	0.024 + 0.012	4 H/ Forage = 30 D	Can be applied over-the-top of corn up to 20" tall and exhibiting up to and including 6 leaf-collars. When tank-mixed with atrazine, can only be applied to corn that is 12" tall or less. Use in combination with a NIS at 0.25% v/v or COC at 1% v/v + ammonium-nitrogen fertilizer (2 qt/A UAN or 2 lb/A AMS). Do not tank-mix with Basagran, 2,4-D, Lorsban, parathion, and malathion. Do not use on corn that was previously treated with Counter, Lorsban, and Thimet. Rotational Restrictions: field corn-0 months; soybeans-15 days; small grains-4 months; cotton -10 months; sorghum/peanut-10 months (soil pH < 6.5). Steadfast Q contains a crop safener (isoxadifen). Can be used on any field corn hybrid. Pre-slurry in water before mixing into larger spray tank. Rain-free period = 4 hours.
<i>mesotrione</i> Callisto 4SC	27	3 oz	0.094	12 H/ 45 D	May be useful for the postemergence control of escaped Palmer amaranth (pigweed) in situations where 2,4-D use would be undesirable or glyphosate, ALS, or triazine-resistance is suspected. Callisto will also provide residual control. Apply before Palmer amaranth exceeds 5" in height. Do not use if the corn has been treated with a soil application of Counter or Lorsban. Corn may be treated up to 30" tall or the 8-leaf stage of growth. Use in combination with a COC (1% v/v) and UAN (2.5% v/v) or AMS (8.5 lb/100 gal). Callisto can be tank mixed with Accent, atrazine, Liberty, Lightning, Basagran, Buctril, Dual Magnum, Bicep II Magnum, Steadfast, or Warrior. Crop injury is increased when tank-mixed with EC formulations of grass herbicides such as Dual Magnum. Do not tank-mix with carbamate or organophosphate insecticides. Rotational restrictions: field corn, grain sorghum-0 months; small grains and sugarcane-4 months; soybeans, cotton, peanuts, sunflowers, canola, tobacco-10 months; other crops-18 months. Temporary bleaching may occur under extreme weather conditions or when the crop is suffering from stress. Sold in various pre-mixes with atrazine + Dual Magnum (Lexar, Lumax). Rain-free period is 1 hour. Callisto does not provide effective control of Texas panicum or sicklepod. Callisto Xtra is a premix formulation of Callisto (0.5 lb/gal) + atrazine (3.2 lb/gal). Callisto GT is a premix formulation of Callisto (0.38 lb ai/gal) + Touchdown (3.8 lb ai/gal).

FIELD CORN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS AI/A		
POSTEMERGENCE: OVER-THE-TOP					
<i>tembotrione + crop safener</i> Laudis 3.5SC	27	3 oz	0.082	12 H/ Forage = 45 D	May be useful for the postemergence control of escaped Palmer amaranth (pigweed) in situations where 2,4-D use would be undesirable, or glyphosate, ALS, or triazine-resistance is suspected. Apply postemergence to field corn from emergence to V8 stage of growth. Two applications can be made if needed (14 days apart). Can be tank-mixed with the following herbicides: atrazine, Liberty, Define, glyphosate, Accent, Option, Steadfast, Buctril. Use a methylated seed oil (MSO) at 1% v/v and nitrogen (1.5 qt/A UAN or 1.5 lb/A AMS). Rain-free period is 1 hour. Crop rotation restrictions: small grains-4 months; soybeans-8 months; cotton and sorghum-10 months; peanut-12 months. In some UGA field trials, Laudis has not been as effective as Accent (nicosulfuron) in controlling Texas panicum.
<i>topramezone</i> Impact/Armezon 2.8SC	27	0.75 oz	0.016	12 H/ 45 D	May be most useful in areas where atrazine-resistant Palmer amaranth is a problem. Can be applied postemergence up until 45 days before harvest. Tank-mix with atrazine, glyphosate (RR corn), or Liberty (LL corn). Use in combination with MSO or COC at 1% v/v and 1.25% v/v UAN or AMS (8.5-17 lb/100 gallons water). Rotation restrictions: wheat-3 months; cotton, peanut, soybean, sorghum, sunflower-9 months; tobacco-18 months. Rain-free period-1 hour.
<i>thiencarbazone + tembotrione + crop safener</i> Capreno 3.45SC	2 + 27	3 oz/A	0.013 + 0.0675	12 H/ 45 D	Contains same active ingredient as Laudis. Apply postemergence for the control of Palmer amaranth and certain annual grasses such as crabgrass and Texas panicum. Capreno can be applied over-the-top from V1 until V6 stage of growth and post-directed from V6-V7 stage of growth. Can be tank-mixed with atrazine, glyphosate (RR corn), or Ignite (LL corn). Use in combination with a COC at 1% v/v and 1.5 qt/A UAN or 1.5 lb/A AMS. Do not use on field corn treated with OP soil insecticides. Crop rotation restrictions: wheat-4 months; cotton, soybean, sorghum-10 months; peanut-12 months; canola, tobacco-18 months. Rain-free period-1 hour. Capreno contains a crop safener (isoxadifen).
<i>rimsulfuron + mesotrione + crop safener</i> Realm Q 38.75DG	2 + 27	4 oz/A	0.019 + 0.078	12 H/ Grain = 70 D Forage = 45 D	May be most useful in areas where atrazine-resistant Palmer amaranth is a problem. Realm Q can be applied postemergence to corn that is up to 20" or V7, whichever is more restrictive. Use in combination with a COC at 1% v/v or NIS at 0.25% v/v and 2 qt/A UAN or 2 lb/A AMS. Can be applied in combination with atrazine, glyphosate (RR corn), or Ignite (LL corn). Do not use on field corn treated with OP soil insecticides. Crop rotation restrictions: wheat-4 months; cotton, canola, sorghum, soybeans, sunflower-10 months; peanut and tobacco-18 months. Rain-free period-4 hours. Realm Q contains a crop safener (isoxadifen). Can be used on any field corn hybrid. Pre-slurry in water before mixing into larger spray tank.

FIELD CORN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS AI/A		
POSTEMERGENCE: OVER-THE-TOP					
<i>pyraflufen</i> ET 0.208EC	14	0.50-0.75 oz	0.0008-0.0012	12 H/ Grain = 90 D Forage 50 D	Can be applied over-the-top of field corn up to V4 stage of growth. Can be tank-mixed with glyphosate for use in RR corn to improve the control of annual morningglories. Use a NIS at 0.25% v/v. Rain-free period-1 hour. Do not use a COC adjuvant.
POSTEMERGENCE-HERBICIDE TOLERANT HYBRIDS: PLEASE NOTE = Herbicide selection should not be the dominant factor in determining varietal selection. Consult your local extension personnel or seed dealer when choosing a hybrid(s) that is best adapted for your area and farming operation.					
<i>glufosinate</i> Liberty 280 2.34SL Interline 2.34SL Kong 2.34SL	10	22-29 oz	0.40-0.53	12 H/ Grain = 70 D Forage = 60 D	USE ONLY ON "LIBERTY-LINK" CORN HYBRIDS. APPLICATIONS OF Liberty TO NON-TOLERANT HYBRIDS WILL RESULT IN SEVERE CROP INJURY AND/OR CROP DEATH!! Can be applied postemergence from crop emergence until the corn is 24" tall or in the V7 stage of growth. For corn 24"-36" tall, only apply Liberty with drop nozzles and avoid spraying directly into the whorl or leaf axils. Broad-spectrum material with limited systemic activity. Possesses no soil residual activity. Effective on a number of grassy weeds including Texas panicum and several broadleaf species including sicklepod and morningglories. Thorough coverage is essential-use with at least 15-20 gallons water/A. Should be tank-mixed with atrazine for broader spectrum and more consistent control. No major rotation restrictions exist with Liberty. Do not apply within 70 days of grain harvest or 60 days for silage. Requires the use of spray grade ammonium sulfate at 3 lbs/A or 17 lbs/100 gals. Weak on arrowleaf sida. Do not apply more than 2 applications of Liberty (10-14 day interval). Do not apply more than 44 oz/A of Liberty on corn per growing season. Applications of Liberty should be made between dawn and 2 hours before sunset for optimum weed control. Rain-free period is 4 hours. Generic formulations of glufosinate are also available including Kong and Interline. Generic formulations of glufosinate should be used with caution because limited data has been collected by UGA.
<i>glyphosate +S-metolachlor</i> Sequence 5.25 lb/gal	15	2-2.5 pt	0.56-0.70 + 0.75-0.94	24 H/ Grain = 50 D Forage = 30 D	FOR USE ONLY ON ROUNDUP READY CORN HYBRIDS APPLICATIONS OF GLYPHOSATE TO NON-TOLERANT HYBRIDS WILL RESULT IN SEVERE CROP!! Can be applied from corn emergence until the corn plants reach 30" in height. Do not exceed 2.5 pts/A in a single application or 5 pts total/A/year. Very effective for the control of tropical spiderwort if applied before the weed exceeds 1". Can be tank- mixed with atrazine for improved broadleaf weed control.
<i>glyphosate + S-metolachlor + atrazine</i> Expert 4.88 lb/gal	15 + 5	2.5-3.75 qt	0.63-0.94 + 1.09-1.63 + 1.34-2	24 H/ Forage = 30 D	FOR USE ONLY ON ROUNDUP READY CORN HYBRIDS APPLICATIONS OF GLYPHOSATE TO NON-TOLERANT HYBRIDS WILL RESULT IN SEVERE CROP INJURY AND/OR CROP DEATH!! Expert can be applied over-the-top of RR corn up until a maximum corn height of 12".
<i>glyphosate + S-metolachlor + mesotrione</i> Halx GT 4.389 lb/gal	9 + 15 + 27	3.6-4 pt	0.941-1.568 + 0.941-1.568 + 0.094-0.105	24 H/ 45 D	FOR USE ONLY ON ROUNDUP READY CORN HYBRIDS. Can be applied from corn emergence up until 30" or 8 leaf stage of growth. Atrazine can be tank-mixed with Halx if desired. Add a NIS at 0.25% v/v + AMS at 8.5-17 lb/100 gallons of water. Do not use Halx GT if OP insecticides have been used at planting. Rotation restrictions: corn-0 months; grain sorghum (Concep treated)-0 months; barley, wheat, rye-4 months; cotton, peanuts, soybeans, sunflowers, tobacco-10 months;

FIELD CORN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS															
		AMOUNT OF FORMULATION	LBS AI/A																	
POSTEMERGENCE-HERBICIDE TOLERANT HYBRIDS: PLEASE NOTE—Herbicide selection should not be the dominant factor in determining varietal selection. Consult your local extension personnel or seed dealer when choosing a hybrid(s) that is best adapted for your area and farming operation.																				
<i>glyphosate</i> (numerous trade names) 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9	32 oz 26 oz 24 oz 23 oz 22 oz 19 oz	0.75 ae	4 H/ Grain = 50 D Forage = 50 D	<p>FOR USE ONLY ON ROUNDUP READY CORN HYBRIDS APPLICATIONS OF GLYPHOSATE TO NON-TOLERANT HYBRIDS WILL RESULT IN SEVERE CROP INJURY AND/OR CROP DEATH!!</p> <p>Can be tank-mixed with atrazine, Dual, Harness, Harness Xtra, Micro-Tech, Bullet, Partner, or Permit herbicides. Various formulations of glyphosate are available. Not all formulations of glyphosate are labeled for use on RR corn hybrids. Please refer to specific product label. Sequence is a pre-mix of glyphosate+S-metolachlor. Expert is a pre-mix of glyphosate + S-metolachlor + atrazine. Halex GT is a pre-mixture of glyphosate + S-metolachlor + mesotrione. Allow a minimum of 10 days between in-crop applications.</p> <p>USE RATE TABLE (lb ae/A):</p> <table border="0"> <tr> <td></td> <td align="center">RR-Corn</td> <td align="center">2RR-Corn</td> </tr> <tr> <td>Normal Application Rate</td> <td align="center">0.75</td> <td align="center">0.75</td> </tr> <tr> <td>Maximum Application Rate</td> <td align="center">1.12</td> <td align="center">0.75</td> </tr> <tr> <td>Maximum Total In-Crop Rate</td> <td align="center">2.25*</td> <td align="center">1.50*</td> </tr> <tr> <td>Application Timing</td> <td align="center">Up to V8 or 30"</td> <td align="center">Up to V8 30-48" (drops) or 30"</td> </tr> </table> <p>*0.75 lb ae/A = 32 oz/A of 4 lb ai/gal or 22 oz/A of 5.5 lb ai/gal *1.12 lb ae/A = 48 oz/A of 4 lb ai/gal or 32 oz/A of 5.5 lb ai/gal *1.50 lb ae/A = 64 oz/A of 4 lb ai/gal or 43 oz/A of 5.5 lb ai/gal *2.25 lb ae/A = 96 oz/A of 4 lb ai/gal or 64 oz/A of 5.5 lb ai/gal</p>		RR-Corn	2RR-Corn	Normal Application Rate	0.75	0.75	Maximum Application Rate	1.12	0.75	Maximum Total In-Crop Rate	2.25*	1.50*	Application Timing	Up to V8 or 30"	Up to V8 30-48" (drops) or 30"
	RR-Corn	2RR-Corn																		
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Maximum Total In-Crop Rate	2.25*	1.50*																		
Application Timing	Up to V8 or 30"	Up to V8 30-48" (drops) or 30"																		
POSTEMERGENCE-DIRECTED																				
<i>ametryn</i> Evik 80DF	6	1.25-2 lb	1-1.6	12 H/ --	<p>Apply only as a directed spray to corn. Minimum corn height: ametryn-12", linuron-15", paraquat-10". Spray to cover weeds no more than 3-4" tall. Where rate range is given, use lower rate when weeds are no taller than 2" and higher rate for weeds up to 4" tall. Use a nonionic surfactant to improve spray coverage of weeds (ametryn and linuron-0.5% v/v; paraquat-0.25% v/v).</p> <p>DO NOT apply Evik (ametryn) within 3 weeks of tasseling. With paraquat arrange nozzles to spray no higher than lower 3" of stalks.</p> <p>Use Aim for the control of annual morningglory, pigweed, and tropical spiderwort. Add a COC at 1% v/v (1 gal/100 gal). Avoid directing the spray into the whorl of the plant. Aim provides no residual control.</p>															
<i>linuron</i> (numerous trade names) 50DF 4L	7	1.25-1.5 lb 1.25-1.50 pt	0.63-0.75	24 H/ 57 D																
<i>paraquat</i> Gramoxone Inteon / Gramoxone SL 2 lb/gal Firestorm/Parazone/Helmquat 3 lb/gal	22	16-32 oz 11-21 oz	0.25-0.50																	
<i>carfentrazone</i> Aim 2EC	14	0.5-1.9 oz	0.08-0.031																	
<i>pyraflufen</i> ET 0.208EC	14	0.5-1 oz	0.008-0.0016																	

FIELD CORN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS AI/A		
MINIMUM TILLAGE					
<i>paraquat</i> Gramoxone Inteon / Gramoxone SL 2 lb/gal	22	1.88-3.76 pt	0.47-0.94	24 H/ --	Use with a nonionic surfactant (0.25% v/v for contact kill of emerged annual weeds. Paraquat will not adequately control horseweed, swinecress, purslane speedwell, or curly dock. Apply prior to, during, or after planting, but prior to crop emergence. Use 20-60 gallons of spray solution to assure good spray coverage. Use high spray gallonage for heavier weed infestations and where crop residue or stubble is dense. Paraquat does not provide residual control. Paraquat can be tank-mixed with atrazine, Dual, Warrant, Zidua, or Anthem. Can also be tank-mixed with atrazine, 2,4-D or Aim to improve burndown weed control. However, if 2,4-D is used, corn planting must be delayed for 7-14 days.
Firestorm/Parazone/Helmquat 3 lb/gal	22	1.25-2.5 pt			
<i>glyphosate</i> (numerous trade names) 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9	16-128 oz 13-103 oz 12-96 oz 11.7-92 oz 11-85 oz 10-77 oz	0.38-3 ae		Use 0.38-1.13 lbs ae/A for control of most emerged annual grasses and broadleaf weeds. Use 1.5-3 lbs ae/A for control of perennial grasses and broad leaf weeds. Apply with 10-40 gallons of water/A immediately before, during, or after planting, but before crop emergence. As stubble, crop residue or weed density increases, spray gallonage and glyphosate rate should be increased (refer to label). <u>Glyphosate tank mixtures are not recommended for bermudagrass or johnsongrass control in minimum tillage systems.</u> Weed kill from glyphosate treatments applied as a tank mixture with residual herbicides has not been as consistent as when glyphosate and preemergence herbicides are applied separately. Can be tank-mixed with atrazine, dicamba, 2,4-D or Aim to improve burndown weed control. However, if 2,4-D is used, corn planting must be delayed for 7-14 days.
<i>glufosinate</i> Liberty 280 2.34SL Kong Interline	10	22-29 oz	0.40-0.53		Apply during or after planting, but before crop emerges to kill emerged annual grasses and weeds. Liberty will not provide adequate burndown control of small grains. Very effective for burndown control of volunteer peanuts. Can be tank-mixed with glyphosate or 2,4-D. Generic formulations of glufosinate are also available including Kong and Interline. Generic formulations of glufosinate should be used with caution because limited data has been collected by UGA.
<i>flumioxazin</i> Valor SX 51WG Outflank Panther Rowel	14	2 oz	0.064	12 H/ --	Use only on no-till or minimum tillage fields where last year's crop residue has not been incorporated into the soil. Tank-mix with glyphosate or paraquat to improve burndown control of certain weeds. Will also provide residual control of many broadleaf weeds including pigweed and Florida beggarweed. Corn can be planted 7 days after application if a minimum of 25% of the soil surface is covered with the residue of the preceding crop and a minimum of 0.25" or rainfall has occurred between application and planting. If cover is <25%, corn can be planted in 14 days after application in fields where last year's crop residue has not been incorporated into the soil. Do not irrigate from emergence to 2-leaf stage. Corn planted in other tillage systems should not be planted for at least 30 days after application. Pre-slurry in water before mixing into a larger spray tank. Although labeled, UGA weed scientists do not recommend that Valor be used prior to planting field corn. Field corn is the only major crop in GA where PPO herbicides are not used!!!!
<i>carfentrazone</i> Aim 2EC	14	0.5-1 oz	0.008-0.016		Tank-mix with glyphosate or glufosinate for the improved control of large morningglories. Corn can be planted immediately
<i>pyraflufen</i> ET 0.208EC	14	0.5-2 oz	0.0008-0.003		Tank-mix with glyphosate or glufosinate for the improved control of large morningglories. Corn can be planted immediately.
2,4-D (various trade names) 3.8 lb/gal	4	1 pt	0.475		Very effective for cutleaf evening primrose control. Can be tank-mixed with other burndown herbicides. Corn can be planted in 7-14 days after application.

FIELD CORN WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS AI/A		
MINIMUM TILLAGE					
<i>thifensulfuron + tribenuron</i> FirstShot SG 50SG	2	0.5-0.80 oz	0.008 to 0.013 + 0.5 to 0.8 oz	12 H/ --	Tank-mix with glyphosate, paraquat, or Liberty for improved control of broadleaf weeds. Corn can be planted in 14-21 days depending upon soil type.
<i>dicamba</i> Banvel Clarity Diablo Rifle Sterling, etc. 4SL	4	8 oz	0.25		Apply in combination with either Liberty, glyphosate, or paraquat in fields where marestalk or horseweed is a problem. Wait 7 days before planting corn. Corn must be planted at least 1.5" deep.
BURNDOWN CONTROL OF RR FIELD CORN (REPLANTING)					
<i>clethodim</i> SelectMax/TapOut 0.97EC	1	6 oz	0.045		For the control of an existing stand of RR field corn or volunteer RR field corn prior to replanting field corn. Use a NIS (0.25% v/v) + AMS (2.5 lbs/A). Corn can be replanted in 6 days.
HARVEST AID					
2,4-D (numerous trade names) 3.8 lb/gal	4	1- 2 pt	0.48-0.96	48 H/ 7 D	Apply by air or high clearance equipment when corn reaches the hard dough stage to suppress, control or decrease seed production of cocklebur, jimsonweed, ragweed, or vines which interfere with harvesting. Observe drift control precautions noted for postemergence use of 2,4- D. No adjuvant is recommended. Wait 5-7 days after application before harvesting.
<i>glyphosate</i> (numerous trade names) 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9	32 oz 26 oz 24 oz 23 oz 22 oz 19 oz	0.75 ae	4 H/ 7 D	Apply 7 days before harvest when kernel moisture is less than 35% and after black layer formation. Avoid drift onto sensitive crops. Do not use on corn grown for seed if hybrid is not RR Corn 2. Not all formulations of glyphosate may be labeled for use as a harvest aid. Please refer to the specific product label.
<i>carfentrazone</i> Aim 2EC	14	1.6-1.9 oz	0.025-0.030	12 H/ 3 D	Apply for the defoliation/desiccation of annual morningglories and pigweed. Use a COC at 1% v/v. Can be applied aerially or by ground. Do not apply within 3 days of harvest. Do not graze corn stover until 14 days after application.
<i>paraquat</i> Firestorm, Parazone, Helmquat 3 lb/gal Gramoxone Inteon Gramoxone SL 2 lb/gal	22	0.8-1.3 pt 1.2-2 pt	0.30-0.50	24 H/ 7 D	Application must be made at least 7 days before harvest. Apply after the corn is mature and black layer has formed at the base of the kernels. Add a NIS at 0.25% v/v (1 qt/100 gals). Can be applied aerially or by ground.

*When using atrazine formulations other than 4L, use equivalent rates: 1 qt 4L equal 1.25 lb 8 OW or 1.1 lb 90 DF.

FIELD CORN WEED CONTROL

SUGGESTED HERBICIDE PROGRAMS FOR THE POST-HARVEST CONTROL OF TROPICAL SPIDERWORT:

OPTION 1: 2,4-D amine 3.8SL at 1.5 pt/A followed by 2,4-D amine 3.8SL @ 1.5 pt/A or Gramoxone Inteon/Gramoxone SL 2SL at 32 oz/A or Firestorm/Parazone/Helquat 3SL at 21 oz/A + COC at 1% v/v or Aim 2EC at 1.5 oz/A + COC at 1% v/v 14-21 days later

OPTION 2: Gramoxone Inteon/Gramoxone SL2SL at 32 oz/A or Firestorm/Parazone/Helmquat 3SL at 21 oz/A + COC at 1% v/v followed by Gramoxone Inteon/Gramoxone SL 2SL at 32 oz/A or Firestorm/Parazone/Helmquat 3SL at 21 oz/A + COC at 1% v/v 14- 21 days later

OPTION 3: Aim 2EC at 1.5 oz/A + COC at 1% v/v followed by Aim 2EC at 1.5 oz/A + COC at 1% v/v 14-21 days later

METOLACHLOR AND S-METOLACHLOR PRODUCTS

TRADE NAME	ACTIVE INGREDIENT	LBS/GAL	CORN SAFENER	COMPANY
Brawl	S-metolachlor	7.62	none	Tenkoz
Brawl II	S-metolachlor	7.64	benoxacor	Tenkoz
Charger Basic	S-metolachlor	7.62	none	Agrilience
Charger Max	S-metolachlor	7.64	benoxacor	Agrilience
Cinch	S-metolachlor	7.64	benoxacor	DuPont
Dual Magnum	S-metolachlor	7.62	none	Syngenta
Dual II Magnum	S-metolachlor	7.64	benoxacor	Syngenta
Me-Too-Lachlor	metolachlor	8.0	none	Drexel
Me-Too-Lachlor II	metolachlor	7.8	dichlormid	Drexel
Medal	S-metolachlor	7.62	none	Syngenta
Parallel	metolachlor	7.8	benoxacor	Makhteshim-Agan
Parallel PCS	metolachlor	8.0	none	Makhteshim-Agan
Parrlay	metolachlor	8.0	none	Monsanto
Stalwart	metolachlor	8.0	none	SipCam
Stalwart C	metolachlor	7.8	dichlormid	SipCam

FIELD CORN WEED CONTROL

PREPACKAGED TANK-MIXES FOR FIELD CORN

[See manufacturer's label for specific rates and application uses]

PRODUCT NAME	ACTIVE INGREDIENTS (LBS AI/GAL OR % AI)
Accent Gold	<i>nicosulfuron</i> (6.5 %) + <i>rimsulfuron</i> (6.5 %)+ <i>flumetsulam</i> (19.1%) + <i>clopyralid</i> (51.7%)
Acuron	<i>s-metolachlor</i> (2.14) + <i>atrazine</i> (1.0) + <i>mesotrione</i> (0.24) + <i>bicyclopyrone</i> (0.06)
Axiom	<i>flufenacet</i> (54.4%) + <i>metribuzin</i> (13.6%)
Balance Flexx	<i>isoxaflutole</i> (2.0) + <i>cyprosulfamide</i> ⁴
Basis Gold	<i>rimsulfuron</i> (1.34 %) + <i>nicosulfuron</i> (1.34%) + <i>atrazine</i> (82.44 %)
Bicep II	<i>metolachlor</i> (3.23) + <i>atrazine</i> (2.67) + <i>benoxacor</i> ¹
Bicep II Magnum	<i>S-metolachlor</i> (2.4) + <i>atrazine</i> (3.1) + <i>benoxacor</i>
Breakfree ATZ Lite	<i>acetoachlor</i> (4.0) + <i>atrazine</i> (1.50) + <i>dichlormid</i> ²
Callisto Xtra	<i>atrazine</i> (3.2) + <i>mesotrione</i> (0.5)
Capreno	<i>thiencarbazone</i> (0.57) + <i>tembotrione</i> (2.88) + <i>isoxadifen</i> ³
Charger Max ATZ	<i>S-metolachlor</i> (2.4) + <i>atrazine</i> (3.1) + <i>benoxacor</i>
Cinch ATZ	<i>S-metolachlor</i> (2.4) + <i>atrazine</i> (3.1) + <i>benoxacor</i>
Cinch ATZ Lite	<i>S-metolachlor</i> (3.33) + <i>atrazine</i> (2.67) + <i>benoxacor</i>
Degree Xtra	<i>acetoachlor</i> (2.7) + <i>atrazine</i> (1.34)
Epic	<i>flufenacet</i> (48%) + <i>isoxaflutole</i> (10%)
Exceed	<i>primisulfuron</i> (28.5%) + <i>prosulfuron</i> (28.5%)
FieldMaster	<i>acetoachlor</i> (2.0) + <i>atrazine</i> (1.5) + <i>glyphosate</i> (0.75)
Guardzman	<i>dimethenamid</i> (2.33) + <i>atrazine</i> (2.67)
Halex GT	<i>mesotrione</i> (0.209) + <i>S-metolachlor</i> (2.09) + <i>glyphosate</i> (2.09)

PRODUCT NAME	ACTIVE INGREDIENTS (LBS AI/GAL OR % AI)
Accent Gold	<i>nicosulfuron</i> (5.4 %) + <i>rimsulfuron</i> (5.4 %) + <i>flumetsulam</i> (15.9%) + <i>clopyralid</i> (51.4%)
Axiom AT	<i>flufenacet</i> (19.6%) + <i>metribuzin</i> (4.9 %) + <i>atrazine</i> (50.5%)
Basis	<i>rimsulfuron</i> (50%) + <i>thifensulfuron</i> (25%)
Bicep	<i>metolachlor</i> (3.33) + <i>atrazine</i> (2.67)
Bicep Lite II	<i>metolachlor</i> (2.3) + <i>atrazine</i> (1.67) + <i>benoxacor</i>
Bicep Lite II Magnum	<i>S-metolachlor</i> (3.33) + <i>atrazine</i> (2.67) + <i>benoxacor</i>
Breakfree ATZ	<i>acetoachlor</i> (3.0) + <i>atrazine</i> (2.25) + <i>dichlormid</i> ²
Bullet	<i>alachlor</i> (2.5) + <i>atrazine</i> (1.5)
Camix	<i>mesotrione</i> (0.33) + <i>S-metolachlor</i> (3.34) + <i>benoxacor</i>
Celebrity Plus	<i>dicamba</i> (4.66%) + <i>diflufenzopyr</i> (18.1%) + <i>nicosulfuron</i> (10.6%)
Charger Max ATZ Lite	<i>S-metolachlor</i> (3.33) + <i>atrazine</i> (2.67) + <i>benoxacor</i>
Corvus	<i>thiencarbazone</i> (0.75) + <i>isoxaflutole</i> (1.88) + <i>cyprosulfamide</i> ⁴
Distinct	<i>diflufenzopyr</i> (20%) + <i>dicamba</i> (50%)
Equip	<i>foramsulfuron</i> (30%) + <i>idosulfuron</i> (2%)
Expert	<i>S-metolachlor</i> (1.74) + <i>atrazine</i> (2.14) + <i>glyphosate</i> (1.0)
FulTime	<i>acetoachlor</i> (2.4) + <i>atrazine</i> (1.6)
Guardzman Max	<i>dimethenamid-p</i> (1.7) + <i>atrazine</i> (3.3)

FIELD CORN WEED CONTROL

PREPACKAGED TANK-MIXES FOR FIELD CORN

[See manufacturer's label for specific rates and application uses]

PRODUCT NAME	ACTIVE INGREDIENTS (LBS AI/GAL OR % AI)
Harness Xtra	<i>acetochlor</i> (4.3) + <i>atrazine</i> (1.7)
Hornet	<i>flumetsulam</i> (23%) + <i>clopyralid</i> (62.5%)
Keystone	<i>acetochlor</i> (3.0) + <i>atrazine</i> (2.5)
Laddock	<i>bentazon</i> (1.66) + <i>atrazine</i> (1.66)
Lariat	<i>alachlor</i> (2.5) + <i>atrazine</i> (1.5)
Lightning	<i>imazethapyr</i> (52.5%) + <i>imazapyr</i> (17.5%)
Lumax	<i>S-metolachlor</i> (2.68) + <i>mesotrione</i> (0.2 68) + <i>atrazine</i> (1.0) + <i>benoxacor</i>
Parallel Plus	<i>atrazine</i> (2.8) + <i>metolachlor</i> (2.7) + <i>benoxacor</i>
Priority	<i>carfentrazone</i> (12.5%) + <i>halosulfuron</i> (50.0%)
Radius	<i>flufenacet</i> (3.57) + <i>isoxaflutole</i> (0.43)
Resolve Q	<i>rimsulfuron</i> (18.4%) + <i>thifensulfuron</i> (4.0%) + <i>isoxadifen</i> ³
Stalwart Xtra	<i>atrazine</i> (3.1) + <i>metolachlor</i> (2.4) + <i>dichlormid</i> ²
Steadfast	<i>nicosulfuron</i> (50%) + <i>rimsulfuron</i> (25%)
Steadfast ATZ	<i>nicosulfuron</i> (2.7 %) + <i>rimsulfuron</i> (1.3 %) + <i>atrazine</i> (85.3%)
Steadfast Q	<i>nicosulfuron</i> (25.2%) + <i>rimsulfuron</i> (12.5%) + <i>isoxadifen</i>
Stout	<i>nicosulfuron</i> (67.5%) + <i>thifensulfuron</i> (5.0%)
TripleFLEX	<i>acetochlor</i> (3.75) + <i>clopyralid</i> (0.38) + <i>flumetsulam</i> (0.12)

PRODUCT NAME	ACTIVE INGREDIENTS (LBS AI/GAL OR % AI)
Harness Extra 5.6L	<i>acetochlor</i> (3.1) + <i>atrazine</i> (2.5)
Imperium	<i>EPTC</i> (5.6) + <i>acetochlor</i> (1.4)
Keystone LA	<i>acetochlor</i> (4.0) + <i>atrazine</i> (1.5)
LandMaster	<i>glyphosate</i> (1.2) + <i>2,4-D</i> (1.9)
Lexar	<i>S-metolachlor</i> (1.74)+ <i>atrazine</i> (1.74) + <i>mesotrione</i> (0.224) + <i>benoxacor</i>
Liberty ATZ	<i>atrazine</i> (3.3) + <i>glufosinate</i> (1.0)
Marksman	<i>dicamba</i> (1.1) + <i>atrazine</i> (2.1)
Prequel	<i>rimsulfuron</i> (15%) + <i>isoxaflutole</i> (30%)
Propel ATZ Propel	<i>dimethenamid-p</i> (1.7) + <i>atrazine</i> (3.3)
ATZ Lite	<i>dimethenamid-p</i> (2.25) + <i>atrazine</i> (2.75)
Realm Q	<i>rimsulfuron</i> (7.5%) + <i>mesotrione</i> (31.25%) + <i>isoxadifen</i> ³
Revulin Q	<i>mesotrione</i> (36.8%) + <i>nicosulfuron</i> (14.1%) + <i>isoxadifen</i> ³
Shotgun	<i>atrazine</i> (2.25) + <i>2,4-D</i> (1.0)
Steadfast ATZ	<i>nicosulfuron</i> (2.7%) + <i>rimsulfuron</i> (1.3%) + <i>atrazine</i> (85.3%)
Sterling Plus	<i>dicamba</i> (1.1) + <i>atrazine</i> (2.1)
SureStart	<i>clopyralid</i> (0.29) + <i>acetochlor</i> (0.38) + <i>flumetsulam</i> (0.12)
Yukon	<i>halosulfuron</i> (12.5%) + <i>dicamba</i> (55%)

¹Benoxacor-a safener that protects corn from metolachlor injury. ²Dichlormid-a safener that protects corn from metolachlor injury. ³Isoxadifen-a corn safener ⁴Cyprosulamide-a corn safener

WEED RESPONSE TO HERBICIDES USED IN FIELD CORN

Eric P. Prostko, Extension Agronomist-Weed Science

	Sutan	Eradicane	Micro-Tech Lasso	Anthem Zidua	Outlook / Propel	AAtrex Atrazine	Dual ¹ Cinch	Harness Surpass TopNotch Degree Warrant	Simazine	Python
	PPI		PRE							
PERENNIAL WEEDS										
johnsongrass (rhizome)	F	F-G	P		P	P	P	P	P	P
nutsedge, purple	G-E	G-E	P	P	P	P	P	P	P	P
nutsedge, yellow	G-E	G-E	F	P	F-G	P	F-G	F	P	P
ANNUAL GRASSES										
broadleaf signalgrass	G	G	F-G	F-G	F-G	P	F-G	G	P	P
crabgrass	E	E	E	G-E	E	G	E	E	G	P
crowfootgrass	E	E	E	G-E	E	G	E	E	G	P
fall panicum	E	E	E	G-E	E	P	E	E	G	P
goosegrass	E	E	E	G-E	E	G	E	E	G	P
johnsongrass (seedling)	E	E	P		P	P	P	P	P	P
sandbur	E	E	F-G	G-E	F-G		F-G	F-G	G	P
Texas panicum	G-E	G-E	P-F	F	P-F	P	P-F	P	P	P
annual ryegrass				G			G		E	P
BROADLEAF WEEDS										
bristly starbur			P		P	G	P	P	G	E
burcucumber			P		P	P-F	P	P	F	P
citronmelon			P		P	G	P	P	F	
cocklebur			P		P	G-E	P	P	G	E
cowpea			P		P	E	P	P	G	
crotalaria			P		P	G-E	P	P	G	
croton, tropic			P		P	G	P	P	G	
Florida beggarweed			F		P	E	F	F	G	F-G
Florida pusley	G-E	G-E	G-E	G	G-E	E	G-E	G-E	G	G
jimsonweed			P		P	E	P	P	E	P
lambquarters, common	G	G	F-G		F	E	F	F	E	E
morningglories			P		P	G	P	P	G	F-G

PPI = Preplant soil incorporated **PRE** = Preemergence (surface applied)

¹Includes all metolachlor products (Cinch, Dual, Dual II, Dual Magnum, Dual II Magnum). The generic formulations of metolachlor (**Parallel, Stalwart, Me-Too-Lachlor**) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.

Key to response symbols:

E = Excellent control, weed kill 90% or above.

G = Good control, weed kill 80% or above

F = Fair control, weed kill less than 80%, usually unacceptable unless supplemental chemical or cultivation practices are used

P = Poor control. If no symbol is given, weed response is unknown.

WEED RESPONSE TO HERBICIDES USED IN FIELD CORN

	Sutan	Eradicane	Micro-Tech Lasso	Zidua	Outlook / Propel	AAtrax Atrazine	Dual ¹ Cinch	Harness Surpass TopNotch Degree Warrant	Simazine	Python
	PPI		PRE							
BROADLEAF WEEDS										
pigweed	G	G	G	G	G	E	G	G	E	E
ALS-resistant	G	G	G	G	G	E	G	G	E	P
glyphosate-resistant	G	G	G	G	G	E	G	G	E	E
atrazine-resistant	G	G	G	G	G	P	G	G	P	E
prickly sida	G	G	F-G		F	E	F	F	E	E
purslane	G	G	G		G	E	G	G	E	
ragweed, common			P		P	E	P	P	E	G
sesbania, hemp		P	P		P	F-G	P	P		
sicklepod	F	F	P		P	G	P	P	G	F-G
smartweed	P	P	P		P	G-E	P	P	G	G
tropical spiderwort				G-E	F	F	G-E			
volunteer peanuts	P	P	P	P	P	G	P	P	F	
velvetleaf			P			G	P	P		E
wild poinsettia										G
wild radish	P	P	P		P	G	P	P	F	

PPI = Preplant soil incorporated **PRE** = Preemergence (surface applied)
¹Includes all metolachlor products (Cinch, Dual, Dual II, Dual Magnum, Dual II Magnum). The generic formulations of metolachlor (**Parallel, Stalwart, Me-Too-Lachlor**) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.

Key to response symbols:
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 P = Poor control. If no symbol is given, weed response is unknown.

WEED RESPONSE TO HERBICIDES USED IN FIELD CORN

	Evik	Attrex, Atrazine	Accent	Beacon	Exceed	Basagran	Callisto	Laudis	Capreno	Steadfast Q
POSTEMERGENCE/POST-DIRECTED										
PERENNIAL WEEDS										
johsongrass (rhizome)	P	P	G-E	F-G	P-F	P	P			
nutsedge, purple	G	P	P-F		P	P	P-F			
nutsedge, yellow	G	P			P	G	P-F			
ANNUAL GRASSES										
broadleaf signalgrass	G	P-F	G	P		P	F			
crabgrass	E	P-F	P	P	P	P	F-G	F-G	G	F
crowfootgrass	E	P	G-E		P	P	P			G-E
fall panicum	E	P	G-E	F	P	P	P			
goosegrass	E	P	G-E		P	P	P			
johsongrass (seedling)	E	P	G-E	G-E	F-G	P	P			
sandbur	E	F	G-E		P	P	P			
Texas panicum	G-E	P	G-E	P	P	P	P	F-G	G	G-E
annual ryegrasses	F-G	P-F	G			P	P			
BROADLEAF WEEDS										
bristly starbur	E	E				E				
burcucumber	F	F-G	F-G	G	G	P	P-F			
citronmelon	G	G			F	P				
cocklebur	F	E	P-F		G	E	G-E			
cowpea	G	G				P				
crotalaria	E	G				P				
croton, tropic	G	G				P				
Florida beggarweed	E	G	G	G-E		P				
Florida pusley	E	G	P-F	G-E		P				
jimsonweed	E	E	F-G		G	E	G-E			
lambsquarters, common	E	E	F-G		G	P	G-E			
morningglories	G	E	G-E	F	F-G	F-G	F-G			
pigweeds	E	E	G-E	G-E	G	P	G	G	G-E	G-E
ALS-resistant	E	E	P	P	P	P	G	G	G	P
glyphosate-resistant	E	E	G-E	G-E	G	P	G	G	G-E	G-E
Atrazine-resistant	E	P	G-E	G-E	G	P	G	G	G-E	G-E

Key to response symbols: E = Excellent control, weed kill 90% or above; G = Good control, weed kill 80% or above; F = Fair control, weed kill less than 80%, usually unacceptable unless supplemental chemical or cultivation practices are used; P = Poor control. If no symbol is given, weed response is unknown.

WEED RESPONSE TO HERBICIDES USED IN FIELD CORN

	Evik	Attrex, Atrazine	Accent	Beacon	Exceed	Basagran	Callisto	Laudis	Capreno	Steadfast Q
POSTEMERGENCE/POST-DIRECTED)										
BROADLEAF WEEDS (continued)										
prickly sida	E	E	P		F-G	G	P			
purslane	E	E				P				
ragweed, common	E	E	P-F		G	F	F-G			
sesbania, hemp	P-F	F-G	P-F	P	F-G	P				
sicklepod	E	E	P-F	G	G	P	P	P	P	
smartweed		G-E	G	G		G-E	G-E			
tropical spiderwort	G-E	P				F-G				
velvetleaf		E	F	F-G		G-E	E			
volunteer peanuts	G-E	F-G	F	F	P	P	P			
wild poinsettia										
wild radish	G-E	F-G	G	G	G	F				

Key to response symbols: E = Excellent control, weed kill 90% or above; G = Good control, weed kill 80% or above; F = Fair control, weed kill less than 80%, usually unacceptable unless supplemental chemical or cultivation practices are used; P = Poor control. If no symbol is given, weed response is unknown.

WEED RESPONSE TO HERBICIDES USED IN FIELD CORN

	REALM Q	LIBERTY ² , KONG, INTERLINE	GLYPHOSATE ³	BANVEL, CLARITY	LOROX, LINEX
PO (POSTEMERGENCE/POSTEMERGENCE DIRECTED)					
PERENNIAL WEEDS					
johnsongrass (rhizome)		P-F	E	P	P
nutsedge, purple		P	F-G	P	F
nutsedge, yellow		P	F	P	F
ANNUAL GRASSES					
broadleaf signalgrass		G	E	P	G
crabgrass		F-G	E	P	G
crowfootgrass		G	E	P	E
fall panicum		G	E	P	E
goosegrass		P	E	P	E
johnsongrass (seedling)		G	E	P	E
sandbur			E	P	E
Texas panicum		G-E	E	P	G-E
annual ryegrass		G	F-G	P	
BROADLEAF WEEDS					
bristly starbur		G-E	G	E	G
burcucumber		G	E	F	F
citronmelon		G	G	E	E
cocklebur		E	G	E	E
cowpea		G	G	E	G
crotalaria			G	G	E
croton, tropic		G	G	G	G
Florida beggarweed		G-E	G-E	G	E
Florida pusley		P-F	F	G	G
jimsonweed		G	G	E	E
lambsquarters, common		E	G	E	E
morningglories		G-E	F-G	E	G

²Liberty is **only** for use on Liberty-Link corn hybrids.

³Glyphosate is **only** for use on Roundup Ready corn hybrids. Ratings also reflect weed control in minimum tillage applications prior to crop emergence/planting.

Key to response symbols:

E = Excellent control, weed kill 90% or above

G = Good control, weed kill 80% or above

F = Fair control, weed kill less than 80%, usually unacceptable unless supplemental chemical or cultivation practices are used

P = Poor control.

If no symbol is given, weed response is unknown.

WEED RESPONSE TO HERBICIDES USED IN FIELD CORN

	REALM Q	LIBERTY ² , KONG, INTERLINE	GLYPHOSATE ³	BANVEL, CLARITY	LOROX, LINEX
PO (POSTEMERGENCE/POSTEMERGENCE DIRECTED)					
BROADLEAF WEEDS (continued)					
pigweeds	G	F-G	G-E	G-E	G
ALS-resistant	G	F-G	G-E	G-E	G
glyphosate-resistant	G	F-G	P	G-E	G
Atrazine-resistant	G	F-G	G-E	G-E	G
prickly sida		P-F	G	E	G
purslane		G	G	E	G
ragweed, common		G	G	E	E
sesbania, hemp		G-E	F	E	G
sicklepod		G	G-E	E	E
smartweed		G-E	G-E	E	
tropical spiderwort		P-F	F	P	F
velvetleaf		E	G	F-G	
volunteer peanuts		G-E	F	F-G	G
wild poinsettia			G-E		
wild radish		F	G	G-E	G

²Liberty is **only** for use on Liberty-Link corn hybrids.

³Glyphosate is **only** for use on Roundup Ready corn hybrids. Ratings also reflect weed control in minimum tillage applications prior to crop emergence/planting.

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P = Poor control.

If no symbol is given, weed response is unknown.

WEED RESPONSE TO HERBICIDES USED IN FIELD CORN

	PARAQUAT	PROWL ⁺	TRIFLURALIN ⁺	STINGER	2,4-D	SANDEA	BUCTRIL	AIM
PO (POSTEMERGENCE/POSTEMERGENCE DIRECTED)								
PERENNIAL WEEDS								
johnsongrass (rhizomes)	P	P	P	P	P	P	P	P
nutsedge, purple	F	P	P	P	P	G	P	P
nutsedge, yellow	F	P	P	P	P-F	G	P	P
ANNUAL GRASSES								
broadleaf signalgrass	G	G	G	P	P	P	P	P
crabgrass	G	G-E	G-E	P	P	P	P	P
crowfootgrass	G	G-E	G-E	P	P	P	P	P
fall panicum	G	G-E	G-E	P	P	P	P	P
goosegrass	G	G-E	G-E	P	P	P	P	P
johnsongrass (seedling)	G	G	G	P	P	P	P	P
sandbur	G	G	G	P	P	P	P	P
Texas panicum	E	G	G	P	P	P	P	P
annual ryegrass		F	F	P		P		P
BROADLEAF WEEDS								
bristly starbur	G	*	*	F-G		G	G	P
burcucumber	G	P	P	P	P	P	F-G	P
citronmelon	F	*	*	F-G	E	P-F		
cocklebur	G	*	*	G-E	E	G	E	G
cowpea	G	*	*	G-E	E			
crotalaria	G	*	*	G-E	G	P		F
croton, tropic	G	*	*	G	G			G
Florida beggarweed	E	*	*	G-E	P	P	G	F
Florida pusley	F-G	G	G	F-G	G		E	F-G
jimsonweed	G	*	*	G	E			G

Key to response symbols:
 E = Excellent control, weed kill 90% or above
 G = Good control, weed kill 80% or above
 F = Fair control, weed kill less than 80%, usually unacceptable unless supplemental chemical or cultivation practices are used
 P = Poor control. If no symbol is given, weed response is unknown.
 Ratings are based on average to good soil and weather conditions for herbicide performance.

*Must be tank mixed with atrazine or glyphosate for postemergence control of seedling grasses and broadleaf weeds.
 +For control of grasses and selected broadleaf weeds, these herbicides must be applied prior to weed emergence.
 ** Aim will not effectively control smallflower morningglory.
 *** Only for use in no-till or minimum tillage fields with previous crop residue. Rotation restriction for corn in other tillage systems is 30 days (1" rainfall/irrigation is required between application and planting)

WEED RESPONSE TO HERBICIDES USED IN FIELD CORN

	PARAQUAT	PROWL ⁺	TRIFLURALIN+	STINGER	2,4-D	SANDEA	BUCTRIL	AIM
PO (POSTEMERGENCE/POSTEMERGENCE DIRECTED)								
BROADLEAF WEEDS (continued)								
lambsquarters, common	F-G	G*	G*	P	E	P-F	G	G-E
morningglories	G	*	*	P	G	P-F	G	E**
pigweeds	G	G*	G*	P	G-E	F-G	G	G-E
ALS-resistant	G	G	G	P	G-E	P	G	G-E
glyphosate-resistant	G	G	G	P	G-E	F-G	G	G-E
Atrazine-resistant	G	G	G	P	G-E	F-G	G	G-E
prickly sida	F-G	*	*		G			F
purslane	G	G*	G*		G			G
ragweed, common	G	*	*	G	E	G	G	F
sesbania, hemp	P-F				G	F-G	G	
sicklepod	G	*	*	F-G	E	P	P	P
smartweed				F	P-F	F-G		G
tropical spiderwort	G-E	P	P		G-E	P		G-E
velvetleaf		P	P		G	E	G	E
volunteer peanuts	P	P	P	F-G	P	P	P	P
wild poinsettia	F-G	P	P					
wild radish	G	P	P		G	G-E	G	

Key to response symbols:

E = Excellent control, weed kill 90% or above

G = Good control, weed kill 80% or above

F = Fair control, weed kill less than 80%, usually unacceptable unless supplemental chemical or cultivation practices are used

P = Poor control. If no symbol is given, weed response is unknown.

Ratings are based on average to good soil and weather conditions for herbicide performance.

*Must be tank mixed with atrazine or glyphosate for postemergence control of seedling grasses and broadleaf weeds.

+For control of grasses and selected broadleaf weeds, these herbicides must be applied prior to weed emergence.

**Aim will not effectively control smallflower morningglory.

*** Only for use in no-till or minimum tillage fields with previous crop residue. Rotation restriction for corn in other tillage systems is 30 days (1" rainfall/irrigation is required between application and planting)

WEED AND COVER CROP RESPONSE TO BURNDOWN HERBICIDES USED IN CONSERVATION TILLAGE FIELD CORN PRODUCTION SYSTEMS IN GEORGIA

Eric P. Prostko, Extension Agronomist-Weed Science

WEED	GLYPHOSATE	GLYPHOSATE + 2,4-D	GLYPHOSATE + ATRAZINE	GLYPHOSATE + VALOR***	PARAQUAT	PARAQUAT + 2,4-D	PARAQUAT + ATRAZINE	GLUFOSINATE
Carolina geranium	P	F-G	G-E	G	G-E	G-E	G-E	G-E
chickweed	E	E	G-E	E	E	E	E	G-E
corn spurry	G-E	G-E	G-E		F-G			
crimson clover	P-F	F	F		G	G-E	G-E	
cutleaf evening primrose	P-F	E	G-E	F-G	F	E	G-E	G-E (mature plant)
henbit	F-G	E	G-E	E	G	E	G-E	G-E
horseweed	G	G-E	G-E	G-E	F	G	G-E	G-E
red sorrel	E	E	E	E	E	E	E	P-F
ryegrass**	G	G	G-E	G	P-F	P-F	F	P
small grains	E	E	G-E	E	F-G	F-G	G	P-F
swinecress	F-G	G	G	F-G	P-F	F-G	F-G	G-E
volunteer peanut	F	F	F	F-G	P	P-F	F	G-E
wild radish	F-G	G-E	G-E	E	F	G-E	G-E	G-E (mature plant)
corn plant-back restriction	0 days	7-14 days	0 days	7-30	0 days	7-14 days	0 days	0 days

Burndown rates are the following: Glyphosate at 0.75 lb ae/A (22 oz/A of 4.5 lb ae/gal or 32 oz/A of 3 lb ae/gal); paraquat at 0.75 lb ai/A (3 pt/A of Gramoxone Inteon / Gramoxone SL or 2 pt/A of Firestorm/Parazone); glufosinate at 0.40-0.53 lb ai/A (22-29 oz/A of Ignite 2.34SL); atrazine at 1.0 lb ai/A (1 qt/A of Atrazine 4L), Valor SX 51WG at 2 oz/A; and 2,4-D amine at 0.48 lb ai/A (1 pt/A of 2,4-D Amine 3.8SL).

****Programs to Manage Glyphosate-Resistant Italian Ryegrass Prior to Planting Field Corn**

Fall (Mid-October to Mid-November) = Dual Magnum at 1.33 pt/A or double disking. Add Gramoxone SL at 1-2 pts/A (or equivalent generic) to the Dual Magnum if the ryegrass is emerged.

Winter (Mid-January to Mid-February) = SelectMax or TapOut at 16 oz/A or Select/Arrow at 8 oz/A. Corn can be planted 30 days after application.

Spring (March-April) = Gramoxone SL at 3-4 pts/A (or equivalent generic) + Atrazine 4L at 1 qt/A. An additional application of Gramoxone can be applied 10-14 days later if control is less than desirable.

These recommendations are based upon research conducted by Drs. Jason Bond and Tom Eubanks at Mississippi State University.

HERBICIDE PROGRAMS FOR MANAGING GLYPHOSATE AND ALS-RESISTANT PALMER AMARANTH IN FIELD CORN¹

CORN HYBRID	PREEMERGENCE	POSTEMERGENCE	LAYBY/DIRECTED AS NEEDED
Conventional	Atrazine**	Prowl ² + Atrazine + Crop Oil	2,4-D ⁵ or Banvel/Clarity ^{4,5} or Status ¹⁰
	Atrazine**	Atrazine + 1 of the following: Callisto, Laudis, Capreno, Steadfast Q	2,4-D ⁵ or Banvel/Clarity ^{4,5} or Status ¹⁰
	Dual II Magnum ⁶ or Warrant or Zidua or Anthem ¹²	Atrazine + 1 of the following: Callisto, Laudis, Capreno, Steadfast Q	2,4-D ⁵ or Evik or Banvel/Clarity ^{4,5} or Status ¹⁰
Liberty Link	Atrazine**	Liberty ¹³ + atrazine ⁷	2,4-D ⁵ or Banvel/Clarity ^{4,5} or Status ¹⁰
	Dual II Magnum ⁶ or Warrant or Zidua or Anthem ¹²	Liberty ¹³ + atrazine ⁷	2,4-D ⁵ or Evik or Banvel/Clarity ^{4,5} or Status ¹⁰
Roundup Ready	Atrazine**	glyphosate + atrazine; or glyphosate + Warrant; or glyphosate + Dual Magnum ⁶ ; or glyphosate + Status ¹⁰ ; or Expert ⁸ ; or Sequence ⁹ ; or Halex GT ¹¹	2,4-D ⁵ or Banvel/Clarity ^{4,5} or Status ¹⁰
	Dual II Magnum ⁶ or Warrant or Zidua or Anthem ¹²	glyphosate + atrazine; or glyphosate + Status ¹⁰ ; or Expert ⁸ ; or Halex GT	2,4-D ⁵ or Evik or Banvel/Clarity ^{4,5} or Status ¹⁰

¹Glyphosate- and ALS-resistant Palmer amaranth are very serious concerns. An aggressive management program is necessary to slow spread of resistant biotypes and to reduce selection pressure in areas currently not infested with resistant biotypes.

²Generic brands of Prowl (*pendimethalin*) are available and perform similarly.

³Bicep II Magnum is a pre-mixture of *S-metolachlor* and *atrazine*. Less expensive, generic brands containing *metolachlor* and *atrazine* are available (Parallel Plus, Stalwart Xtra). These generic brands may not provide the same length of residual control as Bicep II Magnum (which contains *S-metolachlor*).

⁴Generic brands of Banvel (dicamba dimethylamine salt) are available and perform similarly.

⁵Use extreme caution to avoid drift to sensitive crops, such as cotton, tobacco, soybeans, and vegetables. Use only amine formulations of 2,4-D. Follow all label directions for drift management.

⁶Generic brands containing *metolachlor* are available (Me-Too-Lachlor-II, Parallel, Stalwart-C). However, these generic brands may not provide the same length of residual control as Dual II Magnum (*S-metolachlor*).

⁷Also available in a pre-mixture sold under the trade name of Liberty ATZ.

⁸Expert is a pre-mixture of *glyphosate* + *S-metolachlor* + *atrazine*.

⁹Sequence is a pre-mixture of *glyphosate* + *S-metolachlor*.

¹⁰Status is a pre-mixture of dicamba + diflufenzopyr + isoxadifen.

¹¹Halex GT is a pre-mixture of *glyphosate* + *S-metolachlor* + *mesotrione*.

¹²Anthem is a pre-mixture of *pyroxasulfone* + *fluthiacet*.

¹³Other formulations of Liberty (*glufosinate*) are also available including Kong and Interline. Generic formulations of glufosinate should be used with caution because limited data has been collected by UGA.

**** When atrazine is applied PRE + POST, a total of 2.5 lb ai/A can be applied per year (2.5 qt/A of 4L or 44 oz/A of 90DF). When atrazine is applied only POST, then a total of 2 lb ai/A can be applied per year (2 qt/A of 4L or 36 oz/A of 90DF).**

SPECIAL NOTE: Anthem, Dual Magnum, Warrant, and Zidua have the same mode of action (inhibit very long chain fatty acids). Multiple applications (> 2) of these herbicides in a single year should be avoided to prevent or delay the evolution of resistance. These herbicides have no postemergence activity.

HERBICIDE PROGRAMS FOR MANAGING GLYPHOSATE, ALS, AND ATRAZINE RESISTANT PALMER AMARANTH IN FIELD CORN

HYBRID	PREEMERGENCE	POSTEMERGENCE ¹
Any	Dual II Magnum or Warrant or Zidua or Anthem	Callisto ² , Capreno, Impact, Armezon, Laudis, Realm Q, or Status
Liberty-Link	Dual II Magnum or Warrant or Zidua or Anthem	Liberty ³

¹Atrazine can be tank-mixed with these herbicides if other weeds are a concern such as sicklepod and morningglory.

²Callisto Xtra is a premixed formulation of Callisto + Atrazine.

³Other formulations of Liberty (glufosinate) are also available including Kong and Interline. Generic formulations of glufosinate should be used with caution because limited data has been collected by UGA.

POST-HARVEST (CORN) MANAGEMENT OF PALMER AMARANTH

After corn harvest, Palmer amaranth plants that emerge up until 35 days before first frost will have the potential to produce viable seed. Consequently, these post-harvest populations should be managed up until this time using 1 or more of the following strategies:

A) For plants larger than 6" in height:

- Mowing
- Tillage

B) For plants less than 6" in height:

- Tillage or
- Gramoxone Inteon/Gramoxone SL at 48 oz/A or Firestorm/Parazone/Helmquat 3SL at 32 oz/A + 2,4-D **amine** 3.8SC at 16-24 oz/A + COC (1.0% v/v). If cotton is nearby and drift is a concern, consider using Clarity 4SL at 8 oz/A instead of 2,4-D. Delay planting of small grains for at least 10 days for each 16 oz/A of 2,4-D applied or 15 days for each 8 oz/A of Clarity applied.
- If residual control is desired and a small grain will not be planted in the fall, Dual Magnum/ Stalwart, etc. at 1 pt/A can be included with the burndown treatment.
- In dairy situations (*i.e. no rotations with peanuts, soybeans, and cotton: no overuse of PPO herbicides*), Valor 51WG (2 oz/A) can be used for the residual control of Palmer amaranth after field corn harvest. Wheat can be planted 30 days after application (*need 1" rainfall/irrigation after application*), cereal rye and barley can be planted 3 months after application, and ryegrass can be planted 4 months after application (*with tillage*). Valor can be tank-mixed with paraquat.

It is important to remember that viable Palmer amaranth seed can be produced within 2 weeks after pollen shed. Thus, control strategies need to be implemented before this time to be effective in reducing weed-seed rain back into a field.

COTTON: COTTON INSECT CONTROL

Phillip M. Roberts, Extension Entomologist and Mike Toews, Research Entomologist

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Aphid (Cotton)	<i>acetamiprid</i> Assail 30SG	4A	1.5-2.5 oz	0.028-0.047	12 H/ 28 D	Apply when aphids are abundant and seedling leaves are severely curled, or when "honeydew" is present in older cotton. A naturally occurring fungal disease often eliminates the need for sprays, but this epidemic occurs only after aphid populations reach high levels and tends to be less effective late in the season.
	<i>dicrotophos</i> Bidrin 8	1B	4-8 oz	0.25-0.50	6 D/ 30 D	
	<i>flonicamid</i> Carbine 50WG	9C	1.4-2.8 oz	0.044-0.088	12 H/ 30 D	
	<i>imidacloprid</i> Admire Pro 4.6	4A	0.9-1.7 oz	0.032-0.061	12 H/ 14 D	
	<i>sulfoxaflor</i> Transform 50 WG	4C	0.75-1.0 oz	0.023-0.031	24 H/ 14 D	
	<i>thiamethoxam</i> Centric 40 WG	4A	1.25-2.0 oz	0.031-0.05	12 H/ 21 D	
Beet Armyworm	<i>emamectin benzoate</i> Denim 0.16	6	6-8 oz	0.0075-0.01	12 H/ 21 D	Apply when 10% of squares or terminals are damaged, 10% of blooms are damaged and/or infested, or when 10 active "hits" are observed per 300 row feet. Beet armyworms may infest Palmer amaranth and move to cotton as larvae develop. Bt cottons will not control large beet armyworms moving from Palmer amaranth.
	<i>diflubenzuron</i> Dimilin 2L	15	4-8 oz	0.0625-0.125	12 H/ 14 D	
	<i>flubendiamide</i> Belt 4SC	28	2-3 oz	0.0625-0.094	12 H/ 28 D	
	<i>indoxacarb</i> Steward 1.25EC	22	9.2-11.3 oz	0.09-0.11	12 H/ 14 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	4 oz	0.0625	4 H/ 14 D	
	<i>novaluron</i> Diamond 0.83EC	15	6-12 oz	0.039-0.077	12 H/ 30 D	
	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-27 oz	0.047-0.09	4 H/ 21 D	
	<i>spinosad</i> Blackhawk	5	2.4-3.2 oz	0.054-0.072	4 H/ 28 D	
Bollworm/ Tobacco Budworm	NON-PYRETHROIDS					On non-Bt cotton apply when 8 small larvae are found per 100 terminals prior to first insecticide treatment, or when 5 larvae are found after first spray. Due to the threat of pyrethroid resistance, non-pyrethroid insecticides are recommended for control of tobacco budworm. Resistance management: Do not treat successive generations with insecticides that have the same mode of action. Bt cotton containing the Bollgard II, TwinLink, or WideStrike Bt genes are effective tools for use in bollworm and tobacco budworm management programs. Apply insecticide on Bt cotton when 8 larvae (1/4 " or greater in length) are found per 100 plants.
	<i>emamectin benzoate</i> Denim 0.16	6	8-12 oz	0.01-0.015	12 H/ 21 D	
	<i>flubendiamide</i> Belt 4SC	28	2-3 oz	0.063-0.094	12 H/ 28 D	
	<i>indoxacarb</i> Steward 1.25EC	22	11.3 oz	0.11	12 H/ 14 D	
	<i>methomyl</i> Lannate LV 2.4	1A	1.5-2 pt	0.45-0.6	72 H/ 15 D	
	<i>profenofos</i> Curacron 8E	1B	0.75-1 pt	0.75-1.0	48 H/ 30 D	

COTTON INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Bollworm/ Tobacco Budworm (continued)	NON-PYRETHROIDS					Tobacco budworm is resistant to pyrethroid insecticides. Pyrethroids should not be used for control of tobacco budworm.
	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-27 oz	0.047-0.09	4 H/ 21 D	
	<i>spinosad</i> Blackhawk	5	2.4-3.2 oz	0.054-0.072	4 H/ 28 D	
	PYRETHROIDS					
	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.6-3.6 oz	0.017-0.023	12 H/ 14 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.6 oz	0.0125-0.02	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC Fanfare 2EC	3A	2.6-6.4 oz 2.6-6.4 oz 2.6-6.4 oz	0.04-0.1 0.04-0.1 0.04-0.1	12 H/ 14 D	
	<i>cypermethrin</i> Up-Cyde 2.5EC	3A	2-5 oz	0.04-0.1	12 H/ 14 D	
	<i>esfenvalerate</i> Asana XL 0.66	3A	5.8-9.6 oz	0.03-0.0495	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	1.28-2.05 oz 1.28-2.05 oz	0.0125-0.02 0.0125-0.02	24 H/ 21 D	
	<i>lambda-cyhalothrin</i> Karate w/ Zeon 2.08 Karate EC 1 Silencer 1	3A	1.6-2.56 oz 3.2-5.12 oz 3.2-5.12 oz	0.025-0.04 0.025-0.04 0.025-0.04	24 H/ 21 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8	3A	2.64-3.6 oz	0.0165-0.0225	12 H/ 14 D	
Bollworm/Tobacco Budworm (ovicides)	<i>methomyl</i> Lannate LV 2.4	1A	0.4-0.75 pt	0.12-0.22	72 H/ 15 D	Apply in a tank-mix with a larvacide when large numbers of eggs are present.
	<i>profenofos</i> Curacron 8E	1B	0.125-0.25 pt	0.125-0.25	48 H/ 30 D	
Cutworm (seedling cotton)	<i>acephate</i> Orthene 97 Acephate 97	1B	0.75 lb 0.75 lb	0.72 0.72	24 H/ 21 D	Apply when stand is threatened. Spot treatment is often adequate. Pyrethroids provide good control of cutworms at low rates. See insecticide label for use rate.
	<i>chlorpyrifos</i> Lorsban 4E Chlorpyrifos 4E	1B	1.5-2 pt 1.5-2 pt	0.75-1 0.75-1	24 H/ 14 D	
	<i>Pyrethroids</i>	3A	See Remarks			

COTTON INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Fall Armyworm	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-27 oz	0.047-0.09	4 H/ 21 D	Apply when 15 larvae are found per 100 plants. Control of large larvae (>1/2" in length) is difficult; higher rates should be used.
	<i>diflubenzuron</i> Dimilin 2L	15	4-8 oz	0.0625-0.125	12 H/ 14 D	
	<i>emamectin benzoate</i> Denim 0.16	6	8-12 oz	0.01-0.015	12 H/ 21 D	
	<i>flubendiamide</i> Belt 4SC	28	2-3 oz	0.0625-0.094	12 H/ 28 D	
	<i>indoxacarb</i> Steward 1.25EC	22	9.2-11.3 oz	0.09-0.11	12 H/ 14 D	
	<i>methomyl</i> Lannate LV 2.4	1A	1.5-2 pt	0.45-0.6	72 H/ 15 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	4-10 oz	0.0625-0.156	4 H/ 14 D	
	<i>novaluron</i> Diamond 0.83EC	15	6-12 oz	0.039-0.077	12 H/ 30 D	
	<i>profenofos</i> Curacron 8E	1B	0.75-1 pt	0.75-1	48 H/ 30 D	
	<i>Pyrethroid</i>	3A	See Remarks			
	<i>spinosad</i> Blackhawk	5	2.4-3.2 oz	0.054-0.072	4 H/ 28 D	
Plant Bugs and Fleahoppers	<i>acephate</i> Orthene 97 Acephate 97	1B	0.25-0.50 lb 0.25-0.50 lb	0.24-0.49 0.24-0.49	24 H/ 21 D	Apply insecticide when plants are retaining less than 80% of pinhead squares and numerous plant bugs are observed. Sweep nets and drop cloths may also be used to monitor plant bugs. Sweep nets (15" in diameter) are an effective tool for monitoring adult plant bug populations. Drop cloths are more effective for monitoring immatures. Thresholds: First 2 weeks of squaring: Sweep Net: 8 plant bugs/100 sweeps. Drop Cloth: 1 plant bug/6 row feet. Third week of squaring through bloom: Sweep Net: 15 plant bugs/100 sweeps. Drop Cloth: 3 plant bug/6 row feet. Diamond is an insect-growth regulator and will not control adults.
	<i>dicrotophos</i> Bidrin 8	1B	4-8 oz	0.25-0.5	6 D/ 30 D	
	<i>imidacloprid</i> Admire Pro 4.6	4A	0.9-1.7 oz	0.032-0.061	12 H/ 14 D	
	<i>novaluron</i> Diamond 0.83EC	15	9-12 oz	0.058-0.077	12 H/ 30 D	
	<i>oxamyl</i> Vydate C-LV 3.77	1A	8.5-17 oz	0.25-0.50	48 H/ 14 D	
	<i>sulfoxaflor</i> Transform 50 WG	4C	1.5-2.25 oz	0.047-0.071	24 H/ 14 D	
	<i>thiamethoxam</i> Centric 40 WG	4A	2 oz	0.05	12 H/ 21 D	

COTTON INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Soybean Looper	<i>emamectin benzoate</i> Denim 0.16	6	8-12 oz	0.01-0.015	12 H/ 21 D	Treatment is necessary when soybean loopers threaten to defoliate cotton with immature bolls.
	<i>flubendiamide</i> Belt 4SC	28	2-3 oz	0.0625-0.094	12 H/ 28 D	
	<i>indoxacarb</i> Steward 1.25EC	22	6.7-9.2 oz	0.065-0.09	12 H/ 14 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	4-10 oz	0.0625-0.156	4 H/ 14 D	
	<i>novaluron</i> Diamond 0.83EC	15	6-12 oz	0.039-0.077	12 H/ 30 D	
	<i>spinosad</i> Blackhawk	5	2.4-3.2 oz	0.052-0.072	4 H/ 28 D	
Spider Mites	<i>abamectin</i> Agri-Mek 0.15	6	8-16 oz	0.009-0.018	12 H/ 20 D	Apply when mites are spreading. Spot treatment may be adequate. Thorough coverage is essential; a second application may be necessary. In fields where mites are observed, conservation of beneficial insects should be a priority; insecticides prone to flare mites should be avoided when targeting other pests. *Bifenthrin only provides suppression of mites.
	<i>bifenthrin*</i> Brigade 2EC Discipline 2EC Fanfare 2EC	3A	6.4 oz 6.4 oz 6.4 oz	0.1 0.1 0.1	12 H/ 14 D	
	<i>etoxazole</i> Zeal 72 WSP	10B	0.66-1 oz	0.03-0.045	12 H/ 28 D	
	<i>feproximate</i> Portal 0.4	21A	16-32 oz	0.05-0.1	12 H/ 14 D	
	<i>propargite</i> Comite II 6	12C	1.25-2.25 pt	0.937-1.687	6 D/ 50 D	
	<i>profenofos</i> Curacron 8E	1B	0.5-0.75 pt	0.5-0.75	48 H/ 30 D	
	<i>spiromesifen</i> Oberon 2SC	23	8-16 oz	0.125-0.25	12 H/ 30 D	
	Stink Bugs	ORGANOPHOSPHATES				
<i>acephate</i> Orthene 97 Acephate 97		1B	0.75 lb 0.75 lb	0.72 0.72	24 H/ 21 D	
<i>dicrotophos</i> Bidrin 8		1B	4-8 oz	0.25-0.5	6 D/ 30 D	

COTTON INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Stink Bugs (continued)	PYRETHROIDS					
	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.6-3.6 oz	0.017-0.023	12 H/ 14 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.6 oz	0.0125-0.0205	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC Fanfare 2EC	3A	2.6-6.4 oz 2.6-6.4 oz 2.6-6.4 oz	0.04-0.1 0.04-0.1 0.04-0.1	12 H/ 14 D	
	<i>esfenvalerate</i> Asana XL 0.66	3A	5.8-9.6 oz	0.03-0.0495	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	1.28-2.05 oz 1.28-2.05 oz	0.0125-0.02 0.0125-0.02	24 H/ 21 D	
	<i>lambda-cyhalothrin</i> Karate w/ Zeon 2.08 Karate EC 1 Silencer 1	3A	1.6-2.56 oz 3.2-5.12 oz 3.2-5.12 oz	0.025-0.04 0.025-0.04 0.025-0.04	24 H/ 21 D	
<i>zeta-cypermethrin</i> Mustang Max 0.8	3A	2.64-3.6 oz	0.0165-0.0225	12 H/ 14 D		
Thrips (seedling cotton), At-Plant Treatments	<i>acephate</i> Orthene 97ST Orthene 97 Acephate 97	1B	Commercial Seed Treatment 1 lb 0.97 1 lb 0.97		24 H/ 21 D	Apply acephate as a spray into the seed furrow at planting.
	<i>imidacloprid</i> Admire Pro4.6	4A	9.2 oz	0.33	12 H/ 14 D	Apply Admire Pro as an in-furrow spray during planting directed on or below seed.
	<i>thiamethoxam</i> Cruiser	4A	Commercial Seed Treatment		12 H/ --	Thrips populations in some areas of the US have shown reduced susceptibility to neonicotinoid seed treatments (IRAC Group 4A). Neonicotinoid seed treatments are active for 14-21 days but may need a supplemental foliar insecticide application if thrips populations are high.
	<i>imidacloprid</i> Gaucho 600	4A	Commercial Seed Treatment		12 H/ --	
Thrips (seedling cotton), Foliar Spray	<i>acephate</i> Orthene 97 Acephate 97	1B	3 oz 3 oz	0.18 0.18	24 H/ 21 D	Apply when 2-3 thrips per plant are counted and immatures are present. Expect higher thrips populations on early planted cotton. Seedlings are most susceptible to thrips during early growth stages; economic damage rarely occurs once seedlings reach the 4-leaf stage and are growing rapidly. Thrips injury is more severe when seedlings are not growing rapidly (i.e. stress from cool temperatures or PRE herbicides). Rapidly growing seedlings can better tolerate thrips feeding.
	<i>dicrotophos</i> Bidrin 8	1B	1.6-3.2 oz	0.1-0.2	6 H/ 30 D	

COTTON INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
Thrips (seedling cotton), Foliar Spray (continued)	<i>dimethoate</i> Dimethoate 4	1B	0.25-0.5 pt	0.125-0.25	48 H/ 14 D	
Whitefly (banded winged)	<i>acephate</i> Orthene 97 Acephate 97	1B	0.5-1 lb 0.5-1 lb	0.49-0.97 0.49-0.97	24 H/ 21 D	Apply when 50% of terminals in rapidly growing cotton are infested, or when honeydew is found on foliage or lint of older cotton with open bolls.
	<i>thiamethoxam</i> Centric 40 WG	4A	2 ozs	0.05	12 H/ 21 D	
Whitefly (silverleaf)	<i>acetamiprid</i> Assail 30 SG	4A	4-5.3 oz	0.075-0.1	12 H/ 28 D	Silverleaf whitefly is difficult to control with insecticides. Early detection and conservation of natural controls are important. Hairy leaf cottons are preferred by silverleaf whiteflies compared with smooth leaf varieties. Bifenthrin applied at high rates may suppress adults; tank-mixing with acephate will improve control.
	<i>dinotefuron</i> Venom 70WDG	4A	1-3 oz	0.045-0.134	12 H/ 14 D	
	<i>pyriproxyfen</i> Knack 0.86	7C	8 oz 5 oz fb 5 oz	0.05375 0.033 fb 0.033	12 H/ 28 D	Vegetative cotton; 5 oz followed by 5 oz. See Label.
	<i>spiromesifin</i> Oberon 2	23	8-16 oz	0.125-0.25	12 H/ 30 D	Bifenthrin applied at high rates will suppress adults; tank-mixing with acephate may improve control.
	<i>buprofezin</i> Courier 40SC	16	9-12.5 oz	0.25-0.35	12 H/ 14 D	

Premixed or Co-Packed Insecticide Products:

Products listed below are available as premixes or co-packages of two insecticidal active ingredients. When using premixed or co-packaged products, be sure the use of all active ingredients is necessary. Unnecessary applications or use of reduced rates of an active ingredient may lead to or intensify insecticide resistance.

bifenthrin, avermectin B1 (Athena)
bifenthrin, imidacloprid (Brigadier)
dicrotophos, bifenthrin (Bidrin XP II)
flubendiamide, buprofezin (Tourismo)
imidacloprid, cyfluthrin (Leverage)
lambda-cyhalothrin, chlorantraniliprole (Besiege)
lambda-cyhalothrin, thiamethoxam (Endigo)
spinosad, gamma-cyhalothrin (Consero)
zeta-cypermethrin, bifenthrin (Hero)
chlorpyrifos, lambda-cyhalothrin (Cobalt Advanced)
zeta-cypermethrin, chlorpyrifos (Stallion)
chlorpyrifos, bifenthrin (Tundra Supreme)
fluppyram, imidacloprid (Velum Total)

INSECT PEST RESPONSE TO INSECTICIDES USED IN COTTON

INSECTICIDE	SOUTHERN GREEN STINK BUG	BROWN STINK BUG	CORN EARWORM	TOBACCO BUDWORM**	FALL ARMYWORM	BEE T ARMYWORM	SOYBEAN LOOPER	PLANT BUGS	APHIDS	SPIDER MITES	SILVERLEAF WHITEFLY	CUTWORMS	THRIPS	PREDATORS***	PARASITES***	CHEMICAL CLASS (MOA)	REI (Hours)*
<i>abamectin</i> Agri-Mek 0.15	-	-	-	-	-	-	-	-	-	1	-	-	-	M	M	6	12
<i>acephate</i> Orthene 97	2	2	5	4	4	5	4	1	5	5	5	2	1	H	H	1B	24
<i>acetamiprid</i> Assail 30SG	4	4	5	5	5	5	5	3	1	5	1	5	3	E	E	4A	12
<i>alpha-cypermethrin</i> Fastac 0.83	2	4	1	3	4	5	4	3	4	5	5	2	4	H	M	3A	12
<i>beta-cyfluthrin</i> Baythroid XL 1	1	3	1	3	3	5	4	2	4	5	5	2	4	H	M	3A	12
<i>bifenthrin</i> Brigade 2, Discipline 2, Fanfare 2	1	2	1	3	3	5	4	2	3	3	3	2	4	H	M	3A	12
<i>buprofezin</i> Courier 40 SC	-	-	-	-	-	-	-	-	-	-	1	-	-	E	E	16	12
<i>chlorantraniliprole</i> Prevathon 0.43	5	5	1	1	2	1	2	5	5	5	4	4	5	E	E	28	4
<i>chlorpyrifos</i> Lorsban 4	4	4	4	4	3	3	4	3	4	3	5	1	3	H	H	1B	24
<i>cypermethrin</i> Up-Cyde 2.5EC	2	4	1	3	4	5	4	3	4	5	5	2	4	H	M	3A	12
<i>dicrotophos</i> Bidrin 8	1	1	5	5	5	5	5	1	2	4	5	5	1	H	H	1B	6 days

Efficacy Ratings:

1 = Very Effective

5 = Not Effective

* Read and follow label directions.

** Pyrethroid resistant tobacco budworm have been observed in Georgia, efficacy may be improved if resistance levels are low.

*** Effects on beneficial insects: E = Easy; M = Moderate; and H = Hard

Effects of some insecticides are highly rate sensitive.

Insecticide ratings found in this table are based on research across the Cotton Belt and on field experiences and observations by entomologists. Ratings assume standard rates of insecticides applied at proper times. Ratings should be considered only as general guidelines for comparison purposes.

INSECT PEST RESPONSE TO INSECTICIDES USED IN COTTON

INSECTICIDE	SOUTHERN GREEN STINK BUG	BROWN STINK BUG	CORN EARWORM	TOBACCO BUDWORM**	FALL ARMYWORM	BEE T ARMYWORM	SOYBEAN LOOPER	PLANT BUGS	APHIDS	SPIDER MITES	SILVERLEAF WHITEFLY	CUTWORMS	THRIPS	PREDATORS***	PARASITES***	CHEMICAL CLASS (MOA)	REI (Hours)*
<i>diflubenzuron</i> Dimilin 2L	5	5	5	5	3	3	4	5	5	5	5	5	5	E	E	15	12
<i>dimethoate</i> Dimethoate 4	4	4	5	5	5	5	5	3	3	3	5	5	2	M	H	1B	48
<i>dinotefuron</i> Venom 70 WDG	-	-	-	-	-	-	-	-	-	-	2	-	-	M	M	4A	12
<i>emamectin benzoate</i> Denim 0.16	4	4	2	2	2	1	1	4	5	3	5	4	4	M	E	6	12
<i>esfenvalerate</i> Asana XL 0.66	2	4	1	3	4	5	4	3	4	5	5	2	4	H	M	3A	12
<i>etoxazole</i> Zeal 72 WSP	-	-	-	-	-	-	-	-	-	-	1	-	-	E	E	10B	12
<i>feproximate</i> Portal 0.4	-	-	-	-	-	-	-	-	-	1	3	-	-	E	E	21A	12
<i>flonicamid</i> Carbine 50 WG	4	4	5	5	5	5	5	2	1	5	5	5	3	E	E	9C	12
<i>flubendiamide</i> Belt 4 SC	5	5	1	1	2	1	1	5	5	5	5	-	5	E	E	28	12
<i>gamma-cyhalothrin</i> Declare 1.25, Prolex 1.25	1	3	1	3	3	5	4	2	4	5	5	2	4	H	M	3A	24
<i>imidacloprid</i> Admire Pro 4.6	4	4	5	5	5	5	5	2	2	5	4	5	3	M	M	4A	12
<i>indoxacarb</i> Steward 1.25	4	4	2	1	2	1	1	3	5	5	5	4	5	M	E	22A	12
<i>lambda-cyhalothrin</i> Karate Z 2.08, Karate 1, Silencer 1	1	3	1	3	3	5	4	2	4	5	5	2	4	H	M	3A	24

Efficacy Ratings:
1 = Very Effective
5 = Not Effective

* Read and follow label directions.

** Pyrethroid resistant tobacco budworm have been observed in Georgia, efficacy may be improved if resistance levels are low.

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Effects of some insecticides are highly rate sensitive.

Insecticide ratings found in this table are based on research across the Cotton Belt and on field experiences and observations by entomologists. Ratings assume standard rates of insecticides applied at proper times. Ratings should be considered only as general guidelines for comparison purposes.

INSECT PEST RESPONSE TO INSECTICIDES USED IN COTTON

INSECTICIDE	SOUTHERN GREEN STINK BUG	BROWN STINK BUG	CORN EARWORM	TOBACCO BUDWORM**	FALL ARMYWORM	BEE T ARMYWORM	SOYBEAN LOOPER	PLANT BUGS	APHIDS	SPIDER MITES	SILVERLEAF WHITEFLY	CUTWORMS	THRIPS	PREDATORS***	PARASITES***	CHEMICAL CLASS (MOA)	REI (Hours)*
<i>methomyl</i> Lannate LV 2.4	4	4	3	3	3	4	3	3	4	5	5	3	5	H	M	1A	72
<i>methoxyfenozide</i> Intrepid 2F	5	5	4	4	2	1	2	5	5	5	5	4	5	E	E	18	4
<i>novaluron</i> Diamond 0.83EC	3	3	4	4	1	2	2	2	5	5	4	5	5	M	3	15	12
<i>oxamyl</i> Vydate C-LV 3.77	3	3	5	5	5	5	5	2	5	5	5	5	3	M	M	1A	48
<i>profenofos</i> Curacron 8E	4	4	3	3	3	4	4	3	4	3	5	3	4	H	H	1B	48
<i>propargite</i> Comite II 6	5	5	5	5	5	5	5	5	5	1	5	5	5	M	E	12C	6 days
<i>pyriproxyfen</i> Knack 0.86	5	5	5	5	5	5	5	5	5	5	1	5	5	E	E	7C	12
<i>spinosad</i> Blackhawk	5	5	2	1	2	2	2	5	5	5	5	4	4	E	M	5	4
<i>spiromesifen</i> Oberon 2 SC	-	-	-	-	-	-	-	-	-	1	2	-	-	E	E	23	12
<i>sulfoxaflor</i> Transform 50WG	4	4	-	-	-	-	-	1	1	-	-	-	-	M	M	4C	24
<i>thiamethoxam</i> Centric 40 WG	3	4	5	5	5	5	5	1	1	5	3	5	3	M	M	4A	12
<i>zeta-cypermethrin</i> Mustang Max 0.8	1	3	1	3	3	5	4	2	4	5	5	2	4	H	M	3A	12

Efficacy Ratings:
1 = Very Effective
5 = Not Effective

* Read and follow label directions.

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Effects of some insecticides are highly rate sensitive.

Insecticide ratings found in this table are based on research across the Cotton Belt and on field experiences and observations by entomologists. Ratings assume standard rates of insecticides applied at proper times. Ratings should be considered only as general guidelines for comparison purposes.

COTTON DISEASE CONTROL

Bob Kemeraït, Extension Plant Pathologist

DISEASE	CHEMICAL	MOA	RATE PER ACRE ^a (38" Row Basis)	REI/PHI (Hours/Days)	REMARKS AND PRECAUTIONS	
Seedling Diseases	<i>azoxystrobin + benzobendiflupyr</i> (solatenol) ELATUS	11 + 7	5-7.3 fl oz/A	12 H/ 45 D	Do not apply more than 14.6 fl oz/A per year.	
	Quadris 2.08SC		5.5-11 fl oz	4 H/ 45 D	Liquids gives better coverage than granular or hopperbox treatments. Liquid fungicides should be applied in-furrow using two cone-type nozzle tips. Mount the first behind the seed-drop tube to treat the soil around seed; direct the second to treat soil as it falls in to the seed furrow. Maximum rate is 27 fl oz/A/season.	
			Hopper Box		Hopperbox treatments are considered less effective than granules or in-furrow sprays, but prevent more disease than seed treatments alone.	
	<i>carboxin + terraclor + metalaxyl</i> Prevail		8016 oz/cwt			
	System 3 (biological)		0.5 fl oz/cwt			
			Additional Seed Treatments		24 H/ --	NOTE: These seed treatments are in addition to fungicide treatments that are already applied to the seed by the supplier.
	<i>azoxystrobin + fludioxonil + mefenoxam</i> Dynasty CST		3.1-3.95 fl oz/cwt			
	<i>chloroneb + metalaxyl</i> Delta Coat		8.75-11.85 oz/cwt			
	Kodiak FL		0.5 fl oz/cwt			
	Kodiak HB (biological)		4 oz/cwt			
System 3 (biological)		12 oz/cwt				
<i>trifloxystrobin + metalaxyl</i> Trilex 2000		2 fl oz/cwt				
<i>trifloxystrobin + metalaxyl + triademinol</i> Trilex Advanced		1.6 fl oz/cwt				

^a In-furrow fungicide rates are presented on a per acre basis for cotton planted on 38" rows. To convert these rates to cotton planted on 36" rows, multiply the 38" rate by 1.05. To convert the rates to cotton planted on 40" rows, multiply the 38" rate by 0.95. To convert the rates from a per acre basis to a rate per 1000 feet of row, divide the 36" rate by 14.42, divide the 38" rate by 13.76, and divide the 40" rate by 13.07.

^b Apply all liquids in 5-10 gallons of water per acre.

COTTON NEMATODE CONTROL

Bob Kemeraït, Extension Plant Pathologist

NEMATICIDE TREATMENT	RATE/ACRE	oz/1000 ft of row (38-inch row basis)	REI/PHI (Hours/Days)	REMARKS AND PRECAUTIONS
<i>abamectin</i> + <i>thiamethoxam</i> AVICTA Duo Cotton	seed treatment		48 H/ --	
AERIS Seed-Applied System	seed treatment			AERIS Seed-Applied System is a combination of thiodicarb (nematode control) and imidacloprid (thrips control) with the option of adding the TRILEX Advanced Seed-Applied System for additional control of seedling diseases. AERIS Seed-Applied System should only be considered for use in fields with low-to-moderate populations of plant parasitic nematodes. Maximum rate of 25.6 fl oz/100 lb of seed (delinted seed only).
<i>fluopyram</i> + <i>imidacloprid</i> Velum Total	14-18 fl oz		12 H/ 30 D	
N-Hibit	seed treatment	(1-5 oz/cwt)		NOTE: N-Hibit is labeled for “suppression of nematode egg production” but NOT for control of nematodes on cotton.
Telone II ¹	3 gal	30 fl oz	5 D Post Application/ --	Apply Telone II at least 7 days prior to planting by injecting 12” below final soil surface. Temik may be used at planting or as a side-dress following the use of Telone II. NOTE: Telone II is now labeled for at-plant application in Georgia for nematode control on cotton. Growers who choose to apply Telone II at plant must ensure that soil conditions are correct (see label) otherwise the at-plant fumigation may result in poor germination and plant stand.
Vydate C-LV	17 fl oz	1.24 fl oz	48 H/ 14 D	Make one application between 2nd and 5th true leaf stage. Alternatively, sequential applications of Vydate C-LV may be made at 8.5-11 fl oz/A beginning at 2nd to 5th leaf stage of growth followed by a second 8.5-11 fl oz/A applied 10-14 days later. Applications of Vydate C-LV typically follow use of Telone II or nematicide seed treatments. Vydate C-LV is a supplemental application. Maximum rate is 102 fl oz/A/season.

¹ If Telone II is used for nematode control, you must use an additional chemical for thrips control.

² Temik applied at 3.5 lb/A is often recommended for insect management, but 3.5 lb/A will not provide sufficient nematode control in Georgia.

COTTON FOLIAR DISEASE CONTROL

Bob Kemeraït, Extension Plant Pathologist

NEMATICIDE TREATMENT	RATE/ACRE	REI/PHI (Hours/Days)	REMARKS AND PRECAUTIONS
<i>flutriafol</i> Topguard	7-14 fl oz	12 H/ 30 D	
Headline	6-12 fl oz/A	12 H/ 30 D	Headline, Twinline and Quadris are labeled for control of foliar diseases and boll rot of cotton. Contact your local Cooperative Extension office for efficacy data as it becomes available from the University of Georgia. Maximum rate is 36 fl oz/A/season.
<i>pyraclostrobin</i> + <i>metconazole</i> Twinline	7-8.5 fl oz/A	12 H/ 30 D	Maximum rate is 26 fl oz/A/season.
Quadris	6-9 fl oz/A	4 H/ 45 D	Based upon current research in Georgia, it appears that fungicides may have economic benefit in the control of a disease such as <i>Corynespora</i> leaf spot. (This disease is now often referred to as “target spot” because this name is commonly used in other crops where <i>Corynespora</i> causes similar diseases.) It is still uncertain whether the fungicides will be justified in the management of a disease like <i>Stemphylium</i> leaf spot which is primarily the result of a potassium deficiency in the plant. Significant research data will be available to cotton growers in 2016 to assist in the most appropriate use of fungicides for management of foliar diseases of cotton. Maximum rate is 27 fl oz/A/season.

COTTON WEED CONTROL

A. Stanley Culpepper, Extension Agronomist - Weed Science

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
EARLY PREPLANT BURNDOWN						
Burndown of emerged annual weeds but does not adequately control primrose, geranium, large radish, glyphosate-resistant horseweed, or glyphosate-resistant Palmer amaranth.	<i>glyphosate</i> 4 S (3 lb ae) 5.4 S (4 lb ae) 5 S (4.17 lb ae) 5.5 S (4.5 lb ae) 6 S (5 lb ae)	9	4 H/ N/A	32-48 fl oz 24-36 fl oz 23-34 fl oz 22-32 fl oz 19-29 fl oz	0.75-1.13 (lb ae)	Apply up till planting; adjuvants needed with some products. <i>Control of cover crops:</i> Wheat < 12": 0.56 lb ae Wheat > 12": 0.75 lb ae Rye < 12": 0.56 lb ae Rye >12" (no seed head): 0.75 lb ae Rye with seed head: 0.56 lb ae
Emerged primrose, wild radish, spiderwort, very small horseweed.	<i>2,4-D amine</i> 4 S 4.7 S 5 S	4	48 H/ N/A	12-24 fl oz 10-20 fl oz 9-18 fl oz	0.38-0.75	The MOST CONSISTENT and effective burndown program for winter weeds in Georgia is a 2,4-D application in February when weeds are small and herbicide coverage is adequate followed by glyphosate or paraquat mixtures at or near planting. See label for plant back interval. PRIMROSE: Apply 0.24-0.38 lb ai/A RADISH: Apply 0.5-0.75 lb ai/A HORSEWEED: Apply 0.75+ lb ai/A GLYPHOSATE-RESISTANT HORSEWEED: Apply 0.95 + lb ai/A
Burndown of most emerged weeds, 2,4-D rates are too low to control glyphosate-resistant horseweed. Mixture may not control Carolina geranium.	<i>glyphosate</i> + <i>2,4-D amine</i> 4 S 4.7 S 5 S	9 + 4	48 H/ N/A	see glyphosate + 8-16 fl oz 6-12 fl oz 6-11 fl oz	0.75-1.13 (lb ae) + 0.24-0.48	Most, but not all, brands of 2,4-D may be applied at least 30 days ahead of cotton planting. 2,4-D is the most effective option available for burndown of primrose and 2,4-D at 0.24 lb ae/A will provide control. For glyphosate-resistant horseweed the rate of 0.95 lb ai/A will control small plants. 2,4-D is more effective than dicamba on primrose; less effective on horseweed. Use amine formulations of 2,4-D to reduce potential for off-target movement; no differences in control compared to other formulations. <i>2,4-D volatility occurs and is influenced by environment, soil conditions, and formulations used; avoid off-target issues.</i>
Aim improves control of emerged morningglory, tropical spiderwort, and very small (<1") glyphosate-resistant Palmer amaranth.	<i>glyphosate</i> + <i>carfentrazone</i> Aim 2 EC	9 + 14	12 H/ N/A	see glyphosate + 0.5-1.0 fl oz	0.75-1.13 (lb ae) + 0.008-0.016	May be applied as a burndown treatment anytime prior to planting. Aim does not provide residual weed control.

¹Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
EARLY PREPLANT BURNDOWN (continued)						
Dicamba improves primrose, morningglory, and glyphosate-resistant horseweed control. Suppresses geranium and curly dock. At this rate, likely will not control Palmer amaranth larger than 1.5".	<i>glyphosate</i> + <i>dicamba</i> Clarity, other 4S	9 + 4	24 H/ N/A	see glyphosate + 8 fl oz	0.75-1.13 (lb ae) + 0.25	Following application of dicamba AND a minimum of 1" of rainfall, a waiting period of at least 21 days is required before planting. Dicamba can be applied alone with little to no effect on the small grain cover crop. Dicamba is less effective than 2,4-D on primrose; but more effective on horseweed. Numerous formulations of dicamba exist. <i>Dicamba volatility occurs and is influenced by environmental conditions, soil types, and formulations selected; avoid off-target issues.</i>
Diuron improves control of emerged Palmer amaranth and provides residual control if it reaches the ground and is activated. The addition of 2,4-D or Valor will likely improve weed control; follow most restrictive plant-back interval.	<i>glyphosate</i> + <i>diuron</i> Direx 4F	9 + 7	12 H/ N/A	see glyphosate + 1-1.5 pt	0.75-1.13 (lb ae) + 0.5-0.75	A Georgia 24 C Direx label allows applications up to the day ahead of planting if strip tillage implement is run between application and planting. If no tillage occurs between application and planting then one should wait at least 10 days prior to planting. Do not apply on sand or loamy sand soils. If following shortened plant-back interval, suggest avoid using diuron again PRE. The addition of 2,4-D or Valor will likely improve weed control; follow most restrictive plant-back interval for tank mixture chosen. Many diuron formulations are available but have longer plant-back interval, see labels.
Valor improves emerged primrose and radish control. Valor also provides residual control of pigweed, pusley, smallflower morningglory and other sensitive weeds for up to 6-8 weeks if it reaches the soil and is activated. The addition of 2,4-D (8-16 oz/A of 3.8 lb ai material) would improve control of radish and primrose; follow most restrictive plant-back interval. For PPO-resistance management, make only 3 applications of Reflex or Valor (including generics) on a field in 3 years.	<i>glyphosate</i> + <i>flumioxazin</i> Valor SX 51 WDG	9 + 14	12 H/ N/A	see glyphosate + 2 oz	0.75-1.13 (lb ae) + 0.063	A Georgia 24 c Valor label allows reduced plant-back intervals and provides safer use patterns for Valor in cotton. Outflank, Panther, and Rowel have been tested and perform similarly to Valor but do not have the state label allowing the following use patterns: In strip-till cotton , Valor can be applied 10 days ahead of planting as long as the strip-till operation occurs between applying Valor and planting. In no-tillage production or when the strip is implemented prior to application. Valor plant-back interval should be as follows: 1) <30% ground cover wait 28 days PLUS 1" of rain; 2) >30% ground cover wait 21 days PLUS 1" of rain. If Reflex (or generic) will be applied PRE; suggest adding an additional 7 days to no-tillage planting intervals. Add a non-ionic surfactant or crop oil concentrate (preferred), regardless of glyphosate brand. CAREFULLY follow label directions for cleaning sprayer after each use!
ET improves control of emerged morningglory and small (< 1") glyphosate-resistant Palmer amaranth.	<i>glyphosate</i> + <i>pyraflufen ethyl</i> ET 0.208 EC	9 + 14	12 H/ N/A	see glyphosate + 0.5-2 fl oz	0.75-1.13 (lb ae) + 0.0008-0.003	May be applied as a burndown treatment anytime prior to planting. ET does not provide residual weed control.

*Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
EARLY PREPLANT BURNDOWN (continued)						
Improved control of henbit, chickweed, Carolina geranium, and wild radish compared to glyphosate alone. Use Harmony Extra or Nimble to improve control of curly dock.	<i>glyphosate</i> + <i>thifensulfuron + tribenuron</i> FirstShot SG 50 SG	9 + 14	12 H/ N/A	see glyphosate + 0.5-0.8 oz	0.75-1.13 (lb ae) + 0.008-0.013 + 0.008-0.013	Apply at least 14 days prior to planting. Include nonionic surfactant at 1-2 qt per 100 gal spray or crop oil concentrate at 1-2 gal per 100 gal spray.
2,4-D is more effective on primrose. Dicamba and 2,4-D are more effective on horseweed. Valor and diuron are more effective providing residual control.	<i>glyphosate</i> + <i>thifensulfuron + tribenuron</i> Harmony Extra SG with TotalSol 50 SG Harmony Extra, Nimble 75WDG	9 + 2 + 2	12 H/ N/A	see glyphosate + 0.75 oz 0.5 oz	0.75-1.13 (lb ae) + 0.0156 + 0.0078	
Burndown of emerged annual weeds; best control with annual weeds 3" or less. Does not control immature primrose, large horseweed, curly dock, swinecress, immature radish, or large grasses. Mixtures with diuron are usually far more effective.	<i>paraquat</i> Gramoxone 2S Firestorm, Parazone 3S	22	24 H/ N/A	2.5-4 pt 1.7-2.7 pt	0.63-1	Apply any time prior to planting to control emerged weeds. Add nonionic surfactant at 2 pt/100 gal of spray mix or crop oil concentrate at 1 gal/100 gal spray mix. The addition of diuron is strongly encouraged. Apply 0.63 lb ai for wheat and 0.5 lb ai for rye cover crop. Cover crops must be mature (seedheads present) for adequate control. Gramoxone, Firestorm, and Parazone have been tested; however, numerous other brands of paraquat are also available, see labels.
Burndown of emerged annual weeds and provides residual control if diuron reaches the soil and is activated. Effective on mature primrose and wild radish. BY FAR the most effective. Option for emerged glyphosate-resistant pigweed. If extended residual control is desired, consider adding Valor to the mixture.	<i>paraquat</i> Gramoxone 2S Firestorm, Parazone 3S + <i>diuron</i> Direx 4F	22 + 7	24 H/ N/A	2.5-4 pt 1.7-2.7 pt + 1.5-2 pt	0.63-1 + 0.75-1	A Georgia 24(c) Direx label allows applications up to the day ahead of planting if a strip-tillage implement is run between Direx application and planting. If no tillage occurs between Direx application and planting then one should wait at least 10 days prior to planting. Do not apply on sand or loamy sand soil. If following shortened plant-back interval, suggest avoid using diuron again PRE. Add crop oil concentrate at 1 gal/100 gal spray mix. When mixed with crop oil concentrate and applied in May when winter weeds are mature, control is much greater than when applied on immature winter weeds.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
EARLY PREPLANT BURNDOWN (continued)						
<p>Paraquat mixtures with diuron are more effective on emerged Palmer amaranth; however, Valor is more effective in providing residual Palmer amaranth control.</p> <p>The addition of diuron is suggested if pigweed is larger than 3".</p> <p>For PPO-resistance management, make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.</p>	<p><i>paraquat</i> Gramoxone 2 SL Firestorm, Parazone 3 SL + <i>flumioxazin</i> Valor SX 51 WDG</p>	<p>22 + 14</p>	<p>12 H/ N/A</p>	<p>2.5-4 pt 1.7-2.7 pt + 2 oz</p>	<p>0.63-1 + 0.063</p>	<p>A Georgia 24 c Valor label allows reduced plant-back intervals and provides safer use patterns for Valor in cotton. Outflank, Panther, and Rowel have been tested and perform similarly to Valor but do not have the state label allowing the following use patterns:</p> <p>In strip- till cotton, Valor can be applied 10 days ahead of planting as long as the strip till operation occurs between applying Valor and planting.</p> <p>In no-tillage production or when the strip is implemented prior to application. Valor plant-back interval should be as follows: 1) <30% ground cover wait 28 days PLUS 1" of rain; 2) >30% ground cover wait 21 days PLUS 1" of rain. If Reflex (or generic) will be applied PRE; suggest adding an additional 7 days to no-tillage planting intervals.</p> <p>Add a non-ionic surfactant or crop oil concentrate (preferred).</p> <p>Carefully follow label directions for cleaning sprayer after each use!!</p>
<p>Winter annual broadleaf weeds such as henbit, chickweed, small wild radish, and curly dock.</p> <p>DO NOT anticipate residual control for Palmer amaranth.</p>	<p><i>rimsulfuron</i> + <i>thifensulfuron</i> Leadoff 33 SG</p>	<p>2 + 2</p>	<p>4 H/ N/A</p>	<p>1.5 oz</p>	<p>0.0156 + 0.0156</p>	<p>Apply at least 30 days prior to planting. Can increase rate to 2 oz/A if applying at least 60 days prior to planting. Also suggest at least 1 inch of rain accumulation prior to planting.</p> <p>Mixing 2,4-D with Leadoff will improve control of problematic weeds such as radish, primrose, and horseweed.</p>
EARLY PREPLANT BURNDOWN OF GLYPHOSATE-RESISTANT HORSEWEED						
<p>Glyphosate-resistant horseweed is becoming more common across Georgia. Research from other states suggests dicamba is more effective than 2,4-D on larger horseweeds.</p> <p>Applications should be made prior to April for maximum timeliness.</p> <p>For PPO-resistance management, make only 3 applications of Valor or Reflex (or generics) on a field in 3 years.</p>	<p><i>glyphosate</i> + <i>2,4-D amine</i> numerous brands + <i>flumioxazin</i> Valor SX, other 51 WDG <i>glyphosate</i> + <i>dicamba</i> Clarity, other 4 SL + <i>flumioxazin</i> Valor SX, other 51 WDG</p>	<p>9 + 4 + 14</p>	<p>48 H/ N/A</p>	<p>see glyphosate + see label + 2 oz</p>	<p>0.75-1.13 (lb ae) + 0.95 (lb ae) + 0.063</p>	<p>Glyphosate plus 2,4-D plus Valor SX, or glyphosate plus dicamba plus Valor are the preferred treatments.</p> <p>See sections above on plant back intervals.</p> <p>The 2,4-D or dicamba is needed in the mixture to control emerged resistant horseweed while the Valor provides residual control for seeds that may germinate after the application.</p> <p>Carefully follow label directions for cleaning sprayer after each use! Numerous brands of dicamba exist, see labels. Other brands of flumioxazin are also available including Outflank, Panther, and Rowel; however, these products do not have the same plant-back intervals as Valor, see label.</p> <p>2,4-D and dicamba volatility occurs and is influenced by environmental conditions, soil types, and formulations selected; avoid off-target issues.</p>

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
EARLY PREPLANT BURNDOWN OF GLYPHOSATE-RESISTANT HORSEWEED (continued)						
Glyphosate-resistant horseweed (continued)	<i>paraquat</i> Gramoxone Inteon 2S Firestorm, Parazone 3S + <i>diuron</i> Direx 4 F	22 + 7	24 H/ N/A	4 pt 2.7 pt + 1.5-2 pt	1 + 0.75-1	A Georgia 24(c) Direx label allows applications up to the day ahead of planting if a strip-tillage implement is run between Direx application and planting. If no tillage occurs between Direx application and planting then one should wait at least 10 days prior to planting. Do not apply on sand or loamy sand soil. Suggest avoiding diuron PRE if following shortened plant-back interval. Spray when daytime temps exceed 70°F. Add 1 gal of crop oil concentrate/100 gal of spray mix. May add 2,4-D or dicamba to improve control of emerged plants; follow proper plant-back intervals.
For resistance management, do not apply glufosinate on a field more than 2 times a year.	<i>glufosinate</i> Liberty 280 SL 2.34S others, 2.34 S	10	12 H/ N/A	29-43 fl oz	0.53-0.79	Recommended for fields where growers have failed to control glyphosate-resistant horseweed. If greater than 29 oz/A is applied preplant, the season total applied cannot exceed 72 fl oz/A. To maximize control: >15 GPA water volume, medium spray droplet, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 1 hour of sunset. Cheetah, Kong Glufosinate 280, and Interline have been tested and performed similarly to Liberty, see labels.
PREPLANT: AT OR JUST PRIOR TO PLANTING						
Burndown of emerged annual weeds and cover crops. Inadequate control of primrose, radish, geranium and resistant pigweed or horseweed often noted.	<i>glyphosate</i> 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 6S (5 lb ae)	9	4 H/ N/A	32-48 fl oz 24-36 fl oz 23-34 fl oz 22-32 fl oz 11-29 fl oz	0.75-1.13 (lb ae)	If Palmer is emerged at time of planting, better control with paraquat is most often achieved with applications prior to planting as the planting process may cover them with dirt. Add nonionic surfactant at 2 pt/100 gal or crop oil concentrate at 1 gal/100 gal spray mix for paraquat. Need for adjuvants with glyphosate depend upon brand used.
Burndown of emerged annual weeds. Does not control immature primrose, large horseweed, curly dock, swinecress, immature radish, or large grasses or pigweeds over 3”.	<i>paraquat</i> Gramoxone 2S Firestorm, Parazone 3S	22	24 H/ N/A	2.5-4 pt 1.7-2.7 pt	0.63-1	Control of mature cover crops with seedheads: Wheat < 12”: glyphosate 0.75 lb ae or paraquat 0.63 lb Wheat > 12”: glyphosate 0.75 lb ae or paraquat 0.75 lb Rye < 18”: glyphosate 0.56 lb ae or paraquat 0.6 lb Rye > 18”: glyphosate 0.75 lb ae or paraquat 0.75 lb Rye with seed head: 0.56 lb ae
Burndown of mature primrose and morningglory. Inadequate control of immature radish, pigweeds over 3” or grain cover crops. For resistance management, do not apply glufosinate on a field more than 2 times a year.	<i>glufosinate</i> Liberty 280S 2.34S others, 2.34S	10	12 H/ N/A	29-43 fl oz	0.53-0.79	Applications can be made prior to cotton emergence. To maximize control: >15 GPA water volume, medium spray droplet, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 1 hour of sunset. For Palmer amaranth, apply 29 oz/A when less than 3”; 32 oz/A when 3”; 36 oz/A when 4”; and 43 oz/A when taller than 4”. Cheetah, Kong Glufosinate 280, and Interline have been tested and performed similarly to Liberty, see labels.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
PREPLANT INCORPORATED						
Annual grasses, pigweeds and Florida pusley. Controls glyphosate-resistant Palmer amaranth much more effectively than when applied preemergence.	<i>pendimethalin</i> Prowl 3.3 EC Pendimax 3.3 EC Prowl H20 3.8 AS	3	24 H/ N/A	1.2-2.4 pt 1.2-2.4 pt 2 pt	0.5-1 0.5-1 0.95	Soil incorporate in top 2" of the soil within 24 hours of application; consider mixing with Reflex. Application and incorporation within a week of planting is preferred.
	<i>trifluralin</i> Treflan, others 4 EC	3	12 H/ N/A	1-2 pt	0.5-1	Pendimethalin is less volatile than trifluralin and is a better option if incorporation is delayed, although delayed incorporation will reduce control. For Treflan 4 L, rate should not exceed 1.5 pt/A for most fields. The need for a PRE herbicide as noted with the split program below is critical.
Glyphosate-resistant Palmer amaranth and yellow nutsedge For PPO-resistance management, make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.	<i>fomesafen</i> Reflex 2S	14	24 H/ N/A	16 fl oz	0.25	A Georgia Section 2 (ee) Reflex label allows a preplant application by incorporating Reflex to a SHALLOW (2" or less) depth while the soil is moist; suggest including pendimethalin or trifluralin. The need for a PRE herbicide as noted with the split program below is critical; reduce Reflex rate accordingly if implementing split PPI and PRE program. For Palmer amaranth, less control is noted with Reflex alone incorporated when compared to preemergence applications if activated immediately by rainfall or irrigation; less injury potential is also noted with incorporated application. Thus the split program, below, is usually the best option.
SPLIT PROGRAM WITH PREPLANT INCORPORATED (PPI) FOLLOWED BY PREEMERGENCE (PRE) APPLICATIONS						
The SINGLE MOST effective approach for the control of Palmer amaranth while also offering the least injury potential from fomesafen. Very beneficial on dryland production. For PPO-resistance management, make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.	PPI:		24 H/ N/A	See rates in preplant incorporated +	See rates in preplant incorporated +	PPI: Shallow (2") incorporation is required. Plant within 1 week of application and incorporation if possible. Numerous formulations of fomesafen are available; however, they may not support this use pattern, see label.
	<i>trifluralin or pendimethalin</i> +					
	<i>fomesafen</i> Reflex 2S			10-12 oz	0.16-0.19	
	PRE:		24 H/ N/A	8-10 oz +	0.125-0.16 +	PRE: 1. Be sure to include paraquat PRE if glyphosate-resistant Palmer amaranth is emerged. 2. Warrant offers greater residual control when compared to diuron while diuron offers greater control of emerged weeds. 3. If mixing Reflex + Warrant + diuron, the rate of diuron for most fields should not exceed 10 oz/A.
	<i>fomesafen</i> Reflex 2S + <i>acetochlor</i> Warrant 3ME	3 + 14 + 15 or 7				
	<u>OR</u> <i>diuron</i> Direx, diuron 4F			<u>OR</u> 10-20 fl oz	<u>OR</u> 0.31-0.63	Numerous formulations of fomesafen and diuron are available; see label.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
PREEMERGENCE-BROADLEAF AND GRASS CONTROL						
Residual control of annual grasses, Palmer amaranth, and tropical spiderwort.	<i>acetochlor</i> Warrant 3 ME	15	12 H/ N/A	2-3 pt	0.75-1.125	Warrant should be applied in combination with fomesafen (Reflex, others), diuron, or Cotoran depending on Palmer population and technology grown; add paraquat and adjuvant if Palmer is up. Apply within 24 hr of planting. A rate of 2-2.5 pt/A is in order when 1) tank mixing with another effective residual herbicide, 2) applying on light soil textures, and/or 3) using intense irrigation during the first 2 wk of planting.
Residual control of many annual grasses and broadleaves including Palmer amaranth and tropical spiderwort; suppression of yellow nutsedge.	<i>acetochlor + fomesafen</i> Warrant Ultra 3.45 CS	15 + 14	24 H/ N/A	2.4 pt	0.84 + 0.19	Apply within 24 hr of planting; add paraquat plus adjuvant if Palmer is up. Warrant Ultra at 2.4 pt/A provides 2.2 pt of Warrant and 0.19 lb ai of fomesafen (equivalent to 12 oz/A of Reflex). This rate is ideal for lighter soil textures, under intense irrigation, and when used in dicamba- or 2,4-D-based programs. On heavier soils when implementing Roundup- or Liberty-based programs, the addition of Warrant at 0.5 pt/A to this mix may be in order.
Residual suppression of annual broadleaf weeds and grasses. More effective than Cotoran on pigweed, less effective on most other weeds.	<i>diuron</i> Direx, others 80 DF Direx, others 4L	7	12 H/ N/A	0.38-0.78 lb 10-20 oz	0.31-0.62	Diuron should be applied in combination with fomesafen (Reflex, others) or Warrant depending on Palmer population and technology grown; add paraquat and adjuvant if Palmer is up. Apply within 24 hr of planting. See label for specific rate on soils but in general lower rate on sandier soils and/or intense irrigation. Label restricts use on sands or soils with < 1% organic matter. Numerous generic formulations are available, see label.
Residual suppression of annual broadleaf weeds and annual grasses. The most effective single residual material for sicklepod, cocklebur, and morningglory control. Less effective than diuron on Palmer amaranth.	<i>fluometuron</i> Cotoran 4F	7	12 H/ N/A	2-3 pt	1-1.5	Cotoran should be applied in combination with fomesafen (Reflex, others) or Warrant depending on Palmer population and technology grown; add paraquat and adjuvant if Palmer is up. Apply within 24 hr of planting. See label for specific rate on soils but in general lower rate on sandier soils and/or intense irrigation. A maximum of 2 pt/A is ideal for most GA soils.
The most effective residual herbicide for the control of glyphosate-resistant Palmer amaranth. Good control of poinsettia and suppression of yellow nutsedge. For PPO resistance management, make only 3 applications of fomesafen or Valor (including generics) on a field in 3 years.	<i>fomesafen</i> Reflex, Dawn 2S	14	24 H/ N/A	12-16 fl oz	0.19-0.25	Reflex or generics should be applied in combination with Warrant, diuron, or Cotoran for maximum control depending on Palmer population and technology grown; add paraquat and adjuvant if Palmer is up. Apply within 24 hr of planting. Research suggests 12 oz/A is an appropriate rate when mixed with Warrant or diuron. Apply only to coarse-textured soils; however on sandy soils with low organic matter use lower rates. Injury more often occurs when initial rains or irrigation occur as cotton is emerging; follow irrigation program on the 2016 Palmer Circular. Fomesafen provides good residual pigweed control even if the first rain does not occur until 15 days after treatment. Pigweed that emerges before activation will not be controlled. Reflex and Dawn have been tested intensely; other brands are available.
Annual grasses and Florida pusley; suppression of Palmer amaranth only. Irrigation or rain-fall needed within 24 hours.	<i>pendimethalin</i> Prowl 3.3 EC Pendimax 3.3 EC Prowl H20 3.8 AS	3	24 H/ N/A	1.8-3.6 pt 1.8-3.6 pt 2-3 pt	0.75-1.5 0.75-1.5 0.95-1.42	Preemergence applications are far less consistent than incorporated treatments; tank mixtures are needed. Wet/moist conditions during emergence (rainfall or irrigation) can cause significant plant stunting, leaf/stem malformation, and stem swelling with eventual breaking; especially if used in combination with Reflex (generic). Apply within 24 hours of planting.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
PREEMERGENCE-BROADLEAF AND GRASS CONTROL (continued)						
Controls non-ALS resistant pigweeds, lambsquarters, prickly sida, spurge, and smartweed. Suppresses morningglory, except tall. Make only 1 timely application of Staple and/or Envoke per season.	<i>pyrithiobac</i> Staple LX, Pyrimax 3.2S	2	4 H/ N/A	1.7-2.1 fl oz	0.0425-0.053	Staple or Pyrimax are excellent residual herbicides but cotton injury, especially on irrigated light textured soils is a serious concern. Thus, a delayed PRE or early POST use of Staple is being recommended by UGA; contact your local Extension office for the circular or go to gaweed.com. Do not apply on soils with less than 0.5% organic matter. Can tank mix with diuron, fluometuron, pendimethalin, or Reflex; apply within 24 hr of planting. The addition of paraquat or glyphosate is needed if weeds are emerged.
POSTEMERGENCE OVER-THE-TOP BROADLEAF AND GRASS CONTROL FOR ANY CULTIVAR Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control.						
Pigweed less than 1", morningglory (excluding tall mg), coffee senna, and redweed. Suppresses sicklepod and will not control ALS-resistant pigweed. Provides good residual control of many species if reaches the ground and is activated. Make only 1 TIMELY application of Staple and/or Envoke per season.	<i>pyrithiobac</i> Staple LX, Pyrimax 3.2S	2	4 H/ 60 days	2.7-3 fl oz	0.06-0.07	Apply overtop of cotton from cotyledonary stage up to 60 days of harvest. Avoid applying during periods of cool, wet weather. Include nonionic surfactant at 1 qt per 100 gal spray mix. Label allows two applications per year, not exceeding a total of 5.1 fl oz. Label also allows increasing rate of an application to 3.8 fl oz but injury is a concern. Residual control of non-ALS resistant Palmer has been good even if the first activating rain does not occur for 15 days after application, plants emerging before activation will not be controlled. Do not mix with grass control herbicides. May mix with most insecticides, but do not tank mix with any product containing malathion. Do not mix with any Dual product or Warrant. Separate Staple and Dual/Warrant applications by 5 or more days. See label for rotational restrictions.
Annual broadleaf weeds including sicklepod, Ipomoea morningglory, and nutsedge. Will not control smallflower morningglory or ALS-resistant pigweed, jimsonweed, copperleaf, or prickly sida. Make only 1 TIMELY application of Staple and/or Envoke per season.	<i>trifloxysulfuron</i> Envoke 75 WDG	2	12 H/ 60 D	0.1 oz	0.0047	Apply overtop after cotton has at least 6 (prefer 7) true leaves up until 60 days of harvest. Direct application on larger cotton for improved weed coverage and less injury. Add nonionic surfactant at 1 qt/100 gal; do not use other types of adjuvants. Do not mix with other pesticides including plant growth regulators. In an attempt to avoid injury, do not apply to cotton under stress, such as very dry, wet, or cool conditions. Envoke may be directed to cotton 6" or larger at rates of 0.1-0.25 oz/A. See label for details and rotational restrictions. Rain fast in 3 hr. Also provides residual control of sensitive species if contacts soil and is activated.
Most broadleaf weeds. Poor control of tropic croton, copperleaf and ALS-resistant pigweed. Good residual if activated.	<i>trifloxysulfuron</i> Envoke 75 WDG + <i>pyrithiobac</i> Staple LX 3.2 SL	2 + 2	12 H/ 60 D	0.1 oz + 1.3-1.9 fl oz	0.0047 + 0.03-0.05	Apply overtop or directed after cotton has at least 6 (prefer 7) true leaves up until 60 days of harvest. Add non-ionic surfactant at 1 qt/100 gal spray mix. See comments and restrictions for each product applied alone.

COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE OVER-THE-TOP BROADLEAF AND GRASS CONTROL FOR LIBERTYLINK, GLYTOL LIBERTYLINK, or XTENDFLEX COTTON ONLY Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control						
<p>An at-plant residual herbicide should always be used in a Liberty system.</p> <p>Control of pusley, spiderwort, and goosegrass are not consistent. In general, broadleaf weeds should be <3" and grasses < 2".</p> <p>Excellent control of morningglory including moonflower.</p> <p>For Palmer amaranth, apply 29 oz/A when less than 3"; 32 oz/A when 3"; 36 oz/A when 4"; and 43 oz/A when taller than 4".</p> <p><i>For resistance management, do not make more than 2 applications of glufosinate per year on a field; include two herbicides PRE, residual mixtures POST, and a directed layby.</i></p>	<p><i>glufosinate</i> Liberty 280 SL, others 2.34S</p>	10	12 H/ 70 D	29-43 fl oz	0.53-0.79	<p>Liberty Link, Glytol LibertyLink, or XtendFlex Cultivars Label allows application from full cotyledonary cotton through early bloom; however, UGA recommends applications after 7 leaf cotton be sloppy directed to reduce injury potential while improving weed control. Do not exceed 43 fl oz/A per application. Also, do not exceed 87 fl oz/A per season with individual applications of 29 fl oz/A or less, and do not exceed 72 oz/A per season if any individual application greater than 29 oz/A is made.</p> <p>To maximize control: >15 GPA water volume, medium spray droplet, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 1 hour of sunset. Mixtures with residual herbicides are usually needed to assist in the control of grasses, pusley, spiderwort, and pigweed.</p> <p>Cheetah, Interline, and Kong Glufosinate 280 are formulations of glufosinate also labeled for this use, see labels; limited testing for these products has occurred overtop of glufosinate-tolerant cotton in GA.</p> <p>Research has shown in some environments that more injury from Liberty is observed with XTENDFLEX cotton compared to LibertyLink cotton; however, injury with XtendFlex cotton is less than that of Widestrike cotton.</p> <p>Rain fast within 4 hours. Grass control herbicides should not be mixed with Liberty.</p>
<p>Staple may improve emerged pigweed control (non ALS-resistant) and provides residual activity on sensitive weeds if spray contacts soil and is activated.</p> <p><i>For resistance management, do not make more than 2 applications of glufosinate per year in a field; include 2 herbicides PRE and a directed layby. Also do not make more than 1 Staple and/or Envoke application per year in a field.</i></p>	<p><i>glufosinate</i> Liberty 280 SL, others 2.34L + <i>pyrithiobac</i> Staple LX 3.2 SL</p>	10 + 2	12 H/ 70 D	29 fl oz + 1.9 fl oz	0.53-0.58 + 0.03-0.05	<p>LibertyLink, Glytol LibertyLink, or XtendFlex Cultivars See information for glufosinate alone just above.</p> <p>Leaf speckling/burn/chlorosis will occur. Avoid dew, extremely high temperatures, and mixtures with other pesticides or adjuvants to reduce injury potential. Do not mix with any metolachlor (Dual) product or Warrant.</p> <p>Cheetah, Interline, and Kong Glufosinate 280 are formulations of glufosinate also labeled for this use, see labels; limited testing for these products has occurred overtop of glufosinate-tolerant cotton in GA.</p> <p>Research has shown in some environments that more injury from Liberty is observed with XtendFlex cotton compared to LibertyLink cotton; however, injury with XtendFlex cotton is less than that of Widestrike cotton.</p>

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE OVER-THE-TOP BROADLEAF AND GRASS CONTROL FOR LIBERTYLINK, GLYTOL LIBERTYLINK, or XTENDFLEX COTTON (continued) Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control.						
<p>Dual or Warrant provides residual control of grasses, spiderwort, and pigweeds if spray contacts soil and is activated. Outlook provides residual control of grasses and pigweeds; spiderwort has not been studied.</p> <p>For Palmer amaranth, apply Liberty at 29 oz/A when less than 3"; 32 oz/A when 3"; 36 oz/A when 4"; and 43 oz/A when taller than 4".</p> <p><i>For resistance management, do not make more than 2 applications of glufosinate per year in a field; include 2 herbicides PRE and a directed layby.</i></p>	<i>glufosinate</i> Liberty 280 SL, others 2.34S + <i>acetochlor</i> Warrant 3 ME	10 + 15	24 H/ 70 D	29-43 fl oz + 2-3 pt	0.53-0.79 + 0.75-1.125	<p>LibertyLink, Glytol LibertyLink, or XtendFlex Cultivars</p> <p><i>Warrant</i> mixture can be applied from cotton being fully emerged through early bloom. <i>Dual Magnum</i> mixture can be applied from cotton being fully emerged through 100 days before harvest if applied overtop, up to 80 days before harvest if directed or early bloom, whichever is more restrictive. <i>Outlook</i> mixture can be applied from 1-leaf cotton through second week of bloom.</p> <p><i>UGA research strongly encourages these mixtures to be directed after 7-leaf cotton for reduced injury and better weed control.</i></p> <p>Some leaf speckling/burn will likely occur. Injury may be enhanced if applied to cotton with dew, under extremely high temperatures or when mixed with insecticides or adjuvants. Cotton usually recovers rapidly.</p> <p>To maximize control: >15 GPA water volume, medium spray droplet, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 1 hour of sunset.</p> <p>Several products containing metolachlor (not S-metolachlor) are available. Metolachlor products are less effective per unit of formulated product than those with S-metolachlor. In general it takes 1.5 pt of a metolachlor product to give the activity one gets from 1 pt of S-metolachlor.</p> <p>Cheetah, Interline, and Kong Glufosinate 280 are available formulations of glufosinate but labels do not mention mixtures with acetochlor or dimethanamid.</p> <p>Research has shown in some environments that more injury from Liberty is observed with XtendFlex cotton compared to LibertyLink cotton; however, injury with XtendFlex Cotton is less than that of widestrike cotton.</p>
	<i>glufosinate</i> Liberty 280 SL, others 2.34S + <i>S-metolachlor</i> Dual Magnum 7.62 EC	10 + 15	24 H/ 80 D	29-43 fl oz + 1 pt	0.53-0.79 + 0.95	
	<i>glufosinate</i> Liberty 280 SL, others 2.34S + <i>dimethenamid-P</i> Outlook 6 EC	10 + 15	12 H/ N/A	29-43 fl oz + 12-16 fl oz	0.53-0.79 + 0.56-0.75	
POSTEMERGENCE OVER-THE-TOP BROADLEAF AND GRASS CONTROL IN PHYTOGEN WIDESTRIKE COTTON Application of postemergence herbicide treatments to moisture stressed weeds usually result in poor control.						
Glyphosate-resistant Palmer amaranth in Widestrike cotton.	<i>glufosinate</i> Liberty 280SL 2.34S	10	12 H/ 70 D	29 fl oz	0.53	<p>PhytoGen cultivars with the Widestrike trait are tolerant to Liberty. Tolerance in these cultivars is not complete, and varying levels of crop injury are often noted. Greater injury can be expected when Liberty is mixed with AMS, mixed with other pesticides, or applied at higher rates. Grower assumes the liability of crop injury.</p> <p>Make no more than two topical applications with the second application being made prior to 8 leaf cotton. See above comments for use of Liberty in Liberty Link cotton, including statement on application time of day.</p>

¹Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE OVER-THE-TOP BROADLEAF AND GRASS CONTROL FOR ROUNDUP READY FLEX, GLYTOL LIBERTYLINK, XTENDFLEX COTTON Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control.						
Controls most annual weeds; exceptions include glyphosate-resistant Palmer amaranth, dayflower, Florida pusley, tropical spiderwort, doveweed and hemp sesbania. Timely applications critical for purslane and morningglory. <i>Never apply glyphosate alone. Obtain sound management programs from your Extension office or at gaweed.com.</i>	<i>glyphosate</i> 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 6S (5 lb ae)	9	4 H/ 7 D	32-48 oz 24-36 oz 23-34 oz 22-32 oz 19-29 oz	0.75-1.12 (lb ae)	Roundup Ready Flex, Glytol LibertyLink or XtendFlex Cultivars WeatherMax or PowerMax (4.5 lb ae) may be applied overtop or directed to Flex cotton anytime from cotton emergence until 7 days prior to harvest. The maximum rate for any single application between emergence and 60% open bolls is 32 fl oz (1.12 lb ae). Do not exceed a total of 128 fl oz (4.5 lb ae) applied from emergence through 60% open bolls. Do not exceed a maximum of 44 fl oz (1.55 lb ae) applied between layby and 60% open bolls. Do not exceed a maximum of 44 fl oz between 60% open bolls and harvest. Directed applications may be more effective in larger cotton to allow better coverage of weeds under canopy or to allow for tank mixes with other herbicides. A glyphosate-based program should include: 1) no weeds emerged at planting; 2) two residual herbicides at planting; 3) residual herbicides with Roundup POST and a conventional directed layby.
Warrant provides residual control of grasses, pigweeds and tropical spiderwort, if the acetochlor contacts the soil and is activated.	<i>glyphosate</i> + <i>acetochlor</i> Warrant 3 ME	9 + 15	12 H/ do not apply after bloom	see glyphosate + 3 pints	0.75-1.12 + 1.125	Roundup Ready Flex, Glytol LibertyLink, or XtendFlex Cultivars See comments for glyphosate alone. Label allows a topical application once cotton is completely emerged until it reaches bloom; however, UGA research suggests making directed applications after the 7-leaf stage to reduce injury potential while improving weed control. A topical and directed application may be made as long as Warrant was not applied PRE; if Warrant was applied PRE then one POST application can be made. Use loaded glyphosate formulation; do not add adjuvants or other pesticides including Staple. Avoid heavy dew on cotton plant and extreme, hot conditions.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE OVER-THE-TOP BROADLEAF AND GRASS CONTROL FOR ROUNDUP READY FLEX, GLYTOL LIBERTYLINK, XTENDFLEX COTTON Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control. (continued)						
Outlook provides residual control of annual grasses and pigweeds if it reaches the soil and is activated; no current data on spiderwort.	<i>glyphosate</i> + <i>dimethenamid-P</i> Outlook 6 EC	9 + 15	12 H/ N/A	see <i>glyphosate</i> + 12-16 fl oz	0.75-1.12 + 0.56-0.75	Roundup Ready Flex, Glytol LibertyLink, or XtendFlex Cultivars See comments for <i>glyphosate</i> alone. Label allows a topical application from 1-leaf cotton through 2nd week of bloom; however, UGA research suggests making directed applications after the 7-leaf stage to reduce injury potential while improving weed control. Only one application of Outlook per year. Suggested rate is 12 oz/A on coarse soils or under intense irrigation. Some leaf speckling/burn will likely occur. Injury may be enhanced if applied to cotton with dew, under extremely high temperatures or when mixed with other pesticides or adjuvants. Cotton usually recovers rapidly.
Staple improves control of hemp sesbania, morningglory, tropical spiderwort, and <i>glyphosate</i> -resistant Palmer amaranth. Staple will provide residual control of pigweeds, prickly sida, smartweed, spurred anoda, and velvetleaf if it contacts the soil and is activated. Will not control ALS + <i>glyphosate</i> resistant Palmer.	<i>glyphosate</i> + <i>pyrithiobac</i> Staple LX, Pyrimax 3.2SL	9 + 2	4 H/ 60 D	see <i>glyphosate</i> + 2-3 fl oz	0.75-1.12 + 0.05-0.07	Roundup Ready Flex, Glytol LibertyLink, or XtendFlex Cultivars See comments for <i>glyphosate</i> and Staple alone. Apply ovetop from cotton cotyledonary stage until 60 days prior to harvest, however, UGA research suggests making directed applications after the 7-leaf stage to reduce injury potential while improving weed control. Some leaf speckling/burn will likely occur. Injury may be enhanced if applied to cotton with dew, under extremely high temperatures or when mixed with other pesticides or adjuvants. Cotton usually recovers rapidly. Do not mix with any Dual/metolachlor products or Warrant. For Palmer amaranth, apply Staple at 2.6-3 oz/A when Palmer is 2" or less; rate can be increased to 3.8 oz/A but injury is a concern. For residual control, a rate of 1.9-2.1 oz/A should perform very well. Make only 1 TIMELY application of Staple and/or Envoke per season.
Metolachlor controls annual grasses, pigweeds, doveweed, Florida pusley, tropical spiderwort and suppresses yellow nutsedge if it contacts the soil and is activated. Several products containing metolachlor (not S-metolachlor) are available and labeled. Metolachlor products are less effective per unit of formulated product than those with S-metolachlor. In general it takes 1.5 pt of a metolachlor product to give the activity one gets from 1 pt of S-metolachlor.	<i>glyphosate</i> + <i>S-metolachlor</i> Dual Magnum 7.62 EC Brawl 7.62 EC	9 + 15	24 H/ 100 D	see <i>glyphosate</i> + 1-1.33 pt 1-1.33 pt	0.75-1.12 + 0.95-1.27	Roundup Ready Flex, Glytol LibertyLink, or XtendFlex Cultivars See comments for <i>glyphosate</i> alone. Dual Magnum can be applied ovetop of cotton until 100 days before harvest and directed until 80 days of harvest; however, UGA research suggests making directed applications after the 7-leaf stage to reduce injury potential and improve weed control. Some leaf speckling/burn will likely occur. Injury may be enhanced if applied to cotton with dew, under extremely high temperatures, or when mixed with other pesticides or adjuvants. Cotton usually recovers rapidly. Do not mix with Staple and do not apply within 5 days of Staple application.
	<i>glyphosate</i> + <i>S-metolachlor</i> Sequence 5.25L		24 H/ 100 D	2.5 pt	0.7 + 0.94	Roundup Ready Flex, Glytol LibertyLink, or XtendFlex Cultivars Label allows application from cotyledon stage cotton to the 10 leaf stage (not to exceed 12" tall). Do not harvest within 100 days of application. See comments above for <i>glyphosate</i> + Dual Magnum.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE OVER-THE-TOP BROADLEAF AND GRASS CONTROL FOR ROUNDUP READY FLEX, GLYTOL LIBERTYLINK, XTENDFLEX COTTON						
Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control. (continued)						
Envoke will improve control of Ipomoea morningglory and nutsedge. It will also provide some residual control of sensitive weeds if it reaches the soil and is activated. Will not control ALS + glyphosate resistant Palmer.	<i>glyphosate</i> + <i>trifloxysulfuron</i> Envoke 75 WDG	9 + 2	24 H/ 60 D	see glyphosate + 0.1 oz	0.75-1.12 + 0.0047	Roundup Ready Flex, GlyTol LibertyLink, XtendFlex Cultivars See comments for glyphosate and Envoke applied alone. Tank mix can be applied from 6 (prefer 7) leaf stage until 60 days of harvest; however, directed application strongly encouraged for improved weed control and much much less injury. Make only 1 TIMELY application of Staple and/or Envoke per season.
Volunteer Roundup Ready corn in Roundup Ready Flex cotton	<i>glyphosate</i> + <i>clethodim</i> Select 2 EC Select Max 0.97EC	9 + 1	24 H/ 60 D	see glyphosate + 4-8 fl oz 6-12 fl oz	0.75-1.12 + 0.06-0.09	Roundup Ready Flex, GlyTol LibertyLink, XtendFlex Cultivars For corn up to 12" tall, apply 4-6 oz of Select or 6 oz of Select Max; for corn up to 24" tall, apply 6-8 oz of Select or 9 oz of Select Max; for corn up to 36" tall, apply 12 oz of Select Max. Add 2.5 lb/A ammonium sulfate or equivalent and make sure glyphosate brand used contains adjuvant. Numerous generic formulations of clethodim are available.
	<i>glyphosate</i> + <i>fluazifop -p-butyl</i> Fusilade DX 2 EC	9 + 1	12 H/ 90 D	see glyphosate + 4-6 fl oz	0.75-1.12 + 0.06-0.09	Roundup Ready Flex, GlyTol LibertyLink, XtendFlex Cultivars See comments for glyphosate alone. Apply Assure at 4 oz to corn up to 12", 5 oz for corn up to 18", and 8 oz to corn up to 30". Add 0.125% nonionic surfactant by volume.
	<i>glyphosate</i> + <i>quizalofop-p-ethyl</i> Assure II 0.88 EC	9 + 1	12 H/ 80 D	see glyphosate + 5-8 fl oz	0.75-1.12 + 0.03-0.05	Roundup Ready Flex, GlyTol LibertyLink, XtendFlex Cultivars See comments for glyphosate alone. Apply Assure at 4 oz to corn up to 12", 5 oz for corn up to 18", and 8 oz to corn up to 30". Add 0.125% nonionic surfactant by volume.
Volunteer Roundup Ready soybean	<i>glyphosate</i> + <i>trifloxysulfuron</i> Envoke 75 WDG	9 + 2	12 H/ 60 D	see glyphosate + 0.1 oz	0.75-1.12 + 0.0047	Roundup Ready Flex, GlyTol LibertyLink, XtendFlex Cultivars See comments above on glyphosate plus Envoke, especially regarding crop injury. Cotton should be 6 (prefer 7) leaves, and soybean should have no more than 4 to 5 trifoliolate leaves. Not adequately effective on soybean with the STS trait. Consider the addition of Cotoran PRE at planting to control soybean. Make only 1 timely Envoke and/or Staple /Pyrimax application per season.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE OVER-THE-TOP GRASS CONTROL FOR ANY COTTON CULTIVAR						
Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control.						
Annual grasses	<i>clethodim</i> Select, others 2 EC Select Max 0.97 EC Tapout 0.97 EC	1	24 H/ 60 D	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.13 0.07-0.12 0.07-0.12	Apply to actively growing grasses not under stress. Mixtures with herbicides other than glyphosate will likely reduce grass control. Do not cultivate within 5 days of application. A 2nd application may be made.
	<i>fluzifop p-butyl</i> Fusilade DX 2 EC	1	12 H/ 90 D	8-12 fl oz	0.125 to 0.188	For Select: Add crop oil concentrate at 1 qt/A . For Select Max: Add nonionic surfactant at 1 qt/100 gal solution, crop oil concentrate at 1 gal/100 gal solution, or methylated seed oil at 1 gal/100 gal solution.
	<i>quizalofop p-ethyl</i> Assure II 0.88 EC	1	12 H/ 80 D	7-8 fl oz	0.05-0.06	For Fusilade: Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt /100 gal solution. For Assure: Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt/100 gal solution.
	<i>sethoxydim</i> Poast 1.53 EC Poast Plus 1 EC	1	12 H/ 40 D	16 fl oz 24 fl oz	0.19	For Poast: Add crop oil concentrate at 1 qt/A. Numerous generic formulations for each active ingredient are available.
Perennial grasses	<i>clethodim</i> Select, others 2 EC Select Max 0.97 EC Tapout 0.97 EC	1	24 H/ 60 D	8-16 fl oz 12-32 fl oz 12-32 fl oz	0.13-0.25 0.09-0.24 0.09-0.24	Apply to actively growing johnsongrass 12-24" tall or to bermudagrass with runners up to 6". A second application at the provided rates may be made to bermudagrass when regrowth is up to 6" or when johnsongrass has regrowth of 6-18". Add adjuvant as provided above in annual grass section. Do not mix with other herbicides. Do not cultivate within 7 days before or after application.
	<i>fluzifop p-butyl</i> Fusilade DX 2 EC	1	12 H/ 90 D	10-12 fl oz	0.156-0.188	Apply when johnsongrass is 8-18" or when bermudagrass runners are 4-8". If needed, make a second application of 8 fl oz/A when johnsongrass regrowth or new plants are 6-12" inches or when bermudagrass stolon (runner) regrowth or new plants are 3-6". Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt/100 gal solution. Do not mix with other herbicides. Do not cultivate within 5 days of application.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE OVER-THE-TOP GRASS CONTROL FOR ANY COTTON CULTIVAR						
Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control. (continued)						
Perennial grasses (continued)	<i>quizalofop p-ethyl</i> Assure II 0.88 EC	1	12 H/ 80 D	10 fl oz	0.07	Apply when johnsongrass is 10-24" or bermudagrass runners are 3-6". A second application for treating regrowth or new plants can be made with 7 fl oz/A when johnsongrass reaches 6-10" or bermudagrass reaches 3-6". Apply with crop oil concentrate (preferred) at 1 gal/100 gal solution or nonionic surfactant at 1 qt/100 gal solution. Do not mix with other herbicides. Do not cultivate within 5 days of application.
	<i>sethoxydim</i> Poast 1.53 EC Poast Plus 1 EC	1	12 H/ 40 D	24 fl oz 36 fl oz	0.28	Apply to johnsongrass up to 25" and before bermudagrass runners exceed 6". If regrowth occurs or new plants emerge, make a second application of 16 fl oz/A of Poast when johnsongrass reaches 6-10" and bermudagrass reaches 3-6". Add 1 qt of crop oil concentrate/A. Do not tank mix with other herbicides. Do not cultivate within 5 days of application.
POSTEMERGENCE DIRECTED – ANY COTTON CULTIVAR						
Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control.						
Effective control of many broadleaf weeds and nutsedge. Grasses should be 1" or less. Residual control of many weeds if activated. Diuron plus MSMA is the best directed option to control emerged glyphosate-resistant Palmer amaranth. Diuron is more effective in controlling emerged pigweed than Cotoran or Valor. Valor provides the most effective residual control of pigweed.	<i>diuron</i> Direx, Diuron, other 4F + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal	7 + 17	12 H/ 1st Bloom	1.6-2.4 pt + 2 pt 2 pt	0.8-1.2 + 1.5-1.65	Apply as directed spray to cotton at least 12" tall. Addition of an adjuvant is strongly encouraged. Label prohibits use on sand or loamy sand soils, or any soils with less than 1% organic matter. Higher rates of diuron provide greater residual weed control but have extended rotational concerns. See rotational restrictions. <u>If soil type allows, use at least 2 pt/A of diuron for control of emerged Palmer amaranth.</u> Label prohibits applying MSMA after 1st bloom. To Improve Emerged Morningglory Control Consider Adding: 1) Envoke at 0.1-0.15 oz/A which poses no additional injury concern with 12" or taller cotton; or 2) Aim or ET at 0.5-1 fl oz/A where cotton should be at least 20" tall having 3" of bark with spray only contacting bark portion of the stem. Aim will also improve spiderwort control. To Improve Spiderwort and Grass Residual Control Consider Adding: 1) Dual Magnum 1 pt/A; or 2) Warrant 2-3 pt/A; or 3) Zidua 0.75 to 1.5 oz/A as long as cotton has at least 7-leaf. Numerous formulations of diuron and MSMA are available.
	<i>diuron + linuron</i> Layby Pro 4F + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal	7 + 7 + 17	24 H/ 1st Bloom	2 pt + 2 pt 2 pt	0.5 + 0.5 + 1.5-1.65	Apply as a directed spray to cotton at least 16" tall. Add crop oil concentrate at 1 gal/100 gal spray mix. Label prohibits use on sand or loamy sand soils, or on any soil with less than 1% organic matter. Label prohibits applying MSMA after first bloom.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE DIRECTED—ANY COTTON CULTIVAR						
Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control. (continued)						
Effective control of many broadleaf weeds and nutsedge; grasses should be 1" or less. Palmer amaranth should be 2" or less. Residual control of many weeds if activated. Diuron is more effective in controlling emerged pigweed than Cotoran or flumioxazin; flumioxazin provides the most effective residual control of Palmer amaranth.	<i>flumioxazin</i> Valor SX, others 51 WDG + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal	14 + 17	12 H/ 1st Bloom	2 oz + 2.67 pt 2.5 pt	0.064 + 2	Apply as a directed spray to cotton at least 18" tall. Direct spray to the lower 2" of the cotton stem and do not contact the green portion of the cotton stem. May apply to 6" cotton under a hood. Add nonionic surfactant at 1 qt/100 gal spray mix. DO NOT use crop oil concentrate, methylated seed oil, organo-silicone adjuvant, or any adjuvant containing any of these. Label prohibits applying MSMA after 1st bloom. IN HOODED APPLICATIONS when no contact of the cotton crop occurs; the addition of Dual type product or Warrant is recommend for managing tropical spiderwort and glyphosate- resistant Palmer amaranth. Outflank, Panther, and Rowel have been tested and perform similarly to Valor. For PPO-resistance management, make only 3 applications of Valor or Reflex (including generics) in 3 years.
Currently, the single best layby mixture for both control of emerged glyphosate-resistant Palmer amaranth and extended residual control.	<i>flumioxazin</i> Valor SX, others 51 WDG + <i>diuron</i> Direx, others 4F + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal	14 + 7 + 17	12 H/ 1st Bloom	1 pt + 2 oz + 2 pt 2 pt	0.03 + 1 + 1.5-1.65	See restrictions for each product applied alone. Cotton should be at least 20" tall. Apply as a directed spray to the lower 2" of the barky portion of the cotton stem. Experiment with this mixture on limited acreage as crop injury is of some concern. Add nonionic surfactant at 1 qt/100 gal spray mix. DO NOT use crop oil concentrate, methylated seed oil, organo-silicone adjuvant, or any adjuvant containing any of these. Label prohibits applying MSMA after 1st bloom.
Effective control of many broadleaf weeds and nutsedge; grasses should be 1" or less and Palmer 2" or less. Will not improve control of emerged weeds but better residual control when compared to flumioxazin alone.	<i>flumioxazin+pyrooxasulfone</i> Fierce 76 WDG + <i>MSMA</i> 6 lb/gal 6.6 lb/gal	14 + 15 + 17	12 H/ 1st Bloom	3 oz + 2.67 pt 2.5 pt	0.063+0.08 + 2	Apply as a directed spray to cotton at least 18" tall. Direct spray to the lower 2" of a barky cotton stem; do not contact the green portion of the cotton stem. May apply to 6" cotton under a hood. Add nonionic surfactant at 1 qt/100 gal spray mix. DO NOT use crop oil concentrate, methylated seed oil, organo-silicone adjuvant, or any adjuvant containing any of these. Label prohibits applying MSMA 1st bloom.
Effective control of many broad-leaf weeds, nutsedge, and small annual grasses. Residual control of many weeds. Much less effective than diuron + MSMA in controlling emerged pigweed and less residual than diuron or Valor.	<i>fluometuron</i> Cotoran 4F + <i>MSMA</i> (several brands) 6 lb/gal 6.6 lb/gal	7 + 17	12 H/ 1st Bloom	2-3.2 pt + 2.67 pt 2.5 pt	1-1.6 + 2	Apply as a directed spray to cotton at least 3" tall; cotton has very good tolerance. Label prohibits applying MSMA after 1st bloom. The addition of a Dual type product or Warrant is recommended for managing tropical spiderwort and Palmer amaranth.

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COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE DIRECTED – ANY COTTON CULTIVAR						
Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control. (continued)						
Effective control of many broad-leaf weeds, nutsedge, and small annual grasses. Limited residual control especially on pigweeds. Much less effective than diuron + MSMA in controlling emerged pigweed and less residual than diuron or Valor.	<i>prometryn</i> Caparol 4F + MSMA (several brands) 6 lb/gal 6.6 lb/gal	5 + 17	12 H/ 1st Bloom	1.3-2.4 pt + 2.67 pt 2.5 pt	0.65-1.2 + 2	Apply as a directed spray. Use 1.3 pt/A Caparol in 8-12" cotton and up to 2.4 pt/A in cotton at least 12". Add nonionic surfactant at 2 qt/100 gal spray solution. Label prohibits applying after 1st bloom. The addition of Envoke, Aim, or ET will improve morningglory control. Envoke at 0.1-0.15 oz/A poses no additional injury concern and the mixture can be applied to 12" or larger cotton. For Aim or ET at 0.5-1 fl oz/A, cotton should be at least 20" tall having 3" of bark with spray not contacting green portion of stem. Aim will also improve spiderwort control. The addition of a Dual type product or Warrant is recommended for managing tropical spiderwort.
Effective control of many broad-leaf weeds, yellow nutsedge and small annual grasses. Excellent residual control of sensitive species.	<i>prometryn</i> + <i>trifloxysulfuron</i> Suprend 80 WDG + MSMA (several brands) 6 lb/gal 6.6 lb/gal	5 + 2 + 17	12 H/ 1st Bloom	1-1.25 lb + 2.67 pt 2.5 pt	0.8-1 + 0.007-0.009 + 2	Apply as directed spray in cotton at least 8" tall. Add nonionic surfactant at 1 qt/100 gal spray mix. See rotation restrictions on label. Label prohibits applying MSMA after first bloom. Do not exceed 0.0188 lb ai/A per year of trifloxysulfuron from the combined use of Envoke and Suprend. Suprend is formulated as 79.3% prometryn plus 0.7% trifloxysulfuron.
POSTEMERGENCE DIRECTED—ROUNDUP READY FLEX, GLYTOL LIBERTY LINK, XTENDFLEX CULTIVARS ONLY						
Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control.						
Controls most annual weeds; exceptions include glyphosate-resistant Palmer amaranth, dayflower, doveweed, Florida pusley, tropical spiderwort, and hemp sesbania. Timely application is critical for controlling morningglory and purslane.	<i>glyphosate</i> 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 6S (5 lb ae)	9	4 H/ 7 D	32-48 fl oz 24-36 fl oz 23-34 fl oz 22-32 fl oz 19-29 fl oz	0.75-1.12	Roundup Ready Flex, GlyTol LibertyLink, and XtendFlex Cultivars Glyphosate should never be applied alone but label allows directed application up to 7 days prior to harvest. Improved weed coverage with a directed application generally occurs after 7-leaf cotton. A glyphosate-based program should include: 1) no weeds emerged at planting; 2) two residual herbicides at planting; and 3) residual herbicides with Roundup POST and a conventional directed layby. Obtain programs from the local Extension office or at gaweed.com.
Mixture improves morningglory and glyphosate-resistant Palmer amaranth control and provides residual control of small-seeded broadleaf weeds, such as pigweed. The tank mix may give less grass control than glyphosate alone. Residual Palmer control by diuron alone will last 7-10 days in most conditions.	<i>glyphosate</i> + <i>diuron</i> Direx, Diuron 4F	9 + 14	12 H/ 7 D	see glyphosate + 1-1.5 pt	0.75-1.12 (lb ae) + 0.5-0.75	Roundup Ready Flex, GlyTol LibertyLink, and XtendFlex Cultivars Use 1 pt/A of diuron on cotton 8-12" and up to 1.5 pt/A of diuron on cotton greater than 12". To Improve spiderwort, pigweed, and grass residual control consider adding: 1) Dual Magnum 1 pt/A; 2) Warrant 2-3 pt/A; 3) Zidua 0.75-1.5 oz/A as long as cotton has at least 7-leaf; or 4) Outlook 12-16 oz/A. To Improve Morningglory Control Consider Adding: 1) Envoke 0.1-0.15 oz/A, no additional restrictions; 2) Valor 1-1.5 oz/A, cotton should be at least 18" tall with spray contacting only bottom 2" of barky stem; or 3) Aim or ET 0.5-1 oz/A, cotton should be at least 20" with spray contacting bottom 2" of barky stem only.

¹Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE DIRECTED - ROUNDUP READY FLEX, GLYTOL LIBERTY LINK, XTENDFLEX CULTIVARS ONLY						
Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control. (continued)						
Mixture improves morningglory and tropical spiderwort control and provides residual control of broadleaf weeds including pigweeds, purslane, and Florida pusley. Often poor control of glyphosate-resistant Palmer amaranth over 1".	<i>glyphosate</i> + <i>flumioxazin</i> Valor SX 51WDG	9 + 14	12 H/ 60 D	see glyphosate + 1-2 oz	0.75-1.12 (lb ae) + 0.031-0.063	Roundup Ready Flex, GlyTol LibertyLink, and XtendFlex Cultivars Cotton should be at least 18". Direct spray to the lower 2" of barky cotton stem. Do not allow spray to contact green portion of stem. <i>The addition of diuron will improve control of emerged pigweed.</i> Add nonionic surfactant at 1 qt/100 gal spray mix but only if glyphosate brand requires adjuvant. DO NOT use crop oil concentrate, methylated seed oil, organo-silicone adjuvants, or any adjuvant product containing these. Outflank, Panther, and Rowel have been tested and perform similarly to Valor. For PPO-resistance management, make only 3 applications of Valor or Reflex (including generics) on a field in 3 years.
Provides similar postemergence control as glyphosate + Valor but provides greater residual control for many weeds including spiderwort and Palmer amaranth.	<i>glyphosate</i> + <i>flumioxazin + pyroxasulfone</i> Fierce 76 WDG	9 + 14 + 15	12 H/ 60 D	see glyphosate + 3 oz/A	0.75-1.12 (lb ae) + 0.063-0.08	Apply as a directed spray to cotton at least 18" tall. Direct spray to the lower 2" of a barky cotton stem; do not contact the green portion of the cotton stem. May apply to 6" cotton under a hood. Add nonionic surfactant according to the Fierce label. DO NOT use crop oil concentrate, methylated seed oil, organosilicone adjuvant, or any adjuvant containing any of these.
Mixture improves morningglory control and provides residual control of sensitive species. The tank mix may give less grass control than glyphosate alone.	<i>glyphosate</i> + <i>prometryn</i> Caparol 4F	9 + 5	12 H/ --	see glyphosate + 1-2 pt	0.75-1.12 (lb ae) + 0.5-1	Roundup Ready Flex, GlyTol LibertyLink, and XtendFlex Cultivars Cotton should be at least 8" for Caparol rate between 1-1.3 pt and at least 12" for Caparol rate above 1.3 pt. Add surfactant but only if glyphosate brand requires it. <i>To Improve Spiderwort, Pigweed, and Grass Residual Control Consider Adding:</i> 1) Dual Magnum 1 pt/A; 2) Warrant 2-3 pt/A; 3) Zidua 0.75-1.5 oz/A as long as cotton has at least 7-leaf; or 4) Outlook 12-16 oz/A. <i>To Improve Morningglory Control Consider Adding:</i> 1) Envoke 0.1-0.15 oz/A, no additional restrictions; 2) Valor 1-1.5 oz/A, cotton should be at least 18" tall with spray contacting only bottom 2" of barky stem; or 3) Aim or ET 0.5-1 oz/A, cotton should be at least 20" with spray contacting bottom 2" of barky stem only. Occasionally, directed applications to succulent cotton stems cause chlorosis throughout the plant.

¹Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE DIRECTED - ROUNDUP READY FLEX, GLYTOL LIBERTY LINK, XTENDFLEX CULTIVARS ONLY (continued)						
Application of postemergence herbicide treatments to moisture stressed weeds usually results in poor control.						
Mixing Envoke with glyphosate improves <i>Ipomoea</i> morningglory and nutsedge control and provides some residual control of sensitive species.	<i>glyphosate</i> + <i>trifloxysulfuron</i> Envoke 75 WDG	9 + 2	12 H/ 60 D	see glyphosate + 0.1-0.2 oz	0.75-1.12 (lb ae) + 0.005-0.009	Roundup Ready Flex, GlyTol LibertyLink, and XtendFlex Cultivars Direct to cotton from 6" tall through layby; minimize contact on small cotton. Add nonionic surfactant according to Envoke label. Excellent tolerance when directed. The addition of diuron would greatly improve control of emerged Palmer amaranth. Make no more than 1 application of Envoke or Staple per season.
Mixing Suprend with glyphosate improves control of morningglory, pigweeds, and nutsedge. Also provides residual weed control of sensitive species.	<i>glyphosate</i> + <i>prometryn</i> + <i>trifloxysulfuron</i> Suprend 80 WDG	9 + 5 + 2	24 H/ 60 D	see glyphosate + 1-1.25 lb	0.75-1.12 (lb ae) + 0.8-1 + 0.007-0.0088	Direct to cotton at least 8" tall. Add surfactant according to label of glyphosate brand used. See precautions and rotational restrictions on Suprend label.
POSTEMERGENCE-HOODED SPRAYER						
Glyphosate as a hooded application is especially effective for prostrate, running species such as citron, burgherkin, and annual grasses. SUGGEST NOT USING LIQUID NITROGEN AS ENTIRE CARRIER.	<i>glyphosate</i> 4S (3 lb ae) 5.4S (4 lb ae) 5S (4.17 lb ae) 5.5S (4.5 lb ae) 6S (5 lb ae)	9	4 H/ 7 D	32-48 fl oz 24-36 fl oz 23-34 fl oz 22-32 fl oz 19-29 fl oz	0.75-1.12 (lb ae)	In varieties not resistant to glyphosate, hoods should be kept as close to the ground as possible preventing spray from contacting stems or foliage. Apply in 5-10 GPA at a maximum of 25 PSI. Do not exceed 5 MPH. Suggest that cotton be at least 8" tall. Other herbicides such as Aim, Caparol, diuron, ET, or Valor may be mixed with certain glyphosate formulations to improve burndown in larger cotton. Caparol, Valor or diuron will also offer residual weed control for several troublesome weeds. Grass control may be reduced with tank mixes of glyphosate plus Caparol or diuron. A glyphosate-based program should include: 1) no weeds emerged at planting; 2) two residual herbicides at planting; 3) residual herbicides with Roundup POST and a conventional directed layby. Obtain programs from the local Extension office or at gaweed.com.
Annual grass and broadleaf weeds; suppression of nutsedge. <i>Mixtures with diuron would be the most effective option to control emerged pigweed in row middles.</i>	<i>paraquat</i> Gramoxone 2S	22	24 H/ 3 D	19-38 fl oz	0.3-0.6	DO NOT CONTACT COTTON STEMS OR FOLIAGE. Apply in a minimum of 10 GPA at a maximum of 25 PSI. Do not exceed 5 MPH. Hoods should be kept on the ground. Cotton should be at least 8". Add nonionic surfactant at 2 pt/100 gal of spray mix or crop oil concentrate at 1 gal/100 gal spray mix. Caparol, Cotoran, or diuron (Direx, diuron) may be mixed with paraquat. Mixtures are usually more effective. <i>If paraquat contacts the cotton stem severe damage is to be expected!</i>

¹Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
POSTEMERGENCE-HOODED SPRAYER (continued)						
Timing for pigweed and grasses are critical. Control of pusley, spiderwort, and goosegrass is not consistent. Generally, treat broadleaf weeds prior to 3" and grasses prior to 2". Excellent control of morning-glory including moonflower morningglory. Make no more than 2 applications of Liberty per year.	<i>glufosinate-ammonium</i> Liberty 280 SL, others 2.34 L	10	12 H/ 70 D	29 fl oz	0.53	On non-glufosinate tolerant cotton, keep hoods close to ground to avoid contact with cotton stem. Suggest cotton be at least 8". The addition of diuron or other residual herbicide strongly encouraged. Adjuvant not needed. To maximize control: >15 GPA water volume, medium spray droplet, warm temperatures, high humidity, bright sunlight, good soil moisture, and do not spray within 1.5 hours of sunrise or 1 hour of sunset. Palmer amaranth should be less than 3 inches when treated with glufosinate at this rate; diuron + MSMA is more effective. Cheetah, Interline, and Kong Glufosinate 280 are formulations of glufosinate also labeled for this use.
HARVEST AID						
Mature morningglory	<i>carfentrazone-ethyl</i> Aim 2 EC	14	12 H/ 7 D	up-1.5 fl oz	up-0.024	Apply as a harvest aid when 60-70% of the cotton bolls are open AND when the morningglory are mature (seedpods are visible). May be an additive with other defoliant – see label. See label for addition of adjuvant. See cotton defoliation section for potential negative influence on defoliation activity.
	<i>pyraflufen ethyl</i> ET 0.208 EC	14	12 H/ 7 D	up-2.75 oz	up-0.0044	Apply as a harvest aid when 60-70% of the cotton bolls are open AND when the morningglory are mature (seedpods are visible). May be an additive with other defoliant – see label. See label for addition of adjuvant. See cotton defoliation section for potential negative influence on defoliation activity.

¹Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

COTTON WEED CONTROL

WEED	HERBICIDE	MOA	REI/PHI (Hours or Days)	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE (AI or AE)	
HARVEST AID (continued)						
Desiccation of most weeds. Regrowth of many weeds occurs soon after application.	<i>paraquat</i> Gramoxone Inteon 2S	22	24 H/ 3 D	16-32 fl oz	0.25-0.5	Defoliate cotton as normal. After at least 75% of bolls are open, the remainder of bolls expected to harvest are mature, and most of the cotton leaves have dropped, apply paraquat in a minimum of 20 GPA. Add nonionic surfactant at 1 pt/100 gal spray mix. Wait 3-5 days and pick the cotton as soon as possible. Expect additional trash. An additional option is to add 2-6 oz of Gramoxone Inteon with standard defoliation mixtures. Be aware of potential pine tree injury with drift. Generic brands of paraquat containing 3 lb ai/gal may be labeled. These products would be applied at 11-21 fl oz for 0.25-0.5 lb ae, respectively. See cotton defoliation section.
Annual grasses and broadleaf weeds	<i>glyphosate</i> 4 SL (3 lb ae) 5.4 SL (4 lb ae) 5 SL (4.17 lb ae) 5.5 SL (4.5 lb ae) 6 SL (5 lb ae)	9	4 H/ 7 D	32-64 fl oz 24-48 fl oz 23-46 fl oz 22-44 fl oz 19-38 fl oz	0.75-1.5 (lb ae)	Apply after at least 60% of bolls are open in non-Roundup Ready cotton. May be tank mixed with defoliant. See label and defoliant section. Include nonionic surfactant according to the label of glyphosate brand used. May apply in Roundup Ready Flex cotton until 7 days before harvest. See cotton defoliation section.

¹Mode of Action (MOA) code can be used to delay weed resistance by increasing herbicide diversity in a management program.

WEED RESPONSE TO BURNDOWN HERBICIDES USED IN COTTON

A. Stanley Culpepper, Extension Agronomist-Weed Science

WEED SPECIES	BURNDOWN TREATMENT ¹									
	2,4-D ³	glyphosate	glyphosate ² + 2,4-D ³	glyphosate ² + dicamba ⁴	glyphosate ² + Aim or ET	glyphosate ² + Direx ⁷	glyphosate ² + Harmony Extra ⁵	glyphosate ² + Valor SX ⁶	paraquat	paraquat + Direx ⁷
GRASSES / SEDGES										
annual bluegrass	N	E	E	E	E	E	E	E	G-E	E
bermudagrass	N	F	F	F	F	F	F	F	P	P
crabgrass	N	E	G-E	E	E	G	E	E	F-G	G
goosegrass	N	E	G-E	E	E	G	E	E	F-G	G
Italian ryegrass	N	G	G	G	G	F	G	G	F	F-G
johnsongrass	N	G-E	G	G	G-E	F-G	G-E	G-E	P	P
little barley	N	E	E	E	E	E	E	E	G	G-E
sandbur	N	E	G-E	G-E	E	G	E	E	G	G
Texas panicum	N	E	G-E	E	E	G	E	E	G	G-E
volunteer corn (not RR vol.corn)	N	E	E	E	E	E	E	E	F	F-G
purple nutsedge	N	F-G	F-G	F-G	F-G	F-G	F-G	G	P-F	F
yellow nutsedge	N	P-F	P-F	P-F	P-F	F	P-F	F	P-F	F
BROADLEAVES										
bristly starbur	G	E	E	E	E	E	E	E	E	E
buttercup	G	E	E	E	E	E	E	E	E	E
Carolina geranium	F	P-F	F-G	G	F-G	G	G-E	G	G-E	E
chickweed	P	E	E	E	E	E	E	E	E	E
citronmelon	F	G-E	E	E	E	G-E	G-E	E	F	G
cocklebur	E	E	E	E	E	E	E	E	G-E	E
coffee senna	G	E	E	E	E	E	E	E	F	G
corn spurry	P-F	G-E	G-E		G-E	G-E		E	F-G	G-E
cowpea	G	E			E	E		E	E	E
cudweed	P	E	E	E	E	E	E	E	F-G	G
curly dock	P-F	F	F-G	G-E	F	P-F	E	F	N-P	P
cutleaf primrose	E	P-F	E	G	F	F-G	F	F-G	F ⁸	G-E ⁸
eclipta	P	G-E			G-E	G-E		G-E	F	F
Florida beggarweed	P-F	E	E	E	E	E	E	E	E	E
Florida pusley	F	F	G	G	G	F-G	F	F-G	F	F-G
field pansy	P-F	F	F-G	F-G			F	G	G	G-E
hemp sesbania	G-E	P-F	E		G-E	F-G			F	F-G
henbit	P	F	F-G	G	F-G	G	E	G-E	G ⁸	E ⁸

WEED RESPONSE TO BURNDOWN HERBICIDES USED IN COTTON (continued)

WEED SPECIES	BURNDOWN TREATMENT ¹									
	2,4-D ³	glyphosate	glyphosate ² + 2,4-D ³	glyphosate ² + dicamba ⁴	glyphosate ² + Aim or ET	glyphosate ² + Direx ⁷	glyphosate ² + Harmony Extra ⁵	glyphosate ² + Valor SX ⁶	paraquat	paraquat + Direx ⁷
BROADLEAVES (continued)										
horsenettle	F	F	F-G		P-F	F	F		P-F	F
horseweed	G-E ⁹	G-E ¹⁰	E ¹⁰	E ¹⁰	G-E ¹⁰	G-E ¹⁰	G-E ¹⁰	G-E ¹⁰	P-F	F-G
lambsquarters	E	F-G	E	E	G-E	G-E			F-G	G
morningglory, <i>Ipomoea</i>	G-E	F	E	E	E	G	F	E	F-G	G-E
morningglory, smallflower	F-G	G	E	E	G-E	G-E	G	E	P	F-G
Palmer amaranth	F ⁹	E	E	E	E	E	E	E	F-G	G-E
Palmer amaranth (glyphosate-resistant)	F ⁹	N	F ⁹	F	P-F	G	P	P-F	F-G	G-E
Pennsylvania smartweed	F	G	G	E	G-E	G	E		P-F	F-G
prickly sida	F-G	F-G	G	E	F-G	F-G	F-G		P-F	F-G
purslane	G-E	F	G-E	E	F-G	G	F	G	G	G-E
ragweed	E	G	E	E	G-E	G			G	G
redweed	F	G		G-E	G-E	G			F	G
shepherdspurse	G	G		G	G				G	G
sicklepod	F-G	G-E	E	E	G-E	E	G-E	E	E	E
speedwell	P-F	E	E	E	E	E	E	E	G	E
spurred anoda	F-G	G			G	G			F-G	F-G
swinecress	F	F-G	G	F-G	F-G	G	G-E	F-G	P-F	F-G
tropic croton	F	G-E	G-E	G-E	G-E	G-E		E	F	F-G
tropical spiderwort	G-E	P	G-E	P-F	Aim = G-E ET = P-F	F	P	G	G	G-E
velvetleaf	F-G	G			G-E	G			P	P

Key:

E = 90% or better control
 G = 80%-90% control
 F = 60%-80% control
 P = 30%-60% control
 N = < 30% control.

Note: Ratings based upon average to good soil and weather conditions for herbicide performance and upon proper application rate, technique, and timing.

¹Application rates per acre: Clarity (dicamba): 0.5 pt; 2,4-D: 1 pt; Aim: 1 oz; ET: 1-2 oz; diuron: 0.5-1.0 lb ai; glyphosate acid: 0.75-1.12 lb ae; paraquat: 0.75-1.0 lb ai; Harmony Extra TotalSol: 0.75 oz; Valor: 2 oz.

²Mixing herbicides with glyphosate occasionally reduces grass control (including covercrops). This is more likely with large weeds in dry conditions.

³Labels for 2,4-D are ambiguous concerning the waiting period between application and planting, see label of specific brand used.

⁴Following application of dicamba and a minimum of 1" of rainfall, a minimum 21-day waiting period before planting is required.

⁵Harmony Extra should be applied at least 14 days prior to planting.

⁶See plant-back restrictions noted in the previous section or on the label for Valor.

⁷See previous cotton section on state label for reduced plant back interval for Direx.

⁸This level of control requires plants to be in full bloom with seed forming when treated.

⁹This level of control requires 1.5-2 pt of 2,4-D (4 lb ai product).

¹⁰Glyphosate will not control glyphosate-resistant horseweed, see previous section on controlling this weed.

¹¹Small grain must have visible seedheads for this level of control.

WEED RESPONSE TO BURNDOWN HERBICIDES USED IN COTTON

(continued)

WEED SPECIES	BURNDOWN TREATMENT ¹									
	2,4-D ³	glyphosate	glyphosate ² + 2,4-D ³	glyphosate ² + dicamba ⁴	glyphosate ² + Aim or ET	glyphosate ² + Direx ⁷	glyphosate ² + Harmony Extra ⁵	glyphosate ² + Valor SX ⁶	paraquat	paraquat + Direx ⁷
BROADLEAVES (continued)										
vines (maypop, trumpet creeper)	F	P-F			P-F	F			P	P
Virginia pepperweed	G-E	G	E	G-E	G	G	G	G-E	G	G
volunteer peanuts	P	P-F	P-F	F-G	F-G	F-G	F	F-G	P	P-F
wild lettuce	G	G-E	G-E	G-E	G-E	G-E	G-E	E	P	F
wild poinsettia	F-G	G			G-E	G-E			G-E	G-E
wild radish	G-E	F-G	E	G-E	G	G	E	G	F-G	G-E
COVER CROPS										
clover	F	F	F-G	F-G	F	F-G			F-G	G-E
lupine	G	G	G		G	G			F-G	F-G
small grains	N	E	E	E	E	F-G	E	E	G ¹¹	G-E ¹¹
vetch	E	F	E	E	F	F-G	G	F-G	P-F ⁸	F-G ⁸

Key:
 E = 90% or better control
 G = 80%-90% control
 F = 60%-80% control
 P = 30%-60% control
 N = < 30% control.
Note: Ratings based upon average to good soil and weather conditions for herbicide performance and upon proper application rate, technique, and timing.

¹Application rates per acre: Clarity (dicamba): 0.5 pt; 2,4-D: 1 pt; Aim: 1 oz; ET: 1-2 oz; diuron: 0.5-1.0 lb ai; glyphosate acid: 0.75-1.12 lb ae; paraquat: 0.75-1.0 lb ai; Harmony Extra TotalSol: 0.75 oz; Valor: 2 oz.
²Mixing herbicides with glyphosate occasionally reduces grass control (including covercrops). This is more likely with large weeds in dry conditions.
³Labels for 2,4-D are ambiguous concerning the waiting period between application and planting, see label of specific brand used.
⁴Following application of dicamba and a minimum of 1" of rainfall, a minimum 21-day waiting period before planting is required.
⁵Harmony Extra should be applied at least 14 days prior to planting.
⁶See plant-back restrictions noted in the previous section or on the label for Valor.
⁷See previous cotton section on state label for reduced plant back interval for Direx.
⁸This level of control requires plants to be in full bloom with seed forming when treated.
⁹This level of control requires 1.5-2 pt of 2,4-D (4 lb ai product).
¹⁰Glyphosate will not control glyphosate-resistant horseweed, see previous section on controlling this weed.
¹¹Small grain must have visible seedheads for this level of control.

WEED RESPONSE TO HERBICIDES USED IN COTTON

A. Stanley Culpepper, Extension Agronomist-Weed Science

WEED SPECIES	PREPLANT INCORPORATED	PREEMERGENCE						
	Prowl Treflan others	Prowl ¹ , others	Command	Cotoran	Direx, others	Reflex, Dawn	Staple, Pyrimax	Warrant
PERENNIALS								
bermudagrass	N	N	P-F	N	N	N	N	N
johnsongrass (rhizome)	P	P	N	N	N		N	P
yellow nutsedge	N	N	N	N	N	G-E	F	P
purple nutsedge	N	N	N	N	N	P-F	F	P
ANNUAL GRASSES								
broadleaf signalgrass	G	F	E	P	P	F-G	P	G
crabgrass	E	G	E	F-G	F-G	F-G	P	E
crowfootgrass	E	G	G	F-G	F-G			E
fall panicum	G	F-G	G-E	F	P		P-F	G
foxtails	E	G	E	F-G			P	E
goosegrass	E	G	E	F	F		P-F	E
johnsongrass (seedling)	E	G	G	P	P		F-G	F
sandbur	E	G	F-G	G	G			F-G
Texas panicum	G	F	F	P	P	F	N	P-F
ANNUAL BROADLEAVES								
bristly starbur	N	N	P	G-E	F-G	G-E	F-G	P
burgherkin	N	N	P	F-G	F		F-G	P
citronmelon	N	N	P	F-G	F		F-G	P
cocklebur	N	N	F	F-G	F	G	N-P	P
coffee senna	N	N	P	F-G	F	N	G	P
cowpea	N	N	N-P	P	P		F-G	P
crotalaria	N	N		G	G			P
eclipta	P	P		G		G-E		
Florida beggarweed	P	P	F-G	G-E	G	P	G	P

Key:

E = 90% or better control
 G = 80%-90% control
 F = 60%-80% control
 P = 30%-60% control
 N = < 30% control

Note: Ratings based upon average to good soil and weather conditions for herbicide performance and upon proper application rate, technique, and timing.

¹Assumes irrigation or rainfall occurs within 48 hrs.

²Fair on pitted morningglory.

³Staple does not control tall morningglory or ALS-resistant Palmer amaranth.

WEED RESPONSE TO HERBICIDES USED IN COTTON

(continued)

WEED SPECIES	PREPLANT INCORPORATED	PREEMERGENCE						
	Prowl Treflan others	Prowl ¹ , others	Command	Cotoran	Direx, others	Reflex, Dawn	Staple, Pyrimax	Warrant
ANNUAL BROADLEAVES (continued)								
Florida pusley	E	F-G	F-G	P-F	P	F	G	
hemp sesbania	N	F	P	P	P	P	P	
jimsonweed	N	N	G	G	G		F-G	
lambsquarters	G-E	G	G	G-E	G-E	E	G	F
morningglories <i>Ipomoea</i> smallflower	P P	P P	P-F ² P	G G-E	F G	P-F G-E	F ³ E	P P
Palmer amaranth	F-G	P-F	N-P	F	G	E	G-E ³	G
pigweeds: redroot or smooth	G-E	F-G	P	G-E	G-E	E	E	G-E
prickly sida	N	N	E	G	F		G	F
purslane	E	G	G-E	E	E	G	G	G
ragweed	N	N	G	E	G	G	N-P	P
redweed	N	N	G-E	E	G-E		G-E	
smartweed: ladysthumb Pennsylvania	N N	N N	N E	G G	G G		G G	
sicklepod	N	N	P	G	F	P	P-F	P
spurge	N	N	N	P-F	F		G	P-F
tropic croton	N	N	E	F-G	F-G	F-G	F-G	P
tropical spiderwort	N	N	F	F	P-F	N	P	E
volunteer peanuts	N	N	N	P-F	P	P	P	N
wild poinsettia	N	N	F	N	N	G-E	G	P

Key:
 E = 90% or better control
 G = 80%-90% control
 F = 60%-80% control
 P = 30%-60% control
 N = < 30% control

Note: Ratings based upon average to good soil and weather conditions for herbicide performance and upon proper application rate, technique, and timing.

¹Assumes irrigation or rainfall occurs within 48 hrs.

²Fair on pitted morningglory.

³Staple does not control tall morningglory or ALS-resistant Palmer amaranth.

WEED RESPONSE TO HERBICIDES USED IN COTTON
(continued)

WEED SPECIES	Residual Control by POST Applied Herbicides (Assuming soil contact and activation)			
	Dual Magnum	Staple	Envoke	Warrant
PERENNIALS				
bermudagrass	N	N	N	N
johnsongrass (rhizome)	P	N	N	P
yellow nutsedge	F	P-F		P
purple nutsedge	P	F		P
ANNUAL GRASSES				
broadleaf signalgrass	G	P	P	G
crabgrass	E	P	P	E
crowfootgrass	E		P	E
fall panicum	G	P-F	P	G
foxtails	E	P	P	E
goosegrass	E	P-F	P	E
johnsongrass (seedling)	F	F	P	F
sandbur	F-G		P	F-G
Texas panicum	P-F	N	P	P-F
ANNUAL BROADLEAVES				
bristly starbur	P	G	G-E	P
burgherkin	P	F-G		P
citronmelon	P	F-G		P
cocklebur	P	N-P		P
coffee senna	P	G		P
cowpea	P	F-G		P
crotalaria	P			P
eclipta	P-F			
Florida beggarweed	P-F	G	F-G	P-F
Florida pusley	G	F	P-F	G
hemp sesbania	P	P		P
jimsonweed		F-G		
lambquarters	F	G		F
morningglorie <i>Ipomoea</i> smallflower	P P	F ³ E		P P
Palmer amaranth	G	G-E ³	P-F	G
pigweeds: redroot or smooth	G-E	G-E	F	G-E

WEED SPECIES	Residual Control by POST Applied Herbicides (Assuming soil contact and activation)			
	Dual Magnum	Staple	Envoke	Warrant
ANNUAL BROADLEAVES				
prickly sida	F	G		F
purslane	G	G		G
ragweed	P	N-P		P
redweed		G-E		
smartweed: ladythumb Pennsylvania		G G		
sicklepod	P	P	P-F	P
spurge	P-F	G		P-F
tropic croton	P	F		P
tropical spiderwort	E	P		E
volunteer peanuts	N	P	P	N
wild poinsettia	P	G		P

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¹Assumes irrigation or rainfall occurs within 48 hrs.
²Fair on pitted morningglory.
³Staple does not control tall morningglory or ALS-resistant Palmer amaranth.

WEED RESPONSE TO HERBICIDES USED IN COTTON
(continued)

WEED SPECIES	POST OVER-THE-TOP					
	Assure, others	Fusilade, others	Poast	Select/Select Max, others	MSMA	Cotoran
PERENNIALS						
bermudagrass	G	G	F	G	N	N
johnsongrass (rhizome)	E	G-E	G	G-E	P	N
purple nutsedge	N	N	N	N	N-P	N
yellow nutsedge	N	N	N	N	P	N
ANNUAL GRASSES						
broadleaf signalgrass	G	G-E	E	E	P	P
crabgrass	G	G	G-E	G-E	P	P-F
crowfootgrass	G	F	F-G	G	P	P-F
fall panicum	G-E	G-E	E	E	P	P-F
foxtails	E	E	E	E		
goosegrass	G	G	G-E	G-E	P	P-F
johnsongrass (seedling)	E	G-E	G-E	E	P	P
sandbur		G	G	G	P	P
Texas panicum	G	G	E	E	N-P	N
ANNUAL BROADLEAVES						
bristly starbur	N	F-G	N	N	P	G
burgherkin	N	N	N	N	P-F	F-G
citronmelon	N	N	N	N	P-F	G
cocklebur	N	N	N	N	E	F-G
coffee senna	N	N	N	N	P-F	F-G
cowpea	N	N	N	N	F	F-G
crotalaria	N	N	N	N	F	G
eclipta	N	N	N	N		
Florida beggarweed	N	N	N	N	E	G
Florida pusley	N	N	N	N	N-P	P-F
hemp sesbania	N	N	N	N		
jimsonweed	N	N	N	N	P	G

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WEED RESPONSE TO HERBICIDES USED IN COTTON
(continued)

WEED SPECIES	POST OVER-THE-TOP					
	Assure, others	Fusilade, others	Poast	Select/Select Max, others	MSMA	Cotoran
ANNUAL BROADLEAVES (continued)						
lambsquarters	N	N	N	N	P	G
morningglories	N	N	N	N	P-F	G
Palmer amaranth	N	N	N	N	P	P-F
pigweeds: smooth and redroot	N	N	N	N	P	F
prickly sida	N	N	N	N	P	F-G
purslane	N	N	N	N	P-F	F-G
ragweed	N	N	N	N	P-F	G
redweed	N	N	N	N	N	F-G
sicklepod	N	N	N	N	P-F	F-G
smartweed: ladythumb	N	N	N	N	N-P	F-G
Pennsylvania	N	N	N	N	N-P	F-G
spider flower	N	N	N	N		F
spurge	N	N	N	N	N	P-F
tropic croton	N	N	N	N	F	F-G
tropical spiderwort	N	N	N	N	P	P
volunteer peanuts	N	N	N	N	P	F
wild poinsettia	N	N	N	N	P	F

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WEED RESPONSE TO HERBICIDES USED IN COTTON

(continued)

WEED SPECIES	POST OVER-THE-TOP						
	Staple, Pyrimax	Envoke	Envoke + Staple	glyphosate ²	glyphosate ² + Staple, Pyrimax	glyphosate ² + Envoke	Liberty ³ , others
PERENNIALS							
bermudagrass	N	N	N	F	F	F	N
johnsongrass (rhizome)	N-P	P	N-P	G-E	G-E	G-E	F ⁴
purple nutsedge	P-F	F-G	F-G	F-G	F-G	G	P
yellow nutsedge	P-F	G	G	F	F-G	G-E	P
ANNUAL GRASSES							
broadleaf signalgrass	N	N	N	E	E	E	G
crabgrass	N	P	P	E	E	E	G
crowfootgrass	N	N	N	E	E	E	G
fall panicum	N	N-P	P	E	E	E	G
foxtails	N-P	N-P	N-P	E	E	E	G
goosegrass	N-P	N-P	N-P	E	E	E	P
johnsongrass (seedling)	P	P	P-F	E	E	E	G
sandbur	P			E	E	E	G
Texas panicum	N	N-P	P	E	E	E	G
ANNUAL BROADLEAVES							
bristly starbur	G	G-E	G-E	E	E	E	G
burgherkin	G			G-E	G-E	G-E	
citronmelon	G-E	G-E	G-E	G-E	E	E	G
cocklebur	G	G-E	E	E	E	E	E
coffee senna	G			E	E	E	G
cowpea	G	G	G-E	E	E	E	G
crotalaria				G	G	G	
eclipta	G	P-F		E	E	E	G
Florida beggarweed	G	G-E	G-E	E	E	E	G
Florida pusley	N-P	P	P	P-G	P-G	P-G	F
hemp sesbania	G-E			P-F	G-E		

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¹Staple does not control tall morningglory.

²Glyphosate should be applied only to glyphosate-resistant cultivars. All formulations of glyphosate are not labeled for this use.

³Glufosinate (Liberty, others) should be applied only to tolerant cotton.

⁴Good johnsongrass control can be obtained with two applications of Liberty.

WEED RESPONSE TO HERBICIDES USED IN COTTON

(continued)

WEED SPECIES	POST OVER-THE-TOP						
	Staple, Pyrimax	Envoke	Envoke + Staple	glyphosate ²	glyphosate ² + Staple, Pyrimax	glyphosate ² + Envoke	Liberty ³ , others
ANNUAL BROADLEAVES (continued)							
jimsonweed	E	N		E	E	E	E
lambsquarters	N	G		G	G	E	E
<i>Ipomoea</i> morningglories	G ¹	G	G-E	F-G	G-E	E	E
Smallflower morningglory	E	N	E	G	E	G	E
Palmer amaranth	F	P-F	F	E	E	E	F-G
Palmer amaranth (glyphosate-resistant)	F	P-F	F	N	F	P-F	F-G
Palmer amaranth (glyphosate-and ALS resistant)	N	N	N	N	N	N	F-G
pigweed: smooth and redroot	G	F-G	G	E	E	E	G
prickly sida	F	N	F	F-G	G	G	F
purslane	F			F-G	G	G	F
ragweed, common	P	G		E	E	E	E
redweed	G			E	E		
sicklepod	P-F	E	E	E	E	E	E
smartweed: ladythumb Pennsylvania	G G	G G		G G	E E	E E	E G
spider flower							
spurge	F-G			G	G	G	F-G
tropic croton	P	P-F	P-F	E	E	E	G
tropical spiderwort	F	P-F	F	P-G	G	P-G	P-F
volunteer peanuts	P	P-F		F-G	F-G	F-G	G-E
wild poinsettia	F	G		G-E	G-E	E	P-F

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⁴Good johnsongrass control can be obtained with two applications of Liberty.

WEED RESPONSE TO HERBICIDES USED IN COTTON

(continued)

WEED SPECIES	POSTEMERGENCE-DIRECTED							
	MSMA	Cotoran + MSMA	Caparol + MSMA	Direx, others + MSMA	Direx + Linex + MSMA	Cobra + MSMA	Valor, others + MSMA	Suprend + MSMA
PERENNIALS								
bermudagrass	N	N	N	N	N	N	N	N
johnsongrass (rhizome)	P	P	P	P	P	P	P	P
purple nutsedge	F	F	F	F	F	F	F-G	E
yellow nutsedge	F-G	F-G	F-G	G	G	F-G	G	E
ANNUAL GRASSES								
broadleaf signalgrass	F	F	F-G	G	G	P-F	F	F-G
crabgrass	F	F	F-G	G	G	P-F	F	F-G
crowfootgrass	F	F	F-G	F-G	F-G	P-F	F	F-G
fall panicum	F	F	F-G	F-G	F-G	P-F	F	F-G
foxtails	F	F	F-G	F-G	F-G	P-F	F	F-G
goosegrass	F	F	F-G	F-G	F-G	P-F	F	F-G
johnsongrass (seedling)	F	F	F-G	F-G	F-G	P-F	F	F-G
sandbur	F	F	F-G	F-G	F-G	P-F	F	F-G
Texas panicum	P	P	F	F	F	P	P-F	F
ANNUAL BROADLEAVES								
bristly starbur	P-F	G	G	G	G	G	G	G-E
burgherkin	F	F-G	G	G	G	G		
citronmelon	F	G	F-G	G	G	G		
cocklebur	E	E	E	E	E	E	E	E
coffee senna	F	G	G	G	G	F	G	
cowpea	F-G	G	G	G	G	F-G	G	
crotalaria	G	G	G	G	G	G		
eclipta		G	G	E	E	E	E	E
Florida beggarweed	E	E	E	E	E	E	E	E

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WEED RESPONSE TO HERBICIDES USED IN COTTON

(continued)

WEED SPECIES	POSTEMERGENCE-DIRECTED							
	MSMA	Cotoran + MSMA	Caparol + MSMA	Direx, others + MSMA	Direx + Linex + MSMA	Cobra + MSMA	Valor, others + MSMA	Suprend + MSMA
ANNUAL BROADLEAVES (continued)								
Florida pusley	P	F	F	F	F	F	F-G	F
hemp sesbania	N	P-F	P-F	P-F		F		
Jimsonweed	F	G-E	G	G	G	G-E	E	G
lambquarters	P-F	G	G	G	G	F	F-G	G-E
morningglories	P-F	F-G	G	G	G-E	E	E	E
Palmer amaranth	P	F	F	G-E	G-E	F	F-G	G-E
pigweeds: redroot or smooth	P-F	G	G	G-E	G-E	G	G-E	G-E
prickly sida	P	F-G	G-E	G-E	G-E	G-E	G-E	G-E
purslane	P-F	F-G	F-G	G	G	G	G	
ragweed, common	F	G-E	E	E	E	E	G-E	E
redweed	N	F-G	G	G-E		F		
sicklepod	F	G	G-E	G-E	G-E	P-F	G-E	E
smartweed: ladysthumb & Penn	P	G	F	F	F	F	G	
spider flower	G-E (in bloom)	G-E (in bloom)	G-E (in bloom)	G-E (in bloom)	G-E (in bloom)	G-E (in bloom)		
spurge	N	P-F	G	G		G	G	
tropic croton	F	G	G	G	G	E	E	G-E
tropical spiderwort	F	G	F-G	G	G	F-G	G-E	F-G
volunteer peanuts	P-F	F-G	F-G	G	G	P-F	F-G	G
wild poinsettia	P-F	F	P-F	P-F		G	G	

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WEED RESPONSE TO HERBICIDES USED IN COTTON
(continued)

WEED SPECIES	POSTEMERGENCE-DIRECTED							HOOD
	glyphosate ¹	glyphosate ¹ + Direx, diuron	glyphosate ¹ + Aim	glyphosate ¹ + Envoke	glyphosate ¹ + Staple, Pyrimax	glyphosate ¹ + Valor, others	Liberty ² , others	Gramoxone + Direx, diuron
PERENNIALS								
bermudagrass	F	F	F	F	F	F	N	P
johnsongrass (rhizome)	G-E	G	G-E	E	G-E	G-E	F	P
purple nutsedge	F-G	G	F-G	E	F-G	G	P	P-F
yellow nutsedge	F	F-G	F	E	F-G	G	P	P-F
ANNUAL GRASSES								
broadleaf signalgrass	E	G-E	E	E	E	E	G	G-E
crabgrass	E	G-E	E	E	E	E	F-G	G
crowfootgrass	E	G-E	E	E	E	E	G	G
fall panicum	E	G-E	E	E	E	E	G	G
foxtails	E	G-E	E	E	E	E	G	G
goosegrass	E	G-E	E	E	E	E	P	G
johnsongrass (seedling)	E	G-E	E	E	E	E	G	G
sandbur	E	G-E	E	E	E	E	G	G
Texas panicum	E	G-E	E	E	E	E	G	G
ANNUAL BROADLEAVES								
bristly starbur	G-E	G-E	G-E	G-E	G-E	E	G	E
burgherkin	G	G	G		G			F
citronmelon	G-E	G-E	G-E	E	E	E	G	G
cocklebur	E	E	E	E	E	E	E	G
coffee senna	E	E	E	E	E	E	G	F
cowpea	G-E	G-E	G-E	G-E	G-E	E	G	G
crotalaria	G	G	G		G			
eclipta	E	E	E	E	E	E	G	F
FL beggarweed	E	E	E	E	E	E	G	E
Florida pusley	P-G	G	G	P-G	P-G	G-E	F	P-F
hemp sesbania	P-F		G-E		G-E			

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Note: Ratings based upon average to good soil and weather conditions for herbicide performance and upon proper application rate, technique, and timing

¹Glyphosate should be applied only to glyphosate-resistant cotton.

²Glufosinate (Liberty, others) should be applied only to tolerant cotton.

WEED RESPONSE TO HERBICIDES USED IN COTTON

(continued)

WEED SPECIES	POSTEMERGENCE-DIRECTED							HOOD
	glyphosate ¹	glyphosate ¹ + Direx, diuron	glyphosate ¹ + Aim	glyphosate ¹ + Envoke	glyphosate ¹ + Staple, Pyrimax	glyphosate ¹ + Valor, others	Liberty ² , others	Gramoxone + Direx, diuron
ANNUAL BROADLEAVES (continued)								
jimsonweed	E	E	E	E	E	E	E	G
lambsquarters	G	G-E	G-E	G-E	G-E	G-E	E	F
morning glory - <i>Ipomoea</i>	F-G	G-E	E	G-E	G-E	E	E	F-G
morningglory - smallflower	G	E	E	G	E	E	E	P-F
Palmer amaranth	E	E	E	E	E	E	F-G	G-E
Palmer amaranth (glyphosate-resistant)	N	F-G	P-F	P	F	P-F	F-G	G-E
Palmer amaranth (glyphosate & ALS resis.)	N	F-G	P-F	N	N	P-F	F-G	G-E
pigweed: redroot or smooth	E	E	E	E	E	E	G	G-E
prickly sida	F-G	G	F-G	F-G	G	G-E	F-G	P-F
purslane	F-G	G-E	G			G-E	F-G	G
ragweed, common	E	E	E	E	E	E	E	F
redweed	G-E	G-E	G-E		G-E			F-G
sicklepod	E	E	E	E	E	E	E	G-E
smartweed:	G	G	G-E	E	E	G	G-E	G
spider flower			G			G		
spurge	G	G-E	G-E	G	G	G	F-G	
tropic croton	E	E	E	E	E	E	G	F
tropical spiderwort	P-F	F-G	G-E	P-F	F-G	G-E	P-F	G-E
volunteer peanuts	F	G	F-G	F-G	F	F-G	G-E	P
wild poinsettia	G	G	G-E	E	G	G-E	P-F	G

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COTTON DEFOLIATION / HARVEST AID OPTIONS

Jared Whitaker, Extension Agronomist & Guy Collins, Extension Agronomist

The following are basic guidelines for harvest aid application. Rates indicated are amount per acre. Specific rates should be adjusted according to temperature, humidity, day-length, plant leaf condition and maturity, expected weather, and desired effects such as defoliation, regrowth control, boll opening and/or weed control. Defoliant should be applied in a minimum spray volume of 5 gal/A by air and 10-20 gal/A by ground. Reduced performance issues are often related to low spray volume and poor canopy penetration. Fields should be fit into one of the following categories based on temperature and harvest aid function. Preparing cotton for harvest is often difficult and is influenced by many factors, therefore the guidelines below should be considered as basic recommendations. Always observe label restrictions before using cotton harvest aids.

HARVEST-AID FUNCTION	PRODUCT COMMON NAME (BRAND NAME)	BROADCAST RATE/ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
EARLY-SEASON (highs 90°F plus, lows 70°F plus)			
Defoliation Only (combinations provide more consistent defoliation than a single product)	<i>carfentrazone</i> Aim EC	0.75-1 oz	Add non-ionic surfactant at 0.25% v/v. The potential for leaf sticking is greater during periods of high temperatures.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add crop oil at 1-2 pt/A. Limited data, use precaution. The potential for leaf sticking is greater during periods of high temperatures.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add crop oil at 1 pt/A. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add crop oil at 0.5% v/v. The potential for leaf sticking is greater during periods of high temperatures.
	<i>sodium chlorate</i>	3 lb ai	Apply to mature foliage only. Do not mix with products containing tribufos or ethephon.
	<i>tribufos</i> Def/Folex	1.5 pt	Reduce rate to 1.25 pt if above 94°F.
Regrowth Control and Defoliation	<i>thidiazuron</i> (numerous brands)	3.2 oz	For maximum regrowth control. Thidiazuron is sensitive to wash-off when rain occurs within 6-12 hours after application. Addition of tribufos (4-8 oz) or ammonium sulfate (2 lb/A) enhances rainfastness.
	<i>thidiazuron</i> (numerous brands) + <i>tribufos</i> Def/Folex	1.6-2.5 oz + 4-16 oz	For minimum regrowth control apply thidiazuron at 1.6 oz plus tribufos at 8-12 oz. For good regrowth control apply thidiazuron at 2.5 oz plus tribufos at 8-12 oz. For superior regrowth control apply thidiazuron at 3.2 oz plus tribufos at 6-8 oz. These combinations may cause “leaf sticking” when temperatures exceed 94°F, when combined with spray adjuvants, or when calibration errors occur. Consider reducing higher rates of tribufos by 10-20% when temperatures exceed 94°F. Regrowth control or suppression is minimal when thidiazuron is applied at rates below 1.6 oz. Higher rates (2.5-3.2 oz) or sequential applications increase time of effectiveness.
	<i>thidiazuron</i> (numerous brands) + ONE OF THE FOLLOWING:	1.6-2.5 oz +	
	<i>carfentrazone</i> Aim EC	0.75 oz	Add 0.25 % v/v non-ionic surfactant.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add crop oil at 1 pt/A. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add crop oil at 1 pt/A. Limited data, use precaution. The potential for leaf sticking is greater during periods of high temperatures.
<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil.	

COTTON DEFOLIATION / HARVEST AID OPTIONS

HARVEST-AID FUNCTION	PRODUCT COMMON NAME (BRAND NAME)	BROADCAST RATE/ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
EARLY-SEASON (highs 90°F plus, lows 70°F plus)			
Regrowth Control and Defoliation (continued)	<i>thidiazuron + diuron</i> (numerous brands)	6.4-8 oz	Limited data are available with these products. Regrowth control is minimal when some brand products are applied at rates below 6.4 oz. Likelihood of leaf sticking may occur when temperatures exceed 94°F or when high rates are used.
	<i>glyphosate</i> (numerous brands) + <i>tribufos</i> Def/Folex	1.2-2 pt + 8-16 oz	Glyphosate WILL NOT provide regrowth suppression when applied to RF cotton. See specific labels for product rates.
Boll Opening and Defoliation	<i>ethephon</i> (numerous brands)	2-2.67 pt	
	<i>ethephon</i> (numerous brands) + ONE OF THE FOLLOWING: <i>carfentrazone</i> Aim EC	1.33-1.5 pt + 0.75 oz	Add 0.25 % v/v non-ionic surfactant.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil.
	<i>tribufos</i> Def/Folex	1-1.25 pt	
	<i>thidiazuron</i> (numerous brands)	1.6 oz	
	<i>thidiazuron + diuron</i> (numerous brands)	4-6 oz	Likelihood of “leaf sticking” is increased when applied at or above 5 oz in combinations of defoliant. Rate of 4 oz suggested during periods of high temperatures.
	<i>ethephon + urea sulfate</i> FirstPick + ONE OF THE FOLLOWING: <i>carfentrazone</i> Aim EC	1.75-2 qt + 0.75 oz	Likelihood of leaf sticking is increased during periods of high temperatures.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	
	<i>thidiazuron</i> (numerous brands)	1.6 oz	
	<i>thidiazuron + diuron</i> (numerous brands)	4-6 oz	Likelihood of “leaf sticking” increases when applied at or above 5 oz in combinations of defoliant. Rate of 4 oz recommended during early season.
	<i>tribufos</i> Def/Folex	4-6 oz	

COTTON DEFOLIATION / HARVEST AID OPTIONS

HARVEST-AID FUNCTION	PRODUCT COMMON NAME (BRAND NAME)	BROADCAST RATE/ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
EARLY-SEASON (highs 90°F plus, lows 70°F plus)			
Boll Opening and Defoliation (continued)	<i>ethephon + cyclanilide</i> Finish 6 Pro +	1.33-1.5 pt +	
	ONE OF THE FOLLOWING:		
	<i>carfentrazone</i> Aim EC	0.75 oz	Add 0.25 % v/v non-ionic surfactant.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt./A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt./A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil.
	<i>thidiazuron</i> (numerous brands)	1.6 oz	
Boll Opening, Regrowth Control, and Defoliation	<i>ethephon</i> (numerous brands) +	1.33-1.5 pt +	Limited data are available for some products. Regrowth control is minimal when these products are applied at rates below 6.4 oz.
	ONE OF THE FOLLOWING:		
	<i>thidiazuron</i> (numerous brands)	2-2.5 oz	
	<i>thidiazuron + diuron</i> (numerous brands)	6.4 oz	
	<i>ethephon</i> (numerous brands) +	1.33-1.5 pt +	
	<i>thidiazuron</i> (numerous brands)	2-2.5 oz	
	ONE OF THE FOLLOWING:		
	<i>carfentrazone</i> Aim EC	0.75 oz	Add 0.25 % v/v non-ionic surfactant.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4 oz	Add 1-2 pt./A crop oil. Limited data, use precaution.
<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt./A crop oil. Limited data, use precaution.	
<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil.	
<i>tribufos</i> Def/Folex	6-12 oz		

COTTON DEFOLIATION / HARVEST AID OPTIONS

HARVEST-AID FUNCTION	PRODUCT COMMON NAME (BRAND NAME)	BROADCAST RATE/ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
EARLY-SEASON (highs 90°F plus, lows 70°F plus)			
Boll Opening, Regrowth Control, and Defoliation (continued)	<i>ethephon + urea sulfate</i> FirstPick	1.75-2 qt 1	Likelihood of “leaf sticking” is increased when temperatures exceed 94°F.
	OR <i>ethephon + cyclanilide</i> Finish 6 Pro	0.33-1.5 pt +	Limited data are available with some products. Regrowth control is minimal when these products are applied at rates below 6.4 oz.
	ONE OF THE FOLLOWING: <i>thidiazuron</i> (numerous brands)	1.6-2 oz	
	<i>thidiazuron + diuron</i> (numerous brands)	6.4 oz	
MID-SEASON (highs 80 to 89°F plus, lows 60 to 70°F)			
Defoliation Only (combinations provide more consistent defoliation than a single product)	<i>carfentrazone</i> Aim EC	0.75-1 oz	Add 1% v/v crop oil for 0.75 oz rate. Add 0.25% non-ionic surfactant for 1 oz rate.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
	<i>sodium chlorate</i>	4 lb ai	Apply to mature foliage only. Do not mix with products containing tribufos or ethephon.
	<i>tribufos</i> Def/Folex	1-1.5 pt	
Regrowth Control and Defoliation	<i>thidiazuron</i> (numerous brands)	3.2 oz	Glyphosate WILL NOT provide regrowth suppression when applied to RF cotton. See specific labels for product rates.
	<i>thidiazuron</i> (numerous brands) OR <i>glyphosate</i> +	2-2.5 oz 1.2-2 pt +	
	ONE OF THE FOLLOWING: <i>carfentrazone</i> Aim EC	0.75-1 oz	
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	
	<i>flumiclorac</i> Resource	4-6 oz	
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	
	<i>pyraflufen ethyl</i> ET	1.5 oz	
	<i>tribufos</i> Def/Folex	1 pt	
	<i>thidiazuron + diuron</i> (numerous brands)	6.4-8 oz	

COTTON DEFOLIATION / HARVEST AID OPTIONS

HARVEST-AID FUNCTION	PRODUCT COMMON NAME (BRAND NAME)	BROADCAST RATE/ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>	
MID-SEASON (highs 80 to 89°F plus, lows 60 to 70°F)				
Boll Opening and Defoliation	<i>ethephon</i> (numerous brands)	2-2.67 pt		
	<i>ethephon</i> (numerous brands)	1.5-2 pt		
	+	+		
	ONE OF THE FOLLOWING:	<i>carfentrazone</i> Aim EC	0.75-1 oz	Add 0.25% v/v non-ionic surfactant to the 0.75 oz rate or 1% v/v crop oil to the 1 oz rate.
		<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
		<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
		<i>fluthiacet-methyl</i> Blizzard	0.5-0.6	Add 1 pt/A crop oil. Limited data, use precaution.
		<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
		<i>tribufos</i> Def/Folex	1-1.25 pt	
		<i>thidiazuron</i> (numerous brands)	1.6 oz	
		<i>thidiazuron + diuron</i> (numerous brands)	6.4 oz	Limited data are available with some of these products
		<i>ethephon + urea sulfate</i> FirstPick	2 qt	
		+	+	
	ONE OF THE FOLLOWING:	<i>carfentrazone</i> Aim EC	0.75-1 oz	
		<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
		<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
		<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
		<i>pyraflufen ethyl</i> ET	1.5 oz	
<i>thidiazuron</i>		1.6 oz		
<i>thidiazuron + diuron</i> (numerous brands)		5 oz	Limited data are available with some of these products.	
<i>tribufos</i> Def/Folex		6-8 oz		

COTTON DEFOLIATION / HARVEST AID OPTIONS

HARVEST-AID FUNCTION	PRODUCT COMMON NAME (BRAND NAME)	BROADCAST RATE/ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
MID-SEASON (highs 80 to 89°F plus, lows 60 to 70°F)			
Boll Opening and Defoliation (continued)	<i>ethephon</i> + <i>cyclanilide</i> Finish 6 Pro +	1.33-1.5 pt +	
	ONE OF THE FOLLOWING:		
	<i>carfentrazone</i> Aim EC	0.75-1 oz	Add 0.25% v/v non-ionic surfactant to the 0.75 oz rate or 1% v/v crop oil to the 1 oz rate.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
	<i>tribufos</i> Def/Folex	6-8 oz	
	<i>thidiazuron</i> (numerous brands)	1.6 oz	
	<i>thidiazuron</i> + <i>diuron</i> (numerous brands)	5 oz	Limited data are available with some of these products.
Boll Opening, Regrowth Control, and Defoliation	<i>ethephon</i> (numerous brands) +	1.5-2 pt +	
	ONE OF THE FOLLOWING:		
	<i>thidiazuron</i> (numerous brands)	2-2.5 oz	
	<i>thidiazuron</i> + <i>diuron</i> (numerous brands)	6.4-8 oz	Limited data are available with some of these products.
	<i>ethephon</i> (numerous brands) +	1.5-2 pt +	
	<i>thidiazuron</i> (numerous brands) +	2-2.5 oz +	
	ONE OF THE FOLLOWING:		
	<i>carfentrazone</i> Aim EC	0.75-1 oz	Add 0.25% v/v non-ionic surfactant to the 0.75 oz rate or 1% v/v crop oil to the 1 oz rate.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
	<i>tribufos</i> Def/Folex	8-12 oz	

COTTON DEFOLIATION / HARVEST AID OPTIONS

HARVEST-AID FUNCTION	PRODUCT COMMON NAME	BROADCAST RATE/ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
LATE-SEASON (highs below 80°F, lows below 60°F) In these conditions, proper defoliation may require a preconditioning treatment (see preconditioning section)			
Boll Opening, Regrowth Control, and Defoliation (continued)	<i>ethephon + urea sulfate</i> FirstPick OR	2 qt	
	<i>ethephon + cyclanilide</i> Finish 6 Pro + ONE OF THE FOLLOWING:	1.5-2 pt +	
	<i>thidiazuron</i> (numerous brands)	2-2.5 oz	
	<i>thidiazuron + diuron</i> (numerous brands)	6.4-8 oz	Limited data are available with some of these products.
Defoliation Only (combinations provide more consistent defoliation than a single product)	<i>carfentrazone</i> Aim EC	1 oz	
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>pyraflufen ethyl</i> ET	1.5 oz	
	<i>sodium chlorate</i>	4 lb ai	
	<i>thidiazuron + diuron</i> (numerous brands)	8-10 oz	Limited data are available with some of these products.
Boll Opening and Defoliation	<i>ethephon</i> (numerous brands)	2-2.67 pt	
	<i>ethephon</i> (numerous brands) + ONE OF THE FOLLOWING:	2-2.67 pt +	
	<i>tribufos</i> Def/Folex	1-1.25 pt	
	<i>thidiazuron + diuron</i> (numerous brands)	6 oz	Limited data are available with some of these products.
	<i>carfentrazone</i> Aim EC	1 oz	Add 1% v/v crop oil.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6	Add 1 pt/A crop oil. Limited data, use precaution.
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.

COTTON DEFOLIATION / HARVEST AID OPTIONS

HARVEST-AID FUNCTION	PRODUCT COMMON NAME	BROADCAST RATE/ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>	
LATE-SEASON (highs below 80°F, lows below 60°F) In these conditions, proper defoliation may require a preconditioning treatment (see preconditioning section)				
Boll Opening and Defoliation (continued)	<i>ethephon + cyclanilide</i> Finish 6 Pro	1.75-2 pt		
	+	+		
	ONE OF THE FOLLOWING:			
	<i>carfentrazone</i> Aim EC	1 oz	Add 1% v/v crop oil.	
	<i>carfentrazone + fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.	
	<i>flumiclorac</i> Resource	4-6 oz	Add 1-2 pt/A crop oil. Limited data, use precaution.	
	<i>fluthiacet-methyl</i> Blizzard	0.5-0.6 oz	Add 1 pt/A crop oil. Limited data, use precaution.	
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 1% v/v crop oil.	
	<i>thidiazuron + diuron</i> (numerous brands)	6 oz		
	<i>tribufos</i> Def/Folex	8-12 oz	Limited data are available with some of these products.	

COTTON DEFOLIATION / HARVEST AID OPTIONS

PRECONDITIONING: Fields with a dense canopy of foliage and significant numbers of green bolls may require two applications. The goal is to remove much of the foliage with an initial application, exposing un-open bolls to sunlight and improving air circulation within the canopy. The follow-up application should be made 7-10 days later when sufficient leaf drop has occurred to allow spray coverage with boll opening products containing ethephon. However, premature preconditioning or defoliation may increase the risk of halting development of younger or immature bolls, rendering them unharvestable.

TREATMENT	PRODUCT COMMON NAME	BROADCAST RATE/ ACRE	REMARKS AND PRECAUTIONS <i>(The rates below are given in the broadcast amount per acre unless otherwise noted)</i>
Initial Preconditioning Treatment	<i>carfentrazone</i> Aim EC	1 oz	Add 1% v/v crop oil.
	<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	2up-1 oz	Limited data, adhere to label restrictions, use precaution.
	<i>ethephon</i> (numerous brands)	0.67-1.33 pt	
	<i>flumiclorac</i> Resource	4 oz	Add 1-2 pt crop oil.
	<i>fluthiacet-methyl</i> Blizzard	0.5 oz	Add 1 pt crop oil
	<i>glyphosate</i> (numerous brands)	1.2-2 pt	Glyphosate WILL NOT provide regrowth suppression when applied to RF cotton. See specific labels for product rates.
	<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil when temperatures are above 90°F. Add 1% v/v crop oil when temperatures are 89°F or below.
	<i>tribufos</i> Def/Folex	0.5-1.25 pt	
Follow-up Treatments	Should include products containing ethephon with harvest aid mixtures listed in the previous table.		

HARVEST AID WEED MANAGEMENT

PRODUCT COMMON NAME	BROADCAST RATE/ ACRE	REMARKS AND PRECAUTIONS <i>The rates below are given in the broadcast amount per acre unless otherwise noted.</i>
<i>carfentrazone</i> Aim EC	1 oz	Add 1% v/v crop oil. Effective on morningglory, coffee senna, and tropical spiderwort.
<i>carfentrazone</i> + <i>fluthiacet-methyl</i> Display	up-1 oz	Limited data, adhere to label restrictions, use precaution.
<i>glyphosate</i> (numerous brands)	1.2-2 pt	Use in combination with Def/Folex, dimethipen (Harvade) and/or ethephon. Glyphosate provides fair regrowth suppression of cotton. However, glyphosate WILL NOT provide regrowth suppression when applied to RF cotton. See specific labels for product rates.
<i>paraquat</i> Gramoxone Max, Firestorm, or Parazone	1-4 oz	Use in combinations with standard defoliation applications. May cause crop desiccation and damage to unopened bolls.
Gramoxone Inteon	3-5 oz	
<i>pyraflufen ethyl</i> ET	1.5 oz	Add 0.5% v/v crop oil when temperatures are above 90°F. Add 1% v/v crop oil when temperatures are 89°F or below. Effective on morningglory.
<i>Follow-up Treatments</i> Desiccants paraquat or sodium chlorate	See “Desiccants for Cotton Harvest Preparation” next page.	

DESICCANTS FOR COTTON HARVEST PREPARATION

DESICCANT COMMON NAME	FORMULATION (lb ai/gal)	BROADCAST RATE/ACRE (AMOUNT OF FORMULATION)	SPRAY VOLUME (gal/A)		REMARKS AND PRECAUTIONS <i>The rates below are given in the broadcast amount per acre unless otherwise noted.</i>
			Ground	Air	
<i>paraquat</i>					For addition to defoliant mixtures in cotton at least 75% open. Improves activity in colder, late-season conditions. May cause crop desiccation and damage to unopened bolls.
Firestorm	3				
Gramoxone Inteon	2	3-5 oz	10-20	5	
Gramoxone Max	3	1-4 oz	10-20	5	
Parazone	3				
<i>paraquat</i>					For desiccation of weeds and cotton regrowth after defoliation. Add surfactant at 1-2 qt/100 gal of spray solution. Be prepared to harvest in a timely manner to minimize bark problems. May cause crop desiccation and damage to unopened bolls.
Gramoxone Max	3	5.5 oz-1.5 pt	10-20	5	
Firestorm	3				
Parazone	3				
Gramoxone Inteon	2	1-2 pt	10-20	5	
<i>sodium chlorate</i>	4-6	3-6 lb ai	15-30	5-10	

PERFORMANCE RATING OF HARVEST AIDS BY FUNCTION

COMMON NAME	FUNCTION				
	Removal of Mature Foliage	Removal of Juvenile Foliage	Boll Opening	Regrowth Suppression	Weed Desiccation
<i>ethephon</i> (numerous brands)	F-G	F	E	P	P
<i>ethephon + urea sulfate</i> First Pick	G	G	E+	P	F
<i>ethephon + cyclanilide</i> Finish 6 Pro	G-E	F-G	E+	F	P
<i>paraquat</i> Gramoxone Max, Gramoxone Inteon, Parazone, Firestorm	F	F	P-F	P	G
<i>PPO inhibitors</i> Aim, ET, Resource, Blizzard	G	F	P	P	F
<i>sodium chlorate</i>	F	P	P	P	F-G
<i>thidiazuron</i> (numerous brands)	G-E	G	P	G-E	P
<i>thidiazuron + diuron</i> (numerous brands)	G-E	G	P	G-E	P
<i>tribufos</i> Def/Folex	G-E	P-F	P	P	P

P = Poor, F = Fair, G = Good, E = Excellent

FRUIT AND NUTS

COMMERCIAL IPM GUIDES

Commercial producers are encouraged to contact their local County Extension Agent for information on the various regional fruit guides and other orchard management resources. Inexperienced growers are encouraged to use caution applying pesticides; several materials used are quite toxic and pose an applicator risk if not used with appropriate care. PDFs of the 2016 Fruit IPM guides will be available online prior to the initiation of the 2016 season.

INTEGRATED ORCHARD MANAGEMENT GUIDE FOR COMMERCIAL APPLES IN THE SOUTHEAST

SOUTHEAST REGIONAL BLACKBERRY AND RASPBERRY INTEGRATED MANAGEMENT GUIDE

SOUTHEAST REGIONAL BLUEBERRY INTEGRATED MANAGEMENT GUIDE

SOUTHEAST REGIONAL BUNCH GRAPE INTEGRATED MANAGEMENT GUIDE

SOUTHEAST REGIONAL MUSCADINE GRAPE INTEGRATED MANAGEMENT GUIDE

SOUTHEASTERN PEACH, NECTARINE AND PLUM PEST MANAGEMENT AND CULTURE GUIDE

SOUTHEAST REGIONAL STRAWBERRY INTEGRATED MANAGEMENT GUIDE

COMMERCIAL BLACKBERRY AND RASPBERRY WEED CONTROL

Wayne E. Mitchem, Extension Associate-Fruit Weed Control
Mark A. Czarnota, Extension Horticulture-Weed Science

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREPLANT			
<i>bentazon</i> Basagran 4SL	1.5-2 pt	0.75-1	Apply at or before planting only. Add two pints of crop oil concentrate in 20-50 gal of water/A. DO NOT apply within 1 year of harvest. Sequential applications needed for yellow nutsedge control.
<i>carfentrazone</i> Aim EC 2.0EC Aim EW 1.9EW	0.8-1.5 fl oz	0.013-0.023	For annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply prior to planting to weeds less than 4 inches in height or rosettes less than 3 inches across. Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt/100 gal of spray solution. May be tankmixed with glyphosate.
<i>glyphosate</i> Various trade names and formulations available	See label	See label	Apply to emerged weeds before transplanting. Perennial weeds may require higher rates of glyphosate (i.e. 4 lb ai/A). Some formulations of glyphosate may require the addition of an adjuvant.
PREEMERGENCE ^{1,2,3}			
<i>dichlobenil</i> Casoron 4G Casoron CS	100 lb 1.4-2.8 gal	4 2-4	Apply in early winter to plants that have been established one year or more. DO NOT apply during new shoot emergence. Use no later than mid-February.
<i>mesotrione</i> Callisto 4L	3-6 oz	0.094-0.19	May be applied pre or post bloom, direct to the base of the plant. Apply either a single 6 oz application or two 3 oz split applications can be made. If split application, they must be 14 days apart. If early postemergence weeds control is desired, it is recommended that crop oil concentrate is added to the spray solution (1% v/v). Temporary bleaching or chlorosis may occur to caneberry foliage.
<i>napropamide</i> Devrinol 50WDG	8 lb	4	Use for control of annual grasses and small seeded broadleaf weeds. Apply as a directed spray to base of plants. May be used on first-year plantings. NOTE: Use only half this rate the first year if root cuttings are planted.
<i>norflurazon</i> Solicam 80WDG	2.5-5 lb	2-4	Apply as a directed spray from fall to early spring when the crop is dormant and before weeds emerge. Make only one application per year. Raspberry and blackberry must be established 12 months prior to use. Application of Solicam may result in temporary bleaching or chlorosis of the leaves from which the plant will recover. 60 day preharvest interval.
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS Surflan 85 DF	2-6 qt 2.4-7.1 lb	2-6	Controls annual broadleaf weeds and some annual grasses. Apply 2-4 lb ai/A in spring or apply a split application of 2 lb ai/A in spring followed by 2 lb ai/A in fall. Apply spring applications before annual weeds emerge and before bud break. On plantings less than 6 months old, use 1 lb ai/A. DO NOT apply to newly established plantings until the soil has settled and no cracks are present. Apply before annual weeds emerge or add Gramoxone or glyphosate for control of emerged weeds. DO NOT apply when fruit is present.
<i>simazine</i> Princep 4L, 90WDG Various generic formulations	2.2-4.4 lb 2-4 qt	2-4	Apply 2-4 lb ai/A in spring or apply a split application of 2 lb ai/A in spring followed by 2 lb ai/A in fall. Apply spring applications before annual weeds emerge and before bud break. On plantings less than 6 months old, use 1 lb ai/A. DO NOT use on gravelly, sand, or loamy sand soils. DO NOT apply when fruit is present. Apply in combination with oryzalin or Solicam for improved annual grass control.
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS + <i>simazine</i> Princep 4L, 90WDG	2-4 qt + 2.2 lb 2 qt	2-4 + 2	Use for broad spectrum annual grass and broadleaf weed control. Especially useful on plantings less than 6 months old, use 1 lb ai/A of simazine. DO NOT apply when fruit is present. DO NOT use on gravelly, sand, or loamy sand soils.

COMMERCIAL BLACKBERRY AND RASPBERRY WEED CONTROL

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE ^{1,2,3}			
<i>sulfentrazone + carfentrazone</i> Zeus Prime XC	7.7-15.2 fl oz	0.19 + 0.02 to 0.37 + 0.04	Apply as directed spray to caneberrys that have been established 2 years or longer. If applying in a band and 50% or less of the area is treated Zeus may be applied twice within a 12 month period. Allow at least 60 days between applications. Zeus has a 3 day PHI. Spray water must have a pH from 5-9 for optimum herbicide performance. Tank mix with paraquat for non-selective POST weed control. Sequential applications of Zeus are the most effective on yellow nutsedge. See label for details. For broad spectrum residual control of annual grasses tank mix with oryzalin. Zeus has no postemergence activity on grass weeds.
POSTEMERGENCE			
<i>tenbacil</i> Sinbar 80WDG	0.5-2 lb	0.4-1.6	Use before fruit set in spring or after harvest either before weeds emerge or shortly after weeds emerge. Use only in plantings established one year or more. DO NOT spray foliage. DO NOT use on sandy soils with less than 3% organic matter. See replant restrictions.
<i>bentazon</i> Basagran 4SL	1.5-2 pt	0.75-1	NON-BEARING only, do not apply within 1 year of harvest. Use as a post directed spray, so as to limit foliar contact. Add 2 pints of crop oil concentrate in 20-50 gal of water/A. Sequential applications needed for yellow nutsedge control.
<i>carfentrazone</i> Aim EC 2.0EC Aim EW 1.9EW	0.5-6.4 fl oz	0.008-0.1	Apply as a post-directed spray for primocane and weeds including morningglory, pigweed, and spiderwort. Aim at 1-2 fl oz provides control of most sensitive annuals. For primocanes, apply when 6" in height as a directed application of 6.4 fl oz/A in a minimum of 20 gal of spray at intervals of 14-21 days. Direct the spray at the bottom 18" of the canes and also to contact the soil out to 24" from each side of the plant row. Coverage is essential for weed control. Add a crop oil concentrate at 1 gal/100 gal of spray mix.
<i>glyphosate</i> Various trade names and formulations are available	See label	See label	Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray under bearing and non-bearing canes. DO NOT allow spray to contact foliage or green bark of canes. Brambles are especially sensitive from bloom until full dormancy. Refer to product label for rates to control specific weeds. Allow a minimum of 14 days between last application and harvest. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. The addition of an adjuvant to some glyphosate products is recommended, see labels.
<i>paraquat</i> Various trade names and formulations are available	1.3-4 pt (varies by formulation, check label)	0.25-1 (varies with formulation, check label)	Use for broad spectrum, contact control of emerged weeds. Apply as a high volume (50 gpa), coarse directed spray with 1 qt surfactant/100 gal of spray solution. Avoid drift. Apply before emergence of new canes or shoots to minimize potential for plant injury. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. Contact with new growth will cause injury.

COMMERCIAL BLACKBERRY AND RASPBERRY WEED CONTROL

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE GRASS CONTROL			
<i>clethodim</i> SelectMax 0.97EC Intensity One	12-16 fl oz	0.094-0.121	Controls annual and perennial grasses. Use higher rates and sequential applications for perennial grasses. Add crop oil concentrate (1 qt/A). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8" runners; annual grasses: 2-8" tall. Does not control nutsedge(s). Select Max has 7 day PHI for caneberry , unless otherwise noted on the label all other clethodim formulations are for non-bearing caneberry.
<i>fluzifop</i> Fusilade DX 2L	16-24 fl oz	0.25-0.38	Use for control of annual and perennial grasses under NON-BEARING plants (harvest not expected within 1 year). Sequential applications will be necessary for controlling perennial grass weeds. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1 qt/A). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8" runners; annual grasses: 2-8" tall. Does not control nutsedge(s).
<i>sethoxydim</i> Poast 1.5EC	1-2.5 pt	0.18-0.47	Use for control of annual and perennial grasses. Sequential applications will be necessary for control of perennial grass weeds. May be used on bearing raspberries or blackberries, but not within 45 days of harvest. Add crop oil concentrate (1 qt/A). Use low rate on annual grasses up to 6" tall; higher rates on larger annual grasses and perennial grasses. Does not control nutsedge(s). Spray volumes in excess of 25 gpa may reduce herbicide activity. The addition of crop oil concentrate, Dash, or methylated seed oil is necessary for optimum herbicide performance.

¹All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5-1" of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

²Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

³As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2-4 months in most growing mediums (in Georgia).

COMMERCIAL BLUEBERRY WEED CONTROL

Mark A. Czarnota, Extension Horticulture-Weed Science

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PREPLANT					
<i>glyphosate</i> Various trade names and formulations available		See label	See label		Apply to emerged weeds before transplanting. Perennial weeds may require higher rates of glyphosate (ie 4 lb ai/A). Some formulations of glyphosate may require the addition of an adjuvant.
PREEMERGENCE ^{1,2,3}					
<i>dichlobenil</i> Casoron 4G		100 lb	4-6		Apply in early winter to plants that have been established one year or more. Use from mid-November to mid- February. Good product for controlling non-seed bearing plants (i.e. Bracken fern (<i>Pteridium aquilinum</i>), winter annuals, and Florida betony (<i>Stachys floridana</i>). After application, Casoron must be watered in with ½-1” irrigation event.
<i>diuron</i> Direx 4L Karmex 80DF Various generic formulations		1.2-1.6 qt 1.5-2	1.2-1.6		Use for residual control of annual broadleaf weeds ONLY under plants established in the field for at least 1 year. Apply in late fall or early spring before weeds emerge. If small weeds are present apply with a surfactant or crop oil to improve contact activity. A repeat treatment may be made after harvest. DO NOT use on sand, loamy sand, gravelly soils, or on exposed subsoils.
<i>flumioxazin</i> Chateau 51WDG		6-12 oz/A	0.375-0.75		Excellent herbicide for preemergence weed control. Use 10-12 oz rate for extended control (3 plus months). Controls a wide array of annual broadleaf and grass weeds (some early postemergent activity).
<i>hexazinone</i> Velpar 80DF		1.3-2.6 lb	1-2		Apply as directed spray to soil and weeds before blueberry leaf emergence in plantings established for 3 years or more. DO NOT apply within 90 days of harvesting highbush blueberries or within 450 days of harvesting lowbush blueberries.
<i>mesotrione</i> Callisto 4L		3-6 oz	0.094-0.19		May be applied pre or post bloom, direct to the base of the plant. Apply either a single 6 oz application or two 3 oz split applications can be made. Split applications must be 14 days apart. If early postemergence weed control is desired, it is recommended that crop oil concentrate be added to the spray solution (1% v/v). Temporary bleaching or chlorosis may occur to blueberry foliage.
<i>napropamide</i> Devrinol 50WDG Devrinol 10G		8 lb 40 lb	4 4		Use for control of annual grasses and small seeded broadleaf weeds. Rainfall or overhead irrigation is needed within 24 hours of application (irrigation within 48 hours with the XT formulations). Apply as a directed spray to base of plants. May be used on first-year plantings. NOTE: Use only half this rate the first year if root cuttings are planted.
<i>norflurazon</i> Solicam 80WDG		2.5-5 lb	2-4		Provides excellent preemergence control of annual grasses and some broadleaf weeds. Can also provide suppression of some perennials. Apply as a directed spray in the fall or early spring when dormant--fall applications control a broader weed spectrum than spring applications. DO NOT apply to blueberry plants established less than 6 months. Use the low rate on coarse textured soils; higher rates on fine textured soils. Make only 1 application per year. DO NOT use on nursery stock. Temporary bleaching or chlorosis may occur. DO NOT apply within 60 days of harvest.
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS Surflan 85 DF		2-6 qt 2.4-7.1 lb	2-6		Controls annual grasses and small seeded annual broadleaf weeds. Use low rate for short-term control (1-2 months); high rate for long-term control (2-3 months). DO NOT apply to newly established plantings until the soil has settled and no cracks are present. Apply before annual weeds emerge or add Gramoxone or glyphosate for control of emerged weeds. Benefits highly from a tank mix partner like Simazine or Trellis. Do not apply when fruit is present.
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS + <i>simazine</i> Princep 4L, 90WDG		2-4 qt + 2.2 lb 2 qt	2-4 + 2		Use for broad spectrum annual grass and broadleaf weed control. Especially useful on plantings less than 6 months old, use 1 lb ai/A of simazine. DO NOT apply when fruit is present. DO NOT use on gravelly, sand, or loamy sand soils.

COMMERCIAL BLUEBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PREEMERGENCE ^{1,2,3}					
<i>oryzalin</i> Surflan 4 AS Oryzalin 4 AS + <i>isoxben</i> Trellis		2-4 qt + 0.66-1.33 lb/A	2-4 + 2		USE ON NON-BEARING PLANTS ONLY. Provides excellent preemergent weed control of many small seeded broadleaf weeds. Especially useful on plantings less than 6 months old, and if worried about damage from simazine.
<i>prodamine</i> Kerb 50W		2-4 lb	1-2		Apply as a single directed spray in established blueberries only for early postemergence control of susceptible winter annual weeds, perennial grasses, and chickweed and for preemergence control of these and many other weeds. DO NOT APPLY ON NEW PLANTINGS UNTIL ESTABLISHED. DO NOT exceed 4 lb/A/year. Apply in late fall or winter when soil temperature is 55°F or less.
<i>simazine</i> Princep, Simazine 90DG Princep, Simazine 4F and other generic formulations		2.2-4.4 lb 2-4 qt	2-4		Use for control of annual broadleaf weeds and some annual grasses. A tank mix partner will enhance spectrum of weed control (i.e. norflurazon, oryzalin). Two quarts of Surflan and Princep is an excellent application for recent or young plantings and should give at least 8 weeks of residual weed control. DO NOT apply when fruit is present.
<i>terbacil</i> Sinbar 80WDG		0.5-3 lb	0.4-2.4		Use for broad spectrum annual weed control ONLY under plants established in the field for at least 1 year. Apply a single application in spring or after harvest in the fall before weeds emerge or after weeds emerge but are less than 2" tall. DO NOT use on sand, loamy sand, or gravelly soils with less than 3% organic matter or plant damage can occur. Apply to the ground beneath the bushes, avoiding contact of foliage and fruit. Recommend trying on small acreage, monitor 4-8 weeks for damage before using on large acreage.
PREEMERGENCE HERBICIDES FOR CONTAINER PRODUCTION (BLUEBERRIES GROWN FOR PLANTS ^{1,2,3})					
If in South Georgia (south of Macon), it is recommend that you make herbicide applications 6 times a year. If a herbicide program is started in January, applications should be made every 2 months for the remainder of the year (Jan, Mar, May, Jul, Sep, and Nov). Plants should be well rooted at the time of first herbicide application.					
<i>benefin/oryzalin</i> XL 2G		150 lb	3		USE ON NON-BEARING PLANTS ONLY. No postemergent activity. Excellent product for containers and small in-ground operations. Controls a wide array of annual broadleaf and grass weeds.
<i>dithiopyr</i> Dimension 1SL Dimension 40WP		2 qt/A 20 oz/A	0.5 0.5		USE ON NON-BEARING PLANTS ONLY. Provides preemergent control of most annual grasses and small seed broadleaf weeds. Also provides early postemergent control of some annual grasses up to 3 tillers. Use on 1-year old plants.
<i>flumioxazin</i> Broadstar 0.25GR Chateau 51WDG		150 lb/A 6-12 oz/A	0.375 0.375-0.75		Excellent preemergence weed control. Use 10-12 oz rate for extended control (3 plus months). Broadstar is excellent for containers and small in-ground operations. Controls a wide array of annual broadleaf and grass weeds (some early postemergent activity).
<i>isoxben</i> Trellis		0.66-1.33 lb/A	0.5-1		USE ON NON-BEARING PLANTS ONLY. Provides excellent preemergent weed control of many small seeded broadleaf weeds. Maximum of 4 lb/year. Needs a tank mix partner for annual grass control (i.e., Oryzalin)
<i>isoxaben</i> + <i>trifluralin</i> + <i>oxyfluorfen</i> Showcase 2.5TG		100-200 lb	0.25-0.5 + 2-4 + 0.25-0.5		USE ON NON-BEARING PLANTS ONLY. Excellent product for containers and small in-ground operations. Controls a wide range of annual weeds. DO NOT apply to newly planted blueberries until the soil has firmly settled and no cracks are present. DO NOT apply to blueberries when foliage is wet. Apply ½-1" of irrigation water to Showcase-treated area if adequate rainfall is not received within 3 days of application. Repeat applications of 150 lbs or higher should not be made sooner than 60 days. DO NOT apply more than 600 lbs of Showcase per year

COMMERCIAL BLUEBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PREEMERGENCE HERBICIDES FOR CONTAINER PRODUCTION (BLUEBERRIES GROWN FOR PLANTS ^{1,2,3}) (continued)					
<i>oxadiazon</i> Regalstar 2G		100-200 lb/A	2-4		USE ON NON-BEARING PLANTS ONLY. Provides good preemergent weed control on a large spectrum of grass and broadleaf weeds. Works well on many winter annuals (i.e., Bittercress, Oxalis, etc.). Excellent product for containers and small in-ground operations. Label recommends using on small acreage to confirm safety before large-scale use.
<i>trifluralin/isoxaben</i> Snapshot 2.5TG		150-200 lb	3.75-5		USE ON NON-BEARING PLANTS ONLY No postemergent activity. Excellent product for containers and small in-ground operations. Control a wide array of annual broadleaf and grass weeds.
<i>oxyfluorfen + proflamizone</i> Biathlon 2.75 GR		100 lb	2.75		Good herbicide at controlling a broad spectrum of annual grasses and broadleaf weeds from seed. Do not apply to wet foliage.
POSTEMERGENCE HERBICIDES²					
<i>glufosinate</i> Rely 280 2.34L Cheetah 2.34L Reckon 280 2.34L		3-5 qt 48-82 oz. 1.5-4 oz /gal	0.75-1.25		Good on annual and perennial weeds with shallow root systems. Provides only suppression of perennial type weeds such as yellow and purple nutsedge. DO NOT allow spray drift to contact desirable foliage or uncultured bark of young branches as damage will occur. DO NOT apply more than 12 qts/A/year of Rely. DO NOT apply within 14 days of harvest or through any type of irrigation system.
<i>glyphosate</i> Various trade names and formulations are available		See label	See label		Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray under bearing and non-bearing bushes. DO NOT allow spray to contact foliage or green bark. Refer to product label for rates to control specific weeds and postharvest restrictions. May be tank mixed with certain preemergence herbicides to provide postemergence and residual weed control. Blueberry growing in bark beds or other soil-less media are susceptible to glyphosate injury.
POSTEMERGENCE (GRASS HERBICIDES)²					
<i>clethodim</i> SelectMax 0.97EC		9-16 fl oz	0.068-0.121		Controls annual and perennial grasses in blackberries. Use higher rates and sequential applications for perennial grasses. Add non-ionic surfactant (1 qt/100 gal, or as label instructs). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8"runners; annual grasses: 2-8" tall. Multiple applications will be required for difficult grasses. Does not control nutsedge(s). Can us up to 7 days of harvest (PHI 7 days). Maximum single application is 16 oz/A, and yearly maximum is 64 oz/A.
<i>fluzifop</i> Fusilade DX 2L		16-24 fl oz	0.25-0.38		Controls annual and perennial grasses in NON-BEARING PLANTINGS (harvest not expected within 1 year). Sequential applications will be necessary for perennial grass control. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1 qt/A). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8"runners; annual grasses: 2-8 in. tall. Does not control nutsedge(s).
<i>halosulfuron</i> Sanda 75DF		0.5-1 oz	0.375-0.75		Apply as a post-directed application to control yellow, purple, and many other sedge species. Can provide preemergence control of many weeds from seed (see label). Sedges are best controlled when treatments are applied to actively growing nutsedges (3 to 5 leaf stage). Contact with blueberry plant should be avoided. If repeatapplications are necessary, wait 45 days. Blueberry plants should be actively growing, well established, and 12-18" tall. DO NOT apply more than 2 oz in a 12 month period. Post-harvest interval (PHI) is 14 days.
<i>sethoxydim</i> Poast 1.5EC		1.5-2.5 pt	0.18-0.47		Use for control of annual and perennial grasses in bearing blueberries. Sequential applications will be necessary for controlling perennial grass weeds like bermudagrass and johnsongrass. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1 qt/acre). For annual grasses up to 6" tall, 1-1.5 pt/A should be adequate. For annual grasses taller than 6" and perennial grasses, use up to 2.5 pt/A. Do not use more than 5 pt/A/season and the last application must be made at least 30 days prior to harvest. Does not control nutsedge(s). If spot spraying, use a 1-1.5% solution.

¹All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5-1" of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

²Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

³As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2-4 months in most growing mediums (in Georgia).

COMMERCIAL GRAPE (MUSCADINE AND BUNCH) WEED CONTROL

Wayne E. Mitchem, Extension Associate-Fruit Tree Weed Control

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE			
<i>oryzalin</i> Surflan 4AS 4 lb/gal oryzalin 4 lb/gal	2-6 qt	2-6	Use for control of annual grasses and small seeded annual broadleaf weeds. Use low rate for short-term control (2-4 months); high rate for long-term control (6-8 months). DO NOT apply to newly established vines until soil has settled and no cracks are present. Apply before annual weeds emerge or add paraquat, Rely or glyphosate for control of emerged weeds. Sequential applications may be used so long as total use rate does not exceed 12 qt/A/year. Allow 2.5 months between applications.
<i>flumioxazin</i> Chateau 51WDG Tuscany 51 WDG	6-12 oz	0.19-0.38	Grapes established <2 years must be trellised and shielded with a non-porous wrap, grow tube, or waxed container. DO NOT apply after bloom unless hooded application equipment is used to prevent spray drift contact with crop foliage or fruit. Once vines (wine/juice grapes only) break dormancy it is recommended that Chateau not be applied with glyphosate. Apply with either glufosinate or paraquat for non-selective POST weed control after bud break. DO NOT apply within 60 days of harvest. Research indicates Chateau applied at 6-8 oz/A in the spring followed by another 6-8 oz/A in early summer is very effective. DO NOT use more than 6 oz/A/application to soils having >80% sand and/or gravel content when vines are less than 3 years old.
<i>simazine</i> Princep, Simazine 90DF Princep, Simazine 4L	2.2-4.4 lb 2-4 qt	2-4	Use for control of annual broadleaf weeds and some annual grasses only under plants established in the vineyard at least 3 years. Use low rate on coarse textured soils. DO NOT use on sand, loamy sand, or gravelly soils. May be tank mixed with Surflan for broad spectrum annual grass and broadleaf weed control. Add paraquat, glufosinate or glyphosate for control of emerged weeds. Tank mixing with oryzalin or Prowl H ₂ O will improve PRE control of annual grass weeds.
<i>diuron</i> Karmex, Diuron 80DF	2-3 lb	1.5-2	Use for control of annual broadleaf weeds and some annual grasses only under plants established in the vineyard at least 3 years. Apply in the spring before annual weeds emerge. DO NOT use on sand, loamy sand, gravelly soils, or on exposed subsoils. DO NOT use on soils with less than 1% organic matter. Severe injury may occur if heavy rainfall or more than 1" of overhead irrigation water follows treatment. This risk is assumed by user. May be tank mixed with oryzalin or Solicam for broad spectrum annual grass and broadleaf weed control.
<i>norflurazon</i> Solicam 80DF	1.25-5 lb	1-4	Use for control of annual grasses, broadleaf weeds, and suppression of some perennials <u>only</u> under plants established in the vineyard at least 2 years. Apply in the fall or early spring prior to weed emergence—fall applications control a broader weed spectrum than spring applications. Use the low rate on sandy loam soils; higher rates on fine textured soils. DO NOT apply after bud break on sandy loam or coarser soils. Add paraquat, glufosinate or glyphosate for control of emerged weeds. DO NOT apply within 60 days of harvest. Loss of pigment in leaf veins will occur in coarse textured soils when applied within 3 months after bud break.
<i>oxyfluorfen</i> Goal 2XL Galigan 2E Oxiflo 2EC 2 lb/gal Goal Tender 3EC 4 lb/gal.	2-8 qt 1-4 pt	0.5-2	Apply ONLY to DORMANT plants that have vines on a trellis wire a minimum of 3 ft above the soil surface. Direct spray toward the base of the vine. Avoid direct plant contact. DO NOT apply during the growing season or bud swell stage of growth. May be used as a preemergence or postemergence treatment. Use the higher rates for preemergence applications. May be tank mixed with simazine, Devrinol, oryzalin, paraquat, or glyphosate. Refer to Goal label for information on rates for postemergence treatments and tank mixes.
<i>sulfentrazone + carfentrazone</i> Zeus Prime XC	7.7-15.2 fl oz	0.19 + 02 to 0.37 + 04	Apply as a directed spray to vines that have been established 2 years or longer. Zeus provides control of yellow nutsedges (see label) as well as broadleaf and grass weeds. For optimum PRE control of annual grasses tank mix Zeus with oryzalin. If applying in a band and 50% or less of the vineyard is treated Zeus may be applied twice within a 12 month period. Allow 60 days or more between applications. Zeus has a 3 day PHI. Tank mix with paraquat, glyphosate, or glufosinate for non-selective POST weed control.

COMMERCIAL GRAPE (MUSCADINE AND BUNCH) WEED CONTROL

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE			
<i>pendimethalin</i> Prowl H ₂ O 4 lb/gal	2-6 qt	2-6	Use for control of annual grasses and small seeded broadleaf weeds. DO NOT apply to newly planted vines until the soil has settled and no cracks are present. Apply to dormant vines (new transplants and one year old vines). DO NOT apply to newly planted vineyards if buds have started to swell. Apply before annual weeds emerge in the spring. Rainfall or irrigation (at least 0.5") within 7 days of application is necessary for effective weed control. In bearing vineyards Prowl may be applied anytime after harvest, through winter, and in the spring. Use rate cannot exceed 6 qt/A/year. Prowl H₂O has a 90 day PHI.
<i>oryzalin</i> Surflan 4AS 4 lb/gal oryzalin 4 lb/gal + <i>simazine</i> Princep, Simazine 90DF Princep, Simazine 4L	2-4 qt + 2.2-4.4 lb 2-4 qt	2-4 2-4	Use for broadspectrum preemergence weed control in vineyards where plants have been established for 3 years. DO NOT use on sandy, loamy sand, or gravelly soils. Tank mix with paraquat, glufosinate or glyphosate for control of emerged weeds.
<i>rimsulfuron</i> Matrix 25WG Pravin 25WG Solida 25WG	4 oz	063	Rimsulfuron has PRE and POST activity on broadleaf and some grass weeds. For broad spectrum residual control Matrix should be tank mixed with oryzalin or duiron. It should be tank mixed with glyphosate, paraquat, or glufosinate for non-selective POST weed control. DO NOT treat vineyards established <1 year. Rainfall is necessary for activation. DO NOT apply within 14 days of harvest. Rimsulfuron may be applied as sequential applications so long as total use rate does not exceed 4 oz/A/year and application is made in a band that is <50% of the vineyard floor.
POSTEMERGENCE			
<i>paraquat</i> Firestorm Paraquat Concentrate Parazone 3 lb/gal	1.75-2.7 pt	0.6-0.9	Use for broad spectrum, contact control of emerged weeds. Apply as directed spray in high spray volume (20+ gpa) with 1 qt surfactant/100 gal of spray solution. Apply when weeds are succulent and 1-6" tall. DO NOT allow spray drift to contact foliage or green cane tissue, since severe damage may occur. May be tank mixed with certain preemergence herbicides for postemergence and residual weed control.
Gramoxone SL 2 lb/gal	2-4 pt		
<i>glufosinate</i> Reckon Rely 280SL Lifeline 2.34 lb/gal	48-82 oz	0.88-1.5	Use for broad-spectrum control of emerged weeds and grasses, both annuals and perennials. Apply as a directed spray on bearing and non-bearing vines in a high volume (20+ GPA) spray. Possesses contact and limited systemic activity, but does well on wild brambles and certain perennial grasses. DO NOT allow spray drift to contact foliage or green cane tissue, since severe damage may occur. May be tank mixed with certain preemergence herbicides for postemergence and residual weed control. Does not have soil residual activity. DO NOT make more than 3 applications/year. Glufosinate may be used for sucker control. See supplemental label for details.

COMMERCIAL GRAPE (MUSCADINE AND BUNCH) WEED CONTROL

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE			
<i>glyphosate</i> Various brands and formulations	See label for rate	0.75-2	Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray, contacting only mature bark of the main trunk. DO NOT allow spray to contact foliage or green bark of vines. Use low rate for control of annual weeds less than 12" tall. Refer to label for rates to control specific perennial weeds. Allow a minimum of 14 days between last application and harvest. Some difficult to control perennial weeds may require higher rates. Refer to label for rate and application timing for certain perennial weeds. Applying glyphosate in spray volumes of 25 gal/A or less is recommended for optimum results. Generic glyphosate formulations may require surfactant. Tank mix with residual herbicides for postemergence and preemergence weed control. Reduced rates may be used to suppress the growth of perennial grass sod between rows. See label for details.
<i>clethodim</i> Select 2 lb/gal Arrow Volunteer Select Max 1 lb/gal Intensity One 1 lb/gal	6-8 oz 12-1 6 oz	0.095-0.125	Use for control of annual and perennial grasses in NON-BEARING vines that will not be harvested within 1 year of application. Use higher rates for perennial grasses. The addition of a non-ionic surfactant containing at least 80% ai at 1 qt/100 gal of spray solution (0.25% v/v) is required for optimum results. Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8 runners; annual grasses: 2-8" tall. Does not control nutsedge(s). Sequential applications may be necessary to control perennial grass weeds.
<i>fluzifop</i> Fusilade DX 2 lb/gal	1-1.5 pt	0.25-0.375	Use for POST control of annual and perennial grasses. Low spray volumes generally improve control. Add crop oil concentrate (1 qt/acre). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8" runners; annual grasses: 2-8" tall. Does not control nutsedge(s). Sequential applications may be necessary to control perennial grass weeds. DO NOT apply within 50 days of harvest.
<i>sethoxydim</i> Poast 1.5 lb/gal	1-1.5 pt	0.23-0.34	Use for control of annual and perennial grasses under BEARING and non-bearing vines. Low spray volumes (10 gpa) generally improve control. Add crop oil concentrate (1 qt/A). DO NOT use more than 5 pt/A/season and the last application must be made at least 50 days prior to harvest. Use lower rates on annual grasses up to 6" tall; higher rates on larger annual grasses and perennial grasses. Sequential applications may be necessary for control of perennial grass weeds. Does not control nutsedge(s).
<i>carfentrazone</i> Aim 2EC 2 lb/gal	1-2 oz	0.016-0.031	Apply using hooded application equipment designed to totally enclose spray pattern preventing spray deposition on green stems, leaf tissues, flowers, or fruit of the crop. Aim may be used alone or tank mixed with other herbicides. Aim controls cocklebur, pigweed, nightshade, velvetleaf, carpetweed, spreading dayflower, and tropical spiderwort. DO NOT apply within 3 days of harvest. Apply in a minimum spray volume of 20 GPA. Apply in combination with a non-ionic surfactant (1 qt/100 gal of spray solution) or crop oil concentrate (1 gal/100 gal of spray solution). See label for tank mix instructions. DO NOT use on newly transplanted vines. See label for details regarding its use for sucker management.

COMMERCIAL PECAN INSECT CONTROL (BEARING TREES)

Will Hudson, Extension Entomologist

ORCHARD SURVEY PROCEDURES

Insect and mite infestation levels should be estimated at least weekly based on thorough orchard sampling. Sample trees in all segments of each orchard. A good method is to sample every fourth tree in every fourth tree row (about 10% of the trees). Sample each major cultivar represented in the orchard. Sample a minimum of 10 terminals per tree. Check all the compound leaves and the nut clusters on each terminal. Check as high in the tree as possible. Foliar pest counts should be made on compound leaves surrounding the nut clusters. Nut clusters should be inspected carefully for the presence of pests or damage. Hickory shuckworm and pecan weevil populations should be monitored by survey traps and knockdown sprays or a combination of these methods.

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Phylloxera	<i>chlorpyrifos</i> 4E Lorsban, Chlorphos	1B	2 pt	24 H/ --	Treat trees with a recent history of heavy infestation and surrounding trees. Apply at budbreak with the first prepollination spray. Note: Other imidacloprid formulations are available. Read labels carefully to find the proper rate.
	Centric 40WG	4A	2-2.5 oz	12 H/ --	
	Provado 1.6F	4A	3.5 oz	12 H/ --	
	Trimax Pro	4A	1.3-2.6 oz	12 H/ --	
Spittlebugs	<i>imidacloprid</i> Trimax, Provado, many generics	4A	See label <i>Several formulations are available</i>	12 H/ --	Spittlebug infestations are easily recognized by the white, frothy masses on terminals or nut clusters. Definite thresholds have not been established and treatment is seldom needed. Many generic imidacloprid formulations are available.
Pecan Nut Casebearer	<i>chlorpyrifos</i> 4E Lorsban, Chlorphos	1B	1.5 pt	24 H/ --	Light infestations causing occasional damage do not require control in normal crop years. The most serious damage usually occurs in mid May. Adult emergence should be monitored with pheromone traps. Place traps in orchards by mid April. Begin sampling for nut casebearer in the first week of May. Pay particular attention to orchards not under a spray program the preceding year and orchards with a recent history of nut casebearer problems. Try to time sprays to stop injury before more than one nut per cluster is infested. Make a second application one week later if infestations are heavy. Additional applications may also be needed for second generation nut casebearers in mid June. Several pyrethroid insecticides, including Ammo, Asana, and Fury are labeled for nut casebearer control. It is suggested that they not be used for control of first generation nut casebearers (in May) to avoid aphid exposure to these materials and to conserve beneficial insect populations. (see Special Considerations section.) DO NOT apply more than 1 application, no more than 27 oz/A/season.
	BeltSC	28	3-4 oz	12 H/ --	
	Intrepid 2F	18	4-8 oz	4 H/ --	
	Spintor 2SC	5	4-10 oz	4 H/ --	
	Dimilin 2L	15	8-16 oz	12 H/ --	
	<i>clothianadin</i> Belay	4A	3-6 oz	12 H/ --	
	<i>methoxyfenozide</i> + <i>spinetoram</i> Intrepid Edge		4-6.4 oz		
	<i>tolfenpyrad</i> Apta		17-27 oz		

COMMERCIAL PECAN INSECT CONTROL

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Mites	<i>abamectin</i> Agri-Mek SC and others	6	2.25-4.25 oz	12 H/ --	A non-ionic surfactant or horticultural oil MUST be added to the tank.
	Acramite 4SC	Unclassified	12-16 oz	12 H/ --	Mites, especially the pecan leaf scorch mite, are normally late season pests. Mite damage appears as bronzed, scorched areas on the undersides of leaflets. Scorched areas begin at the leaflet midribs then spread out toward leaflet margins. Mites often build up on low limbs in the shaded, interior portions of trees then spread rapidly up and out. For heavy infestations, repeat the application in 5 to 7 days. Savey is an ovicide, and should be tank-mixed with an adulticide. Zeal is primarily an ovicide/larvicide.
	Envidor 2SC	23	14-18 oz	12 H/ --	
	Portal	21A	2 pt	12 H/ --	
	<i>pyridaben</i> Nexter	21	5.2-10.67 oz	24 H/ --	
	Savey 50DF	10A	3-6 oz	12 H/ --	
	Zeal	10B	2-3 oz	12 H/ --	
Yellow Aphids	FOLIAR APPLICATIONS				
Assail 30SG	4A	2.5-9.6 oz	12 H/ --		
<i>clothianidin</i> Belay	4A	3-6 fl oz	12 H/ --		
<i>flonicamid</i> Beleaf, Carbine	9C	2-2.8 oz	12 H/ --		
<i>imidacloprid</i> Provado, many generics	4A	See label	12 H/ --		
<i>pymetrozine</i> Fulfill	9B	4 oz	12 H/ --		
<i>pyridaben</i> Nexter	21	5.2-10.67 oz	24 H/ --		
<i>sulfoxaflor</i> Closer		1.5-2.75 oz			
<i>thiamethoxam</i> Centric	4A	2-2.5 oz	12 H/ --		
<i>tolfenpyrad</i> Apta	21A	17-27 oz	12 H/ --		
	SYSTEMIC APPLICATIONS				
Admire Pro	4A	7-14 fl oz	12 H/ --		

COMMERCIAL PECAN INSECT CONTROL

PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	TIMING AND REMARKS
Black Pecan Aphid	SAME INSECTICIDES AS FOR YELLOW APHIDS or <i>chlorpyrifos</i> Lorsban, generics	1B	Check label	24 H/ --	Black pecan aphids may cause damage as early as May but are usually a serious problem only in late season. Damage appears as yellow spots on leaflets. Damaged spots later turn brown and 2 to 4 damaged spots per leaflet can cause leaflet drop. Carefully check all compound leaves on 10 terminals per tree, on at least 10 trees per orchard for the presence of black pecan aphids. Prior to July 1, treat if 25% of terminals have 2 or more black aphids. After July 1, treat if 15% of terminals have more than one black aphid and nymph clusters are found. Concentrate checks on susceptible cultivars such as Schley, Sumner and Gloria Grande. Be sure to check all compound leaves on each terminal examined.
Hickory Shuckworm	Belt SC	28	3-4 oz	12 H/ --	Shuckworms are active throughout the season but do not cause significant damage until June or later. Prior to shell hardening, larval feeding causes nuts to drop. After shells harden, feeding causes shucks to stick to the shells, reducing quality. If orchards have a history of shuckworm infestation, a spray should be applied in early June. In early August, 2-3 additional sprays should be applied. Initiate August sprays at half-shell hardening and repeat at 2-week intervals until shuck split if shuckworm activity continues. Chlorpyrifos and pyrethroids (Asana, Ambush, Mustang, etc.) applied for other pests will also control shuckworm. It is not necessary to spray in August if pecan weevil controls are applied. Please note the Special Considerations section regarding the use of pyrethroid materials.
	<i>chlorpyrifos</i> 4E Lorsban, Chlorfos	1B	1-14 pt	24 H/ --	
	<i>clothianadin</i> Belay	4A	3-6 oz	12 H/ --	
	Dimilin 2L	15	8-16 oz	12 H/ --	
	Intrepid 2F	18	4-8 oz	4 H/ --	
	<i>methoxyfenozide + spinetoram</i> Intrepid Edge	5 & 18	4-6.4 oz	4 H/ --	
	<i>tolfenpyrad</i> Apta	21A	17-27 oz	12 H/ --	DO NOT apply more than 1 application, no more than 27 oz/A/season.
Pecan Weevil	Carbaryl 80S Sevin	1A	3 lb	24 H/ --	Pecan weevil emergence may extend from July into October. Peak emergence is normally between August 10 and September 20. Emergence should be monitored in each infested grove with traps, knockdown sprays or a combination of these methods. Trees known to have a recent history of weevil problems should be selected for monitoring. If excessive nut drop results from pecan weevil feeding punctures before pecan shells begin to harden, spray at once. After pecan shells harden and nuts reach the “dough” or “gel” stage, treat when weevils emerge (especially following rains) and continue at 7 to 10 day intervals until emergence stops. APHID OR MITE POPULATIONS MAY BUILD UP WHERE CARBARYL IS USED. If these pests become a problem, apply aphicides or miticides as previously directed. <u>Note:</u> Several pyrethroids, (Asana, Ammo, Baythroid, Brigade, Mustang Max) as well as Imidan are labeled for pecan weevil control. If these materials are used for weevils, they can be expected to be most effective where weevil populations are low. They may be adequate to prevent feeding injury from weevils emerging prior to shell hardening but their use could be risky under heavy weevil pressure after nuts reach the gel stage and are subject to weevil oviposition. (See Special Considerations section).
	Carbaryl 4F Sevin XLR	1A	4-5 qt	24 H/ --	
	Various pyrethroids				

COMMERCIAL PECAN INSECT CONTROL

KERNAL FEEDING HEMIPTERANS

(Stink bugs and Plant bugs)

A complex of true bugs (stink bugs and plant bugs) attack pecan. They may be present in orchards all year but normally cause their most serious injury from late August through September. Prior to shell hardening, feeding injury causes nut drop. After shell hardening, their feeding causes black, bitter spots on kernels, reducing quality. They can continue to feed, through the hardened shells, until nuts are harvested. The presence and numbers of stink bugs and plant bugs should be noted in surveys throughout the season. Special attention should be paid to the true bugs in late-season orchard surveys. Treat when 1 stink bug is found per 40 terminals OR when 5 or more are found per knockdown spray on a sheet covering 20% of the area under a tree. Sprays for these insects are difficult to time properly because the bugs move in and out of orchards. Close checking is required to detect damaging populations. No materials have consistently given excellent stink bug control, possibly due to the difficulty in timing sprays. The pyrethroids are labeled for stink bug control. Please note the pre-harvest use restrictions of the products.

FIRE ANTS

Fire ants have been known to protect pecan aphids by destroying beneficial insects in pecan orchards. Fire ants should be controlled or at least kept out of pecan trees. Lorsban 4E at 2 pts./Acre as a ground spray is labeled for fire ant control. Best approach is probably applying an ant bait in late spring.

SCALE INSECTS

Scale populations build slowly, but can reach damaging levels before becoming obvious. Examine fallen limbs carefully during the season for scale presence. Preferred treatment is 1%-2% horticultural oil spray, applied in November-December and again in February. For severe problems an application of Esteem in June may be necessary.

OTHER INSECT PESTS

Pests such as pecan leaf casebearer, leaf miners, walnut caterpillar, fall webworm, pecan budmoth, nut curculio, shoot curculio, Prionus root borers and others may occasionally cause economic injury to pecan. Growers should be able to identify these pests and their damage. Color photographs of all pecan pests and their injury can be found in the Southern Pecan Growers Handbook and online from the UGA Extension pecan team (Google search 'ugapekans'). The publication is available at \$30 per copy. For ordering information, visit: <http://extension.uga.edu/publications/for-sale.cfm>. Specific controls for occasional pests not covered in this spray guide can be obtained from your local county agent.

SPECIAL CONSIDERATIONS

Alternative Formulations. Some pesticides listed in this publication are available in formulations other than the ones listed. If different formulations are used, apply an equivalent amount of actual toxicant per acre.

Pest Resistance and Chemical Use. The aphids and mites which attack pecan have demonstrated the ability to become resistant to insecticides applied for their control. The rate at which this resistance develops depends upon the chemical used, the frequency of use, the duration of use, and the rates used. Aphid and mite exposure to effective materials should be minimized to prolong the effective life of the chemicals. It is suggested that no insecticide be applied until it is absolutely necessary (this can be determined by thorough sampling) and that chemicals be alternated as much as possible. Resistance to neonicotinyl insecticides has developed in some areas for both yellow- and black-margined pecan aphids. This class of insecticides includes imidacloprid, thiamethoxam, acetamiprid, and clothianidin. These materials no longer provide adequate control of resistant populations. Aphid and mite populations may flare following application of Sevin or pyrethroids. Growers should be alert for this response, and limit applications of these materials to the minimum necessary for weevil or stink bug control.

Supplemental Control Measures. Beneficial insects such as lady beetles and lacewings provide natural assistance in suppressing aphid and mite populations. Beneficials are of particular value in early season. Elimination of unneeded early-season insecticide sprays conserves existing populations of beneficial insects and reduces the potential for severe aphid problems later in the season. The planting of leguminous cover crops in tree-row middles promotes the build up and retention of lady beetle populations in orchards. Crimson clover and Hairy vetch appear to be two of the best ground covers. If leguminous ground covers are planted, a herbicide strip should be maintained down each tree row and special attention should be paid to the increased water requirements that are likely to exist. Extraneous plant material resulting from the heavy growth of legumes must be removed or broken down prior to harvest or implementation of a program of row middle vegetation suppression (see Weed Control section).

COMMERCIAL PECAN INSECT AND DISEASE SPRAY GUIDE

(NON-BEARING TREES)

Will Hudson, Extension Entomology, and Jason Brock and Tim Brenneman, Department of Plant Pathology

FOLIAR SPRAYS

TIME OF APPLICATION	PEST	PESTICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	INSTRUCTIONS AND REMARKS
Bud Break when first buds open.	Foliar disease	Fungicide + <i>chlorpyrifos</i> Chlorphos, Lorsban	1B	+ half rate 1-2 pt 4-8 oz	24 H/ --	Spray sufficient gallonage for thorough coverage. For fungicide options, refer to the Prepollination section for Pecan Disease Control.
	Pecan bud moth	<i>flubendiamide</i> Belt SC	28	3-4 oz	12 H/ --	
		Intrepid 2F	18	3-4 oz	4 H/ --	
		<i>methoxyfenozide</i> + <i>spinetoram</i> Intrepid Edge	5 & 18	4-6.4 oz	4 H/ --	
	Hickory shoot curculio	<i>chlorpyrifos</i> Lorsban, Chlorphos, etc.	1B	1.5 -2 pt	24 H/ --	Apply sprays for shoot curculio at bud-break on the earliest cultivars and repeat at 10-14 day intervals.
Cover Sprays three weeks after bud-break spray and every 4-6 weeks as needed.	Foliar disease	Fungicide + <i>chlorpyrifos</i> Chlorphos, Lorsban	1B	See above + 1-2 pt	24 H/ --	Spray sufficient gallonage for thorough coverage.
	Pecan bud moth	Belt SC		3-4 oz		
		Dimilin 2L		8-16 oz		
		Imidan 70WSP		1.5 lb		
		Intrepid 2F		4-8 oz		

PECAN CHEMICALS: PRE-HARVEST INTERVALS AND OTHER RESTRICTIONS

CHEMICAL	MOA	REI/PHI (Hours or Days)	TIMING AND REMARKS
Acramite 4 SC	Undetermined	12/ 14 D	Only 1 spray per year.
Admire	4A	12 H/ --	Apply to soil between May 15 and July 15. Apply only to orchards that have been established on trickle irrigation for at least 5 years. DO NOT apply more than 32 fl oz of Admire per acre per season as a soil application. DO NOT apply more than 0.5 lb ai of Admire or Provado/A/season.
Ammo		--/ 21 D	Up to 0.8 lb ai/A/season may be applied prior to shuck split. DO NOT graze or feed cover crops.
Asana		--/ 21 D	DO NOT feed or graze livestock on treated orchard floors. DO NOT exceed 0.3 lb ai/A/season. DO NOT mix with fungicides containing triphenyltin hydroxide.
Assail	4A	12 H/ 14 D	DO NOT apply more than 4 times per season, nor more often than every 7 days.
Baythroid		--/ 14 D	No more than 2.8 fl oz/A/season.
Belay	4A	12 H/ 21 D	No more than 12 oz/season. DO NOT graze.
Belay	4A	12 H/ 21 D	DO NOT apply more than 12 fl oz/season.
Belt SC	28	12 H/ 14 D	No more than 4 oz per 7 days nor more than 12 oz/season.
Carbaryl	1A	24 H/ 14 D	DO NOT apply more than a total of 15 qt/season.
Centric	4A	12 H/ 14 D	DO NOT exceed 5 oz/A/season. Allow at least 7 days between applications.
Closer		--/ 7 D	No more than 4 applications per season, and no more than 2 consecutive applications.
Desperado		--/ 7 D	No more than 2.2 gal/season; no aerial application.
Dimethoate		--/ 21 D	DO NOT graze livestock in treated groves.
Elast F			DO NOT apply after shucks open. DO NOT graze treated areas.
Enable		--/ 28 D	DO NOT apply after shuck split. DO NOT apply more than 48 oz/A. DO NOT graze treated areas.
Endosulfan*			DO NOT apply after shuck split. DO NOT graze livestock in treated groves. DO NOT exceed 2 applications per year or 4 qt/A/year.
Envidor	23	12 H/ 7 D	Maximum of 1 application per season.
Fury/Mustang		--/ 21 D	DO NOT apply more than 0.3 lb ai/A/season or after shuck split. DO NOT graze or cut treated cover crops for feed.
Headline		--/ 14 D	DO NOT apply more than 28 fl oz/A/season.

PECAN CHEMICALS: PRE-HARVEST INTERVALS AND OTHER RESTRICTIONS

CHEMICAL	MOA	REI/PHI (Hours or Days)	TIMING AND REMARKS
Imidan		3 D/ 14 D	<u>DO NOT</u> graze livestock in treated groves.
Intrepid	18	18/ 14 D	<u>DO NOT</u> graze livestock in treated areas or feed cover crops grown in treated areas. <u>DO NOT</u> apply more than 10 fl oz/application or 64 oz/season.
Kelthane		--/ 7 D	Applicators must be in enclosed cabs or cockpits.
Lorsban, Chlorphos	1B	24 H/ 28 D	<u>DO NOT</u> allow livestock to graze in treated orchards. Make no more than 5 applications per season.
Nexter	21A	24 H/ 7 D	No more than 10.67 oz/application nor more than 2 applications per season. No aerial applications.
Portal	21A	12 H/ 14 D	No more than one application per season.
Propimax			<u>DO NOT</u> apply after shuck split. <u>DO NOT</u> graze livestock in treated areas or cut treated areas for feed. <u>DO NOT</u> apply more than 32 fl oz/A/season.
Provado	4A	12 H/ --	<u>DO NOT</u> apply more than 28 fl oz of Provado/A/year. <u>DO NOT</u> apply more than a total of 0.5 lb ai of Provado or Admire/A/season.
Quilt		--/ 45 D	<u>DO NOT</u> apply after shuck split. <u>DO NOT</u> graze livestock in treated areas or cut treated areas for feed. <u>DO NOT</u> apply more than 122 fl oz/A/season.
Savey	10A	12 H/ --	<u>DO NOT</u> graze livestock in treated areas. Only one application per season may be made.
Sovran		--/ 45 D	<u>DO NOT</u> apply more than 25.6 fl oz/A/season.
Stratego		--/ 30 D	<u>DO NOT</u> apply after shuck split. <u>DO NOT</u> apply more than 30 fl oz/A/season.
Sulfur			No time limitations.
TPTH			<u>DO NOT</u> use more than 45 oz (36 oz ai) of product per season. <u>DO NOT</u> apply after shucks begin to open. <u>DO NOT</u> graze dairy or meat animals in treated groves.
Topsin M			<u>DO NOT</u> apply after shuck split. <u>DO NOT</u> graze livestock in treated areas or cut treated areas for feed. <u>DO NOT</u> apply more than 3 lb/A/season.
Trimax Pro	4A	12 H/ 7 D	Maximum of 10.1 oz/A allowed per crop season. Allow at least 10 days between applications.
Zeal	10B	12 H/ 28 D	Maximum of 1 application per season.

**DO NOT graze livestock in treated groves where prohibited or until grazing restrictions have been met.

PECAN DISEASE CONTROL

Jason Brock and Tim Brenneman, Department of Plant Pathology

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
PREPOLLINATION APPLICATIONS: Every 10-14 Days From Bud Break Through Nut Set					
Scab; Downy Spot	<i>azoxystrobin</i> Abound Azaka	11	6-12 fl oz	4 H/ 45 D	
	<i>difenoconazole + azoxystrobin</i> Quadris Top	3 + 11	10-14 fl oz	12 H/ 45 D	
	<i>dodine</i> Elast 400F + FRAC group 3 fungicide	U12 + 3	25 fl oz + half rate	48 H/ Do not apply after shuck split	<u>DO NOT</u> use Elast on Moore, Van Deman, Barton, or Shawnee.
	<i>dodine</i> Elast 400F + TPTH	U12 + 30	25 fl oz + half rate	48 H/ Do not apply after shuck split or within 30 D of harvest	<u>DO NOT</u> use any surfactant with Elast. <u>DO NOT</u> use Elast with foliar zinc treatments.
	<i>fenbuconazole</i> Enable 2F	3	8 fl oz	12 H/ Do not apply after shuck split or within 28 D of harvest	
	<i>kresoxim-methyl</i> Sovran	11	2.4-3.2 fl oz	12 H/ 45 D	
	<i>metconazole</i> Quash	3	2.5-3.5 oz/A	12 H/ 25 D	<u>DO NOT</u> make more than 4 applications per season.
	<i>phosphorous acid</i> Phostrol ProPhyt FungiPhite Reliant	33	2-5 pt 2-3 pt 2-3 pt 4 pt	4 H/ --	For best control apply in 100 gpa by ground. <u>DO NOT</u> apply in consecutive applications. The phosphite (phosphorous acid-based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season.
	<i>phosphorous acid + tebuconazole</i> Viathon	33 + 3	2-2.5 pt	12 H/ 0 D	The phosphite (phosphorous acid-based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season.

PECAN DISEASE CONTROL

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
PREPOLLINATION APPLICATIONS: Every 10-14 Days From Bud Break Through Nut Set					
Scab; Downy Spot (continued)	<i>propiconazole</i> Orbit Propimax EC Bumper 41.8EC	3	6-8 fl oz	12 H/ Do not apply after shuck split	Additional generic products could also be labeled for use on pecan. Before using any product, check the label.
	<i>propiconazole + azoxystrobin</i> Quilt Quilt Xcel	3 + 11	14-27.5 fl oz 14-21 fl oz	12 H/ Do not apply after shuck split or within 45 D of harvest	Use higher rates when disease pressure is severe.
	<i>pyraclostrobin</i> Headline	11	6-7 fl oz	12 H/ 14 D	
	<i>tebuconazole</i> Folicur 3.6F Tebuzole 3.6F Monsoon Orius 3.6F Toledo 3.6F	3	6-8 fl oz	12 H/ Do not apply after shuck split	For best results, tank mix tebuconazole with a surfactant. <u>DO NOT</u> add a surfactant if mixing with other fungicides.
	<i>tebuconazole + azoxystrobin</i> Custodia	3 + 11	8.6-17.2	12 H/ 45 D	
	<i>tebuconazole + trifloxystrobin</i> Absolute	3 + 11	5-7.67 fl oz	12 H/ Do not apply after shuck split or within 30 D of harvest	
	tetraconazole + triphenyltin hydroxide Minerva Duo	3 + 30	16 oz	48 H/ 30 D	Do not make more than 5 applications per season.
	<i>thiophanate methyl</i> ² (Topsin M) + TPTH or + Elast	1 30 U12	1 lb + half rate or + 25 fl oz	3 D/ Do not apply after shuck split	When conditions are very favorable for scab, use Topsin plus a full rate of TPTH or Elast.
	<i>triphenyltin hydroxide</i> (TPTH) ¹ + FRAC group 3 fungicide	30 + 3	half rate ² + 4 fl oz	48 H/ 30 D	
Anthracnose	Anthracnose is a disease with a long latent period; symptom expression occurs many weeks after infection. Fungicides used for control of scab have been effective in suppressing anthracnose.				
POSTPOLLINATION APPLICATIONS: Every 10-21 Days From Nut Set To Shell Hardening					
Scab	<i>difenoconazole + azoxystrobin</i> Quadris Top	3 + 11	10-14 fl oz	2 H/ 45 D	
	<i>dodine</i> Elast 400F	U12	50 fl oz	48 H/ Do not apply after shuck split	
	<i>dodine</i> Elast 400F + FRAC group 3 fungicide ³	U12 3	25 fl oz + 4-6 fl oz	48 H/ Do not apply after shuck split	For any tank mix combination of Elast, TPTH, or a group 3 fungicide, the rates provided are the lowest recommended and will provide excellent control of scab under most conditions. When disease pressure is elevated, the rate of either mixing partner can be increased.
	<i>dodine</i> Elast 400F + TPTH	U12 30	25 fl oz + half rate ²	48 H/ Do not apply after shuck split	<u>DO NOT</u> use any surfactant with Elast.

PECAN DISEASE CONTROL

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
POSTPOLLINATION APPLICATIONS: Every 10-21 Days From Nut Set To Shell Hardening					
Scab (continued)	<i>phosphorous acid</i> Phostrol ProPhyt Viathon FungiPhite Reliant	33	2-5 pt 2-3 pt 2 pt 2-3 pt 4 pt	4 H/ --	For best control, apply in 100 gpa by ground. <u>DO NOT</u> apply in consecutive applications. The phosphite (phosphorous acid-based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season. Use the highest labeled rate; tank-mix with other fungicides on highly susceptible cultivars
	<i>phosphorous acid + tebuconazole</i> Viathon	33 + 3	2-2.5 pt	12 H/ 0 D	The phosphite (phosphorous acid-based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season. Use the highest labeled rate; tank-mix with other fungicides on highly susceptible cultivars
	<i>propiconazole + azoxystrobin</i> Quilt Quilt Xcel	3 & 11 3 & 11	20-28 fl oz 20-21 fl oz	12 H/ Do not apply after shuck split or within 45 D of harvest	
	<i>tebuconazole⁴ + trifloxystrobin</i> Absolute	3 & 11	5-7.67 fl oz	12 H/ Do not apply after shuck split or within 30 D of harvest	
	tetraconazole + triphenyltin hydroxide Minerva Duo	3 + 30	16 oz	48 H/ 30 D	Do not make more than 5 applications per season.
	TPTH + FRAC group 3 fungicide	30 + 3	half rate + 4-6 fl oz	48 H/ 30 D	Increasing the rate of a Group 3 fungicide will be important if reduced sensitivity is known or suspected.
	<i>triphenyltin hydroxide (TPTH)¹</i> Agri Tin Agri Tin Flowable Super Tin 80WP Super Tin 4L	30	7.5 oz 12 fl oz 7.5 oz 12 fl oz	48 H/ 30 D	
	<i>ziram</i> Ziram		6-8 lb	48 H/ 55 D	Ziram as a multi-site alternative in cases where resistance to other protectants is an issue.

PECAN DISEASE CONTROL

Powdery Mildew	For powdery mildew, the scab fungicide program can be adjusted if needed. The FRAC group 3 fungicides or mixes containing FRAC 3 fungicides are the best options. Combining sulfur (4-6 lb/A) with fungicides used for scab control is also an option. <u>DO NOT</u> mix sulfur with Elast.
Zonate Leaf Spot	For zonate leaf spot, the scab fungicide program can be adjusted if needed. The FRAC group 3 fungicides or mixes containing FRAC 3 fungicides are the best options. Topsin M also provides suppression of Zonate leaf spot.
Anthracnose	Anthracnose is a disease with a long latent period; symptom expression occurs many weeks after infection. Fungicides used for control of scab have been effective in suppressing anthracnose.

¹ TPTH is available as Agri Tin, Agri Tin Flowable, Super Tin 80WP, and Super Tin 4L.

² Half rates are 3.75oz for Agri Tin and Super Tin 80WP; 6 fl oz for Agri Tin Flowable and Super Tin 4 L.

³ Thiophanate methyl is available as Topsin M 70WDG, Topsin M 70 WP, and Topsin M WSB, and Topsin M 4.5 FL (20 fl oz rate is equivalent to 1 lb of wettable powder). Topsin XTR is a premix of thiophanate methyl and tebuconazole.

⁴ For tebuconazole, use a minimum of 6 fl oz in tank mixes for nut scab control.

NOTE: In orchards where any nuts have any amount of scab by mid-June or in orchards where 10% or more of the nuts have any amount of scab by early July, the following measures should be taken.

1. The interval between fungicide sprays should not exceed 14 days until shell hardening.
2. On varieties with a summer growth flush, the spray interval should be closed so that no more than 10 days pass from the onset of the growth flush until a fungicide spray is made.
3. If the 5-day forecast shows the probability for several days of rain, close the interval to have as much acreage as possible treated within 7 days of the storm.

After Shell Hardening: Fungicide coverage for crop protection is necessary to shell hardening. Beginning in early August, monitor for shell hardening and adjust fungicide needs accordingly.

Foliar diseases: Maintaining leaf health past shell hardening is important. If leaf scab, zonate leaf spot, or another foliar disease is of concern, refer to the previous sections for fungicide options and recommendations. Pay attention to use limitations and fungicide resistance management guidelines. DO NOT use Topsin in consecutive applications for leaf disease control.

DISEASE	CHEMICAL & FORMULATION	MOA	RATE/ACRE	REI/PHI (Hours or Days)	COMMENTS
Phytophthora Shuck and Kernel Rot	A treatment is advised in orchards with a history of this disease (primarily Houston, Peach, and Macon Counties) when wet weather and warm temperatures <86 °F occur between shell hardening and shuck split.				
	TPTH	30	full rate		
	<i>phosphorous acid</i> Fosphite Fungi-Phite KPhite Phiticide Phostrol Rampart Topaz	33	1-2 qt	4 H/ --	The phosphite (phosphorous acid based) fungicides listed are EPA approved and considered to be very safe products. However, there is currently an unresolved issue regarding potential residues of these products in tree nuts exported to the EU. This affects only nuts exported to the EU, but growers who know their crop is going to that market may want to consider not using phosphite fungicides until this issue is resolved. Check labels for potential limitations on maximum number of applications or amount of active ingredient allowed per season.
	MOA Group 11 fungicides	11	full rate		
	<i>copper hydroxide</i> Kocide 3000 Kocide 2000	M1	0.75-1.75 lb 1.5-3 lb	48 H/ --	Use higher rates when disease pressure is high and large, mature trees.

Restrictions and Fungicide Resistance Management Recommendations

- Follow label instructions for proper use of all fungicide products, including safe handling, tank mixing, application method, and resistance management.
- DO NOT apply more than 32 fl oz of propiconazole/A/season.
- DO NOT apply more than 32 fl oz of tebuconazole/A/season.
- DO NOT apply more than 1.5 qt of fenbuconazole/A/season.
- DO NOT use more than 45 oz of Agri Tin or Super Tin 80 WP or 72 fl oz of Agri Tin Flowable or Super Tin 4 L/A/season.
- DO NOT apply more than 1.6 lb (25.6 oz) of kresoxim methyl/A/season.
- DO NOT use Elast full season.
- If using a group 3 fungicide alone prepollination, DO NOT use mixes containing a group 3 fungicide postpollination.
- DO NOT make more than 2 sequential and 3 total applications of group 11 fungicides.
- DO NOT apply more than 3 lb of thiophanate methyl (2.1 lb ai)/A/season.

COMMERCIAL PECAN WEED CONTROL

Wayne Mitchem, Extension Associate, Weed Science
A. Stanley Culpepper, Extension Agronomist, Weed Science

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE			
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS	2-6 qt	2-6	Use on non-bearing and bearing trees for control of annual grasses and small seeded broadleaf weeds. Use low rate for short-term control (2-4 months); high rate for long-term control (8-12 months). DO NOT apply to newly transplanted trees until soil has settled and no cracks are present. Apply before annual weeds emerge in the spring or add paraquat, Rely, or glyphosate for control of emerged weeds. Sequential applications may be used so long as total use rate does not exceed 12 qt/A/year and there are 2.5 months between applications.
<i>diuron</i> Karmex or Diuron 80DF Direx or Diuron 4L other brands	2-4 lb 1.6-3.2 qt	1.6-3.2	Use for control of annual broadleaf weeds and some annual grasses only under trees established in the orchard at least 3 years . Apply in spring before annual weeds emerge; if weeds are present, then include surfactant to improve contact activity. Make a single band or broadcast application as a directed spray. Use low rate on sandy loam soils. DO NOT use on sand, loamy sand, gravelly soils, or on exposed subsoils. DO NOT use on soils with less than 0.5% organic matter. DO NOT graze treated areas. Add paraquat, glufosinate, or glyphosate for enhanced control of emerged weeds.
<i>simazine</i> Princep, Simazine 90DF Princep, Simazine 4F	2.2-4.4 lb 2-4 qt	2-4	Use for control of annual broadleaf weeds and some annual grasses only under trees established for at least 2 years . Provides good control of annual ryegrass. Use low rates on sandy soils. DO NOT apply to gravelly, sand, or loamy sand soils. DO NOT apply when nuts are on the ground. DO NOT graze treated areas. Add paraquat, glufosinate, or glyphosate for control of emerged weeds.
<i>oryzalin</i> Surflan 4AS Oryzalin 4AS + <i>simazine</i> Princep, Simazine 80W 90DG 4L	2-4 qt + 2.5-5 lb 2.2-4.4 lb 2-4 qt	2-4 + 2-4	Use for broad spectrum annual grass and broadleaf weed control. Provides good control of annual ryegrass. Paraquat, glufosinate, or glyphosate may be used with this tank mix to enhance control of emerged weeds. See remarks and precautions for each product.
<i>norflurazon</i> Solicam 80DF + <i>diuron</i> Karmex 80DF Direx 4L	2.5-5 lb + 2-3.8 lb 1.6-3 qt	2-4 + 1.6-3	Use for broad spectrum annual grass and broad leaf weed control only under trees established in the orchard for at least 3 years. Apply in the spring before annual weeds emerge. See remarks and precautions for each product.
<i>pendimethalin</i> Prowl H ₂ O 4EC Prowl or Pendimethalin 3.3EC	2-6 qt 2.4-7.3 qt	2-6	Control of annual grasses and broadleaf weeds such as pigweeds. Most effective when adequate rainfall or irrigation is received within 7 days after application. DO NOT apply to newly transplanted trees until ground has settled around roots. Sequential applications may be used as long as total use rate does not exceed 6 qt/A and there are 30 days between applications. Prowl H₂O has a 60 day PHI for pecans ; however, other pendimethalin formulations can only be used in non-bearing pecans.

COMMERCIAL PECAN WEED CONTROL

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
PREEMERGENCE			
<i>norflurazon</i> Solicam 80DF	2.5-5 lb	2-4	Use for control of annual grasses, broadleaf weeds, and suppression of some perennials under bearing, non-bearing, or newly set trees. Apply to newly planted trees only after soil has settled around roots, at least 6 months after planting. Avoid contact with roots. Apply in the fall or early spring--fall applications control a broader weed spectrum than spring applications. DO NOT apply when nuts are on the ground at harvest. Use low rate on coarse-textured soils, higher rates on fine-textured soils. Make only 1 application per year. DO NOT graze treated areas. May tank mix with simazine or diuron for broader spectrum weed control. Add paraquat, glufosinate, or glyphosate for control of emerged weeds. DO NOT apply within 60 days of harvest. Sequential applications can be used so long as total use rate does not exceed maximum use rate for soil texture and crop.
<i>rimsulfuron</i> Matrix 25WG Solida 25WG Pravin 25WG	4 oz	0.063	Provide PRE & POST control of broadleaf and annual grass weeds (see label for weed control POST). For broad spectrum residual control tank mix with diuron, oryzalin, or Prowl H ₂ O. Use in orchards established at least 1 year. Rimsulfuron has a 14 day PHI for pecan. Sequential applications may be used so long as there is 30 days between applications and total use rate does not exceed 4 oz/A broadcast basis.
<i>flumioxazin</i> Chateau 51WDG Tuscany 51 WDG	6-12 oz	0.19-0.38	DO NOT apply more than 6 oz/A/application to soils having a sand and/or gravel content > 80%. Tree established less than one year must be shielded with a grow tube or waxed container. DO NOT apply second application within 30 days of initial application. Applications after bud break can only be made with shielded application equipment. Once trees break dormancy apply with paraquat or glufosinate for non-selective postemergence control. Must use shielded application equipment if using in non-dormant pecan trees. Chateau has a 60 day PHI for pecans.
<i>indaziflam</i> Alion 1.67SE	3.5-6.5 oz	0.045-0.085	Use in orchards established 3 years or longer. Sequential applications may be used as long as there are 90 days between applications and total use rate does not exceed 10.3 oz/A/year. Use rate cannot exceed 3.5 fl oz/A/application on soils having less than 1% organic matter. On soils with an organic matter content from 1-3%, no more than 5 fl oz/A can be applied in a single application and the total use rate for the year cannot exceed 8.5 fl oz/A. In order to apply more than 5 fl oz/A in a single application soil organic matter must be >3%. Alion should be tank mixed with glyphosate, glufosinate, or paraquat for non-selective POST weed control. Alion has a 14 day PHI. Do not use on soils having a 20% or greater gravel content.
POSTEMERGENCE			
<i>2,4-D amine</i> Various generic formulations 3.8SL	2-3 pt	1-1.4	DO NOT apply more than twice a year or within 60 days of harvest. Trees must be at least 1 year old. DO NOT allow spray to drift onto or contact foliage, fruit, stems, or trunks of trees. DO NOT apply to bare ground. DO NOT apply on light, sandy soils. Past research has shown concerns of injury when applying 2,4-D on sandy soils, immediately before a large rain and during early bud or leaf break. Extreme caution must be taken to avoid off target movement of 2,4-D. Certain crops, like cotton and vegetables, can be severely injured by 2,4-D drift. Some formulations may limit use rate 2 pt/A. Sequential applications may be used as long as there are at least 30 days between applications. See product label for details.
<i>fluazifop</i> Fusilade DX 2EC 2 lb/gal	8-24 fl oz	0.125-0.38	Use for control of annual and perennial grasses under bearing or non-bearing trees. Sequential applications will be necessary for control of perennial grass weeds like bermudagrass and johnsongrass. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1 qt/A). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8" runners; annual grasses: 2-8" tall. Does not control nut sedge(s). DO NOT apply when harvestable nuts are on the ground. DO NOT graze treated area. DO NOT apply within 30 days of harvest.

COMMERCIAL PECAN WEED CONTROL

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE			
<i>sethoxydim</i> Poast 1.5EC 1.5 lb/gal	1-2.5 pt	0.3-0.5	Use for control of annual and perennial grasses. Sequential applications will be necessary for control of perennial grass weeds like bermudagrass and johnsongrass. Low spray volumes (10 GPA) generally improve control. Add crop oil concentrate (1 qt/A). Use low rate on annual grasses up to 6" tall; higher rates on larger annual grasses and perennial grasses. Does not control nutsedge(s). DO NOT harvest within 15 days of application.
<i>clethodim</i> Select 2.0EC Arrow 2EC Select Max 1 lb/gal Intensity One 1 lb/gal	6-8 fl oz 12-1 6 oz		Use for control of annual and perennial grasses in NON-BEARING trees that will not be harvested within 1 year of application. Use higher rates and sequential applications for perennial grasses. Add a non-ionic surfactant containing at least 80% ai at a rate of 1 qt/100 gal of spray solution (0.25% v/v). Make application to johnsongrass: 12-18" tall; bermudagrass: 3" tall or with 4-8" runners; annual grasses: 2-8" tall. Does not control nutsedge(s).
<i>halosulfuron</i> Sanda 75WDG	0.67-1.33 oz	0.032-0.063	For control of nutsedge, pigweed, radish, and cocklebur. Apply as directed spray under trees established for at least one year. Avoid contact of spray with trunk, stem, roots, or tree foliage. May apply up to 2 applications. DO NOT apply within 1 day of harvest. See label for rate restrictions related to soil texture. Tank mix with glyphosate for broad spectrum control
<i>paraquat</i> Firestorm 3SL Parazone Paraquat Concentrate 3 lb/gal Gramoxone SL 2 lb/gal	1.75-2.7 pt 2-4 pt	0.65-1	Use for broad spectrum, contact control of emerged weeds. Apply as a directed spray in at least 20 gal of water with 1-2 pt surfactant/100 gal of spray mix or 1% crop oil concentrate (1 gal/100 gal spray mix). Apply when annual weeds are succulent and 1-6" tall. DO NOT allow spray drift to contact foliage or green bark of trees since severe damage may occur. DO NOT allow animals to graze on treated areas. May be tank mixed with certain preemergence herbicides for effective residual weed control. DO NOT apply when nuts are on the ground.
<i>glufosinate</i> Reckon 280 Rely 280 Lifeline 2.34 lb/gal	48-8 oz	0.88-1.5	Use for broad spectrum control of emerged weeds and grasses, both annuals and perennials. Apply as a directed spray in high spray volumes on non-bearing and bearing trees. Possesses contact and limited systemic activity, but does well on wild brambles and perennial grasses. Does not have soil residual activity. DO NOT contact foliage or green bark.
<i>glyphosate acid</i> Numerous brands 4SL Roundup Weather Max 5.5SL	1-2 qt 11-46 fl oz	1-2	Use for broad spectrum control of emerged weeds, both annuals and perennials. Apply as a directed spray on bearing and non-bearing trees. DO NOT allow spray to contact foliage, suckers, or green bark of trees. Use low rate for control of annual weeds less than 12" tall. Refer to product label for rates to control specific perennial weeds. Repeat applications may be made. Some glyphosate formulations require the addition of an adjuvant. DO NOT allow glyphosate to contact bark or leaves. Try to avoid applications in late summer and fall. Trees are more sensitive to glyphosate during that time. Allow at least 3 days between last application and harvest.

COMMERCIAL PECAN WEED CONTROL

HERBICIDE	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	
POSTEMERGENCE			
<i>carfentrazone</i> Aim 2 lb/gal	0.5-2 oz	0.008-0.031	Apply alone or tank mix with other herbicides for postemergence control of broadleaf weeds including pigweed, morningglory, lambsquarters and prickly lettuce. DO NOT allow Aim to contact desirable foliage, flowers, or fruit. DO NOT apply within 3 days of harvest. Trees less than 2 years old must be shielded from direct contact with Aim. Sequential applications may be used as long as total use rate does not exceed 7.9 oz/A/year and there are 14 days between applications. Best results obtained when applied to weeds in the 2-3 leaf stage. Apply in combination with a non-ionic surfactant (1 qt/100 gal of spray solution) or crop oil concentrate (1 gal/100 gal of spray solution).
ROW MIDDLE VEGETATION SUPPRESSION			
<i>glyphosate acid</i> Numerous brands 4SL Roundup Weather Max 5.5 S80 WDGL	2-16 fl oz 1.3-5.85	0.06-0.5 0.06-0.25	Use for vegetative suppression in row middles. Apply 1-2 weeks after full green-up of bahiagrass or bermudagrass, or after grass has been mowed to a uniform height of 3-4". Rates should vary depending on vigor of vegetative growth and canopy of the grove, with the higher rates for more vigorous grass stands where less shade occurs. Low spray volumes (10 GPA) improve control. See respective labels for surfactant requirements. Sequential applications can be made to maintain growth suppression and prepare the orchard floor for mechanical harvest. Allow a minimum of 21 days between the last application and harvest.

COMMERCIAL STRAWBERRY WEED CONTROL

Mark A. Czarnota, Extension Horticulture-Weed Science

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PREPLANT (plastic culture)					
<i>carfentrazone</i> Aim EC 2EC Aim EW 1.9EW		0.8-1.5 fl oz	0.013-0.023		For annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply prior to planting or before crop emergence to weeds less than 3". Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt/100 gal of spray mix.
<i>dazomet</i> Basamid 99GR		350 lb	347		For best results apply at soil temperatures of 54-64°F. DO NOT apply at soil temperatures less than 43°F or more than 103°F. Uniformly apply granules to freshly tilled, moist soil with a suitable granular applicator. Activity is reduced at low soil temperatures and at low soil moisture levels. After application seal the soil by watering or by tarp (refer to Basamid label). Aerate soil by cultivation 7-12 days after application. After aeration delay planting 3-7 days, depending on soil temperature, to ensure that no gaseous residues are present. A germination test with radish seeds can be conducted to ensure that harmful residues are not present (see label). DO NOT apply within 3-4 ft of growing plants or closer than the dripline of trees.
<i>Other fumigation options</i>					The fumigant methyl bromide is being phased out and other fumigates are being researched for strawberries, and they include chloropicrin, and combinations with chloropicrin and others. For the latest information on fumigants for strawberries check with University of California or University of Florida agricultural publications. Both of these Universities have very active research programs in this area.
PREEMERGENCE^{1,2,3} (plastic culture)					
<i>DCPA</i> Dacthal W-75		8-12 lb	6-9		Control of most annual grasses and small-seeded broadleaf weeds. Also, controls volunteer small grains if applied before emergence. Apply as a banded preemergence treatment to the middles between plastic before weed emergence. Tank mixture with paraquat will provide pre- and post-emergence weed control. Rainfall or irrigation within 24 hr after application is needed for optimum control.
<i>flumioxazin</i> Chateau 51WDG		3 oz/A	0.09		Excellent product for preemergence weed control. Use 3 oz rate to control weeds in row middles. Must be applied a minimum of 30 days prior to transplanting strawberries into plastic. Do not apply more than 3 oz/A/year.
<i>napropamide</i> Devrinol 50DF		4-8 lb	2-4 lb		For row middle and pre-transplant incorporation. Controls annual grasses and annual broadleaf weeds. Mechanically incorporate or irrigate in to a depth of 2-4". Does not control established weeds. DO NOT apply from bloom to harvest.
<i>oxyfluorfen</i> Goal 2XL		1-2 pt	0.25-0.5		Prior to transplanting crop, apply to soil surface of pre-formed beds for broadleaf weed control. Results are best when plastic mulch is applied immediately after application. Do not incorporate for maximum activity; however, to reduce the potential for crop injury incorporate in beds to a depth of 2.5" prior to transplant. DO NOT transplant within 30 days of application.
POSTEMERGENCE (plastic culture)					
<i>clethodim</i> Select Max 2EC		6-8 fl oz	0.094-0.125		Apply postemergence for annual grasses at 6-8 oz/A, or for bermudagrass and johnsongrass, at 8 oz/A. Add 1 gal crop oil concentrate per 100 gal spray mix. Very effective in controlling annual bluegrass. Apply to actively growing grasses not under drought stress. DO NOT apply within 4 days of harvest.
<i>clopyralid</i> Stinger 3 lb/gal		5.3 fl oz	0.124		DO NOT use a surfactant. DO NOT tank mix with other herbicides. DO NOT apply within 30 days of harvest. Make 1-2 applications per year not to exceed 10.6 fl oz/A/year. Make only 1 application in the spring. Minor leaf cupping may occur. Do not use if unwilling to accept minor crop injury. Limited research by the University of Georgia has been conducted. Suggest using on minimal acreage initially. Stinger is effective on weeds in the aster (cocklebur, dandelion, ragweeds, thistle, etc.), legume (clover, vetch, etc.), and nightshade (eastern blacknightshade) families.

COMMERCIAL STRAWBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POSTEMERGENCE (Plastic Culture) (continued)					
<i>sethoxydim</i> Poast 1.5EC		1.5-2.5 pt	0.18-0.47		Use for control of emerged annual and perennial grasses. Apply to actively growing grasses at least 7 days prior to harvest . Low spray volumes (10 GPA) generally improve control. Add crop oil or adjuvant containing crop oil at product's recommended rate. Use low rate on annual grasses up to 6" tall; higher rates on larger annual grasses and perennial grasses. Repeat applications may be made but the total amount applied should not exceed 2.5 pt/season. DO NOT cultivate 5 days prior to or 7 days after application. Reduced rates (4-6 oz/A) may be used to suppress ryegrass growth in the row middles; however, environmental conditions and ryegrass size greatly affect results.
POSTEMERGENCE HOODED OR SHIELDED APPLICATIONS (plastic culture)					
<i>carfentrazone</i> Aim EC 2EC Aim EW 1.9EW		0.5-1.6 fl oz	0.008-0.025		For control of annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply as a hooded spray in row middles. DO NOT allow herbicide to contact the crop. Apply to weeds less than 3". Coverage is essential for weed control. Add a non-ionic surfactant or adjuvant containing surfactant at products recommended rate. May mix with glyphosate.
<i>flumioxazin</i> Chateau 51WDG		3 oz/A	0.09		Excellent preemergence weed control product. Use a 3 oz rate for pre-transplants or preemergence to dormant strawberries. Can also use 3 oz rate on row middles, with a shielded sprayer, before fruit set. DO NOT apply more than 3 oz/A/year .
<i>paraquat</i> Gramoxone Inteon 2SL		2 pt	0.62		Contact kill of emerged broadleaf and grass weeds, using shields and direct spray to row middles to prevent contact with strawberry foliage . Use a nonionic surfactant at 1-2 pt/100 gal spray mix or 1 gal approved crop oil concentrate per 100 gal spray mix. Use a minimum of 20 GPA of water. DO NOT apply Gramoxone within 21 days of harvest . DO NOT make more than 3 applications per season. DO NOT graze livestock in treated areas.
<i>glyphosate</i> Various trade names and formulations are available		See label.	See label.		Apply as a hooded or shielded spray in row middles, as a wiper application in rows, or apply post harvest. To prevent severe injury to crop, DO NOT let herbicide contact foliage, green shoots or stems, exposed roots, or fruit of crop. May make 3 applications per year.
PREEMERGENCE^{1,2,3} (matted row)					
<i>carfentrazone</i> Aim EC 2.0EC Aim EW 1.9EW		0.8-1.5 fl oz	0.013-0.023		For annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply prior to planting or before crop emergence to weeds less than". Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt/100 gal of spray mix.
DCPA Dacthal W-75		8-12 lb	6-9		For control of most annual grasses and small-seeded broadleaf weeds. Apply over-the-top of newly planted transplants in fall or early spring for preemergence weed control. DO NOT apply after first bloom through harvest .
<i>flumioxazin</i> Chateau 51WDG		3.0 oz	0.09		Excellent product for preemergence weed control. Apply 3 oz rate 30 days prior to transplanting strawberries. A crop oil at 1% v/v or a non-ionic surfactant at 0.25% v/v can be added to help provide early postemergence weed control. DO NOT apply more than 3 oz/A/year .
<i>napropamide</i> Devrinol 50DF		4-8 lb	2-4		For control of most annual grasses and small-seeded broadleaf weeds. Delay application until desired number of daughter plants have become established. DO NOT apply from bloom through harvest . Irrigation or mechanical incorporation is essential for activation.

¹All preemergent herbicides require a rain or irrigation event in order for herbicide activation to occur (approximately 0.5-1" of water). If no rain event occurs and no supplemental overhead watering is provided after a preemergent herbicide application, weed control can be extremely poor.

²Most preemergent herbicides will only control germinating weed seed. Generally, preemergent herbicides will not control weeds after they have become established (1st or 2nd true leaf), and most preemergent herbicides will not control weeds coming from vegetative structures (i.e. yellow and purple nutsedge).

³As long as the treated area remains undisturbed, most pre-emergent herbicides will provide weed control for 2-4 months in most growing mediums (in Georgia).

COMMERCIAL STRAWBERRY WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POSTEMERGENCE (matted row)					
<i>clethodim</i> Select 2EC		6-8 fl oz	0.09-0.125		Postemergence grass control. Very effective in controlling annual bluegrass. Add 1% crop oil concentrate to all sprays (1 gal of crop oil concentrate per 100 gallons of spray). DO NOT apply within 4 days of harvest and DO NOT apply more than 8 oz per application.
<i>clethodim</i> Select Max 0.97EC		9-16 fl oz	0.068-0.121		Controls annual and perennial grasses in NON-BEARING PLANTINGS (harvest not expected within 1 year). Sequential applications will be necessary for control of most perennial grass control. Use 10-40 GPA. Add crop oil concentrate to the spray solution (1% v/v but no less than 1 pt/A).
<i>clopyralid</i> Stinger 3 lb/gal		5.3 fl oz 5.3-10.6 fl oz	0.124 0.248		DO NOT use a surfactant. DO NOT tank mix with other herbicides. DO NOT apply within 30 days of harvest. Make 1-2 applications per year not to exceed 10.6 fl oz/A/year. Make only 1 application in the spring. Minor leaf cupping may occur. Do not use if unwilling to accept minor crop injury. Limited research by the University of Georgia has been conducted. Suggest using on minimal acreage initially. Stinger is effective on weeds in the aster (cocklebur, dandelion, ragweeds, thistle, etc.), legume (clover, vetch, etc.), and nightshade (eastern blacknightshade) families.
<i>fluzifop-p</i> Fusilade DX 2EC		16-24 fl oz	0.25-0.38		USE ON NONBEARING CROP ONLY. Postemergence grass control. The addition of either a crop oil or nonionic surfactant will be necessary. DO NOT apply within 1 year of the first harvest.
<i>sethoxydim</i> Poast 1.5EC		1.5-2.5 pt	0.18-0.47		Postemergence grass control. Consult label for specific rates and best times to treat. Add 1 qt of crop oil concentrate per acre. DO NOT apply on days that are unusually hot and humid. DO NOT apply within 7 days of harvest.
POSTEMERGENCE HOODED OR SHIELDED APPLICATIONS (matted row)					
<i>carfentrazone</i> Aim EC 2EC Aim EW 1.9EW		0.5-1.6 fl oz	0.008-0.025		For control of annual broadleaf weeds including morningglory, pigweed, and spiderwort. Apply as a hooded spray in row middles. DO NOT allow herbicide to contact the crop. Apply to weeds less than 3". Coverage is essential for weed control. Add a non-ionic surfactant at 1 qt/100 gal of spray mix. May mix with glyphosate.
<i>glyphosate</i> Various trade names and formulations are available		See label.	See label.		Apply as a hooded or shielded spray in row middles, as a wiper application in row middles, or apply post harvest. To prevent severe injury to crop, DO NOT let herbicide contact foliage, green shoots or stems, exposed roots, or fruit of crop.
<i>paraquat</i> Gramoxone Inteon 2SL		2 pt	0.62		Contact kill of emerged broadleaf and grass weeds using shields and direct spray between the rows to prevent contact with strawberry foliage. Use a nonionic surfactant at 1-2 pt/100 gal spray mix or 1 gal approved crop oil concentrate per 100 gal spray mix. Use a minimum of 20 GPA of water. DO NOT apply Gramoxone within 21 days of harvest . DO NOT make more than 3 applications per season. DO NOT graze livestock in treated areas.

WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

Wayne E. Mitchem, Extension Weed Scientist

	Alion		Diuron, etc.		Devrinol		Solicam		Sinbar		Prowl		Oryzalin		Simazine		Trellis	
Application Method ¹	PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE	
Time of Year ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
BIENNIAL AND PERENNIAL WEEDS																		
asters			F	G	P				F	G	P	P	P	P		G		G
bahiagrass			P	P	P	P	P		P-F	P-F	P	P	P	P	P	P	P	P
bermudagrass			P	P	P	P	F	F	F	P	P	P	F	F	P	P	P	P
briars			P	P	P	P	P	F	P	P	P	P	P	P	P	P	P	P
camphorweed					P			G	F		P	P	P	P		G	P	P
dallisgrass			P	P	P	P	F		P-F	P-F	P	P	P	P	P	P	P	P
dogfennel			P	F	P	P		E	G	G	P	P		P	P	F	G	G
horsenettle			P-F	P	P	P	P	P	F	P	P	P	P	P	P	P-F	P	P
johnsongrass			P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
nutsedge			P	P	P	P	P-F		P-F	P-F	P	P	P	P	P	P	P	P
plantains						G		G		F	P	P	P	P	P	G	G	G
wild garlic/onion			P	P	P			G			P	P	P	P	P	P	P	P
ANNUAL GRASSES																		
barnyardgrass			G		E		G		G		G		G		G		P	P
crabgrass	E		G		E		G-E		G		E		E		G		P	P
crowfootgrass			G		E		G		G		E		E		G		P	P
fall panicum	G		F		G		E		G		G		G		G		P	P
goosegrass	E		G		G		E		G		E		E		G		P	P
johnsongrass (seedling)			F		E		G		G		G		G		P		P	P
ryegrass, annual		G		G		F			F		F		F-G		G-E		P	P
sandbur			G		E		G		G		G		E		G		P	P
signalgrass, broadleaf	G		G		G		G		G		E		G		P		P	P
Texas panicum	G		P		G		F		F		G		G		F		P	P

Key to Response Symbols:
 E = Excellent Control
 G = Good Control
 F = Fair Control
 P = Poor Control

¹ PRE = Preemergence.
² S = Spring; F = Fall.

If no symbol is given, weed does not occur in specific season (spring or fall) or weed response is unknown.

WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

	Alion		Diuron, etc.		Devrinol		Solicam		Sinbar		Prowl		Surflan		Princep, etc.		Trellis	
Application Method ¹	PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE		PRE	
Time of Year ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
ANNUAL BROADLEAF WEEDS																		
bristly starbur			G		P		F		E		P		P		F		P	P
chickweed	E		G	G		E	E	E		E		G		G		G		G
cocklebur	G		G		P		F		G		P		P		F		P	P
crotalaria			G		P				G		P		P				P	P
croton, tropic	G		G		P		E		G		P		P		F-G		P	P
evening primrose	E			G	F	G			F	G	P		P			G-E		G
Florida beggarweed			G		F		G		E		P		P		G		P	P
Florida pusley			G		E		G		E		G		G		G		F	F
horseweed	G	G	F	G	P	F	G	G	G	G	P	P	P	P	P	G		G
jimson weed	G		G		P		G		E		P		F		F-G		G	
lambquarters	E		E		E		F		E		E		E		E		E	
morningglories	G		G		P		F-G		G-E		P		F		F-G		F	
pigweeds	E		G		G		F		E		G		G		F-G		E	
prickly lettuce				G		E	G			E	P	P	P	P	G	E		G
prickly sida (teaweed)	E		G		P		G-E		E		P		P		F-G		G	
purslane, common	E		E		E		E		E		E		E		E		E	
ragweed, common	E		E		F		G		E		P		P		G		E	
sicklepod			G		P		F		E		P		P-F		F-G			
wild radish			F-G	G	F	G	F	G	E	E	P	P	P	P	G	E		E

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WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

	Chateau		MSMA		Oxyfluorfen		Fusilade Clethodim ⁺		Glyphosate		Paraquat		2,4-Damine		Poast		Trellis	
Application Method ¹	PRE		PDS		PRE		PDS		PDS		PDS		PDS		PDS		PDS	
Time of Year ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
BIENNIAL AND PERENNIAL WEEDS																		
asters					F	F	P	P	G	E	F	F	F		P	P		
bahiagrass	P	P	F		P	P	F	P	F	F	F	F	P	P	F	P		
bermudagrass	P	P	P		P	P	G	F	F	G	F	P	P	P	G	P-F		
briars	P	P			P	P	P	P	P-F	G-E	P	P	F	F	P	P		
camphorweed	P	P				G	P	P	G		F				P	P		
dallisgrass	P	P	F		P	P	F	F	G	G	F	P	P	P	P	P		
dogfennel	P	P					P	P	G	G	F	P			P	P		
horsenettle	F	P			P	P	P	P	F	G	P	P	F		P	P		
johnsongrass	P	P	F-G		P	P	G	P	F	G	F	P	P	P	G	F		
nutsedge	P	P	G		F	F	P	P	F	G	F	F	P		P	P		
plantains	G	P					P	P	E	E	F	F	G	G	P	P		
wild garlic/onion							P	P	G	G	F	F	G	G	P	P		
ANNUAL GRASSES																		
barnyardgrass	G		G		F		G		E		G		P	P	G			
crabgrass	G		G		F		G		E		G		P	P	G			
crowfootgrass	G		G		F		G		E		G		P	P	G			
fall panicum	G		G				G		E		G		P	P	G			
goosegrass	G		G		F		G		E		G		P	P	G			
johnsongrass (seedling)	G		G				E		E		E		P	P	E			
ryegrass, annual		G	F		P		G	G	G	G	F	G	P	P	E	E		
sandbur			G		P		G		E		G		P	P	G			
signalgrass, broadleaf	G		F		P		E		E		G		P	P	E			
Texas panicum	G		F		P		E		E		E		P	P	E			

Key to Response Symbols:

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 G = Good Control
 F = Fair Control
 P = Poor Control

¹ PRE = Preemergence; PDS = Post emergence Directed Spray.

² S = Spring; F = Fall.

³ Gramoxone will control only the seedling stages of Florida pusley.

* Gramoxone and Rely provide only contact control of many species.

+ Fusilade and Prism are fluazifop and clethodim, respectively; and have similar activity on most weeds. Weed response also reflects Select herbicide.

If no symbol is given, weed does not occur in specific season (spring or fall) or weed response is unknown.

WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

	Chateau		MSMA		Oxyfluorfen		Fusilade Clethodim ⁺		Glyphosate		Paraquat		2,4-Damine		Poast		Trellis	
Application Method ¹	PRE		PDS		PRE		PDS		PDS		PDS		PDS		PDS		PDS	
Time of Year ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
ANNUAL BROADLEAF WEEDS																		
bristly starbur	G		F		F-G				G		F-G		G		P			
chickweed	G	G							G	G	F	G	F	F	P	P		
cocklebur	G		E		G				E		G		E	E	P		E	E
crotalaria			G		E				E		G		G		P			
croton, tropic	G		F		E				E		F-G		G		P			
evening primrose	G	G			F	G			P-F	F	F	F-G	F	G			G	G
Florida beggarweed			E		P				E		E		F				E	
Florida pusley	G		F		E				G		F ³		F		F	F	G	G
horseweed	G	G			P	F			G-E	G-E	F*	F	G			P	E	E
jimson weed	G		F		G				E		G		E		P			
lambsquarters	G		F		E				G		G		E		P		E	
morningglories	G		F		F-G				G		G		G		P		E	
pigweeds	E		F		E				G		G		G		P		G	
prickly lettuce						G			G	G	F	G	G	G	P	P		E
prickly sida (teaweed)	G		P		E				G	F	G	P	G		P		G	
purslane, common	G		F		E				E		G		E		P		G	
ragweed, common	G		F		E				G		G		E	E	P		G	
sicklepod			F		F				G		E		E		P			
wild radish	G	G			G-E	E			E	E	F	G	G	G	P	P		

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WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

	Aim		Rely*		Velpar		Sanda		Basagran		Stinger		Rimsulfuron		Starane	
Application Method ¹	PDS		PDS		PRE/PDS		PDS		PDS		PDS		PRE/PDS			
Time of Year ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
BIENNIAL AND PERENNIAL WEEDS																
asters			G	G	E	E										
bahiagrass			F	F	F								P			
bermudagrass			F	F	P	P										
briars			G	G	F	F							P		G	
camphorweed					G											
dallisgrass			F	F	F								P			
dogfennel			G	G	G				F						G	
horsenettle			F	F	F										G	
johnsongrass					F											
nutsedge			F	F	F		E		G				F			
plantains			G	G	G	G									G	
wild garlic/onion			G	G	G											
ANNUAL GRASSES																
barnyardgrass			G	G	F											
crabgrass			G	G	G								F			
crowfootgrass			G	G	F											
fall panicum			G	G	F											
goosegrass			G	G	F											
johnsongrass (seedling)			G	G	F											
ryegrass, annual			G	E												
sandbur			G	G	F											
signalgrass, broadleaf			G	G	F											
Texas panicum			G	G	F											

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WEED RESPONSE TO HERBICIDES USED IN FRUITS AND NUTS

	Aim		Rely*		Velpar		Sanda		Basagran		Stinger		Rimsulfuron		Starane	
Application Method ¹	PRE		PDS		PRE/PDS		PDS		PDS		PDS		PRE/PDS			
Time of Year ²	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
ANNUAL BROADLEAF WEEDS																
bristly starbur			G	G	G				G							
chickweed			E	E	G	G							G		E	
cocklebur	G		G	G	G		E		E		E		F		E	
crotalaria					G				P							
croton, tropic			G	G	G				G							
evening primrose	F-P		G	G	E	E									G	G
Florida beggarweed			G	G	F											
Florida pusley					G											
horseweed			G	G	G	E					E		E		G	G
jimson weed	G				G				E		E					
lambquarters	E		G	G	G		F		F				F			
morningglories	G		G	G	F		F		F				F		G	
pigweeds	G		G	G	G		G		P				E			
prickly lettuce	F				G	G						E			G	G
prickly sida (teaweed)			G	G	F				G							
purslane, common	G		G	G	G				G				G		G	
ragweed, common			G	G	G		E		G		E		F			
sicklepod			G	G	F						E		F		G	
wild radish	F		G	G	G	G	E	E	G	G			E			

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GRAIN MILLET: *GRAIN MILLET INSECT CONTROL*

(Pearl millet for grain production)

David Buntin, Research/Extension Entomologist

PEST	INSECTICIDE	MOA	AMOUNT PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	WHEN TO TREAT, REMARKS AND PRECAUTIONS
Soil insects: wireworms	<i>imidacloprid</i> Gaucho 600, Attendant 600, Access, others	4C	6.4 fl oz/ 100 lb of seed	--	12H/ 45 D grazing	Seed treatments also may suppress aphids for 2-3 weeks after planting.
	<i>thiamethoxam</i> Cruiser 5FS	4C	0.75-1.33 fl oz/ 100 lb seed	--	12 H/ --	
chinch bug, false chinch bug	<i>alpha-cypermethrin</i> Fastac 0.83	3A	3.9 fl oz	0.025	12 H/ 14 D	Inspect seedlings soon after emergence. Apply after planting when stunting and discoloration are visible and bugs are present. In wide rows, direct spray at base of plants. In narrow rows, broadcast application. Use at least 10 gal of spray mix/A. Spray for thorough coverage. Applications to dense foliage and after boot stage may not be effective. NOTE: Imidacloprid seed treatment also may suppress chinch bugs on seedlings for 2-3 weeks.
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	2.4 fl oz	0.019	12 H/ 30 D	
	<i>spinosad + gamma cyhalothrin</i> Consero	5 + 3A	3.05 fl oz	--	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Maxx 0.8	3A	4 fl oz	0.025	12 H/ 14 D	
Lesser cornstalk borer	<i>zeta-cypermethrin</i> Mustang Maxx 0.8	3A	4 fl oz	0.025	12 H/ 14 D	Very difficult to control. Broadcast application may provide some control. eDo not plant millet into burnt crop stubble.
Fall armyworm and other worms in the whorl	<i>alpha-cypermethrin</i> Fastac 0.83	3A	3.9 fl oz	0.025	12 H/ 14 D	Millet is very tolerant of whorl stage defoliation. Treat when 50% of whorls are infested and larvae are present. Blackhawk / Tracer is most effective against smaller larvae.
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	2.4 fl oz	0.019	12 H/ 30 D	
	<i>spinosad + gamma cyhalothrin</i> Consero	5 + 3A	3.05 fl oz	--	24 H/ 30 D	
	<i>spinosad</i> Blackhawk (36%)	5	1.7-3.3 oz	0.038-0.075	4 H/ 7 D	
	<i>zeta-cypermethrin</i> Mustang Maxx 0.8	3A	4 fl oz	0.025	12 H/ 14 D	

GRAIN MILLET INSECT CONTROL (Pearl millet for grain production)

PEST	INSECTICIDE	MOA	AMOUNT PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	WHEN TO TREAT, REMARKS AND PRECAUTIONS
Headworms: corn earworm, fall armyworm, sorghum webworm	<i>alpha-cypermethrin</i> Fastac 0.83	3A	3.9 fl oz	0.025	12 H/ 14 D	Larvae chew and damage or destroy seed. Treat when 1 or more earworms and armyworms or 5 or more sorghum webworms per grain head. Blackhawk/Tracer is most effective against smaller larvae.
	<i>spinosad + gamma cyhalothrin</i> Consero	5 + 3A	3.05 fl oz	--	24 H/ 30 D	
	<i>spinosad</i> Blackhawk (36%)	5	1.7-3.3 oz	0.038-0.075	4 H/ 7 D	
	<i>zeta-cypermethrin</i> Mustang Maxx 0.8	3A	4 fl oz	0.025	12 H/ 14 D	
Stink bugs, Leaffooted bugs	<i>alpha-cypermethrin</i> Fastac 0.83	3A	1.8-3.9 fl oz	0.012-0.025	12 H/ 14 D	Infest grain heads, feeding causes shriveled seed. Threshold: 3 bugs/head at milk stage; 5 bugs/head at dough stage. Do not treat after medium dough stage.
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.8-2.4 fl oz	0.014-0.019	12 H/ 30 D	
	<i>spinosad + gamma cyhalothrin</i> Consero	5 + 3A	2.0-3.05 fl oz	--	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Maxx 0.8	3A	3.2-4 fl oz	0.02-0.025	12 H/ 14 D	
False chinch bugs on seed heads	<i>alpha-cypermethrin</i> Fastac 0.83	3A	3.2-3.8 fl oz	0.02-0.025	12 H/ 14 D	Treat when 100 bugs/head are present in milk to soft dough stage.
	<i>zeta-cypermethrin</i> Mustang Maxx 0.8	3A	3.2-4 fl oz	0.02-0.025	12 H/ 14 D	

Disease Control – Except for seed treatments, there are no fungicides labeled for use on pearl millet at this time.

PEARL MILLET FOR GRAIN WEED CONTROL

Eric P. Prostko, Extension Agronomist - Weed Science

		BROADCAST RATE/ACRE			
HERBICIDE	MOA	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
PREEMERGENCE					
<i>mesotrione</i> Callisto 4SC	27	6 oz	0.188	12 H/ --	Callisto will provide preemergence control of large crabgrass and various pigweed species. Apply after planting but before crop emergence. Callisto may cause temporary crop injury in the form of bleaching or whitening. Applications of Callisto to emerged pearl millet will result in severe crop injury. Callisto rotational crop restrictions: field corn, grain sorghum-0 months; small grains and sugarcane-4 months; soybeans, cotton, peanuts, sunflowers, canola, tobacco-10 months; other crops-18 months.
POSTEMERGENCE					
<i>2,4-D amine</i> Various trade names 3.8 SL	4	16 oz	0.475	48 H/ Forage = 7 D	2, 4-D is very effective on common broadleaf weeds such as pigweed and morningglory. Apply when weeds are small and after crop is tillered but before jointing stage of growth. Do not apply before tillering stage or during early boot through milk stage of growth.

GRAIN SORGHUM: *GRAIN SORGHUM INSECT CONTROL*

David Buntin, Research/Extension Entomologist

PEST	INSECTICIDE ¹	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS	
DO NOT USE methomyl (Lannate) or chlorpyrifos (Lorsban and similar products) on sweet sorghum varieties. Also see the section in the Handbook for temporary summer grazing insect control.							
Soil Insects: White grubs, wireworms, seed maggots, rootworms, fire ants	SEED TREATMENTS					Apply Counter granules in a 7" band over the row at planting and lightly incorporate. DO NOT APPLY COUNTER GRANULES IN DIRECT CONTACT WITH THE SEED. Control of white grubs may be variable. Commercial seed treatment. Generally effective against wireworms, seed maggots and fire ants. Seed treatments may not provide effective control of white grubs.	
	<i>imidacloprid</i> Gaucho 600, Attendant 600, Axxess, others	4C	6.4 fl oz/100 lb of seed	0.25/100 lb	12 H/ 45 D grazing		
	<i>thiamethoxam</i> Cruiser 5FS	4C	5.1-7.6 oz/100 lb seed	0.2/100 lb	12 H/ --		
	<i>clothianidin</i> Poncho 600, NipsIt Inside 5	4C	5.1-6.4 fl oz/100 lb seed	0.2-0.25/100 lb	12 H/ --		
	AT-PLANTING TREATMENT						
<i>terbufos</i> Counter 20 G	1B	5.2 oz/ 1000 ft row	varies with row width	48 H/ 100 D			
Cutworms, Lesser cornstalk borer	AT-PLANTING TREATMENT					<p>Lorsban 15G for cutworms and lesser cornstalk borer: Apply Lorsban 15G at-planting in a T-band and cover lightly with soil. DO NOT APPLY LORSBAN 15G OR SIMILAR PRODUCTS IN-FURROW WITH THE SEED.</p> <p>CUTWORMS: Lorsban 4E, Asana. Adjourn, Baythroid, Delta Gold, and cyhalothrin products also can be applied broadcast at or immediately before planting or applied in a narrow band over the row at planting. Use full rate for broadcast applications or concentrate lower labeled dosage rate in the treated band.</p> <p>LESSER CORNSTALK BORER: Apply liquid formulations in a band over the row at planting and lightly incorporate. Broadcast application is not effective. Seed treatments as listed for soil insects may provide suppression of lesser cornstalk borer.</p> <p>NOTE: DO NOT USE Lorsban/Nufos/Chlorpyrifos on sweet sorghum varieties</p>	
	<i>alpha-cypermethrin</i> Fastac 0.83 (Cutworm only)	3A	2.6-3.6 oz	0.017-0.023	12 H/ 14 D		
	<i>beta-cyfluthrin</i> Baythroid XL 1EC (cutworm only)	3A	1.3 fl oz	0.01	12 H/ 0 D		
	<i>chlorpyrifos</i> Lorsban 15G	1B	6.6 lb/A OR 8 oz/1000 ft row	0.97			
	<i>deltamethrin</i> Delta Gold 1.5EC	3A	1.8 fl oz	0.025	12 H/ 7 D		
	<i>esfenvalerate</i> Asana XL, Adjourn 0.6 6EC	3A	5.8-9.6 fl oz	0.03-0.05	12 H/ 21 D		
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.02-1.54 fl oz 2.56-3.84 fl oz	0.01-0.015 0.01-0.015	24 H/ 7 D		
	<i>lambda cyhalothrin</i> Karate Zeon (2.08) Warrior, Silencer, Lambda, others 1	3A	1.28-1.92 fl oz 2.56-3.84 fl oz	0.02-0.03 0.02-0.03	12 H/ 7 D		
	POST-EMERGENCE TREATMENTS						NOTE: Apply chlorpyrifos products post-emergence at base of plants in 8-12" band with adequate water. Concentrate full rate in the treated band. Post-emergence control of lesser cornstalk borer is difficult.
	<i>chlorpyrifos</i> Lorsban, Nufos, Chlorpyrifos 4E		2pt	1	24 H/ 30 D		

GRAIN SORGHUM INSECT CONTROL

PEST	INSECTICIDE ¹	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Aphids (Sugarcane Aphid, Greenbug and Corn leaf Aphid)	SEED TREATMENTS					Greenbug and corn leaf aphid seldom require control on sorghum in Georgia. Sugarcane aphid is new to Georgia and can cause devastating losses to sorghum if not controlled. Seed Treatments: Products listed with provide 25-40 day control of aphids. For sugarcane aphid use thiamethoxam or clothianidin products at the highest rate listed. Imidacloprid products are not specifically listed for sugarcane aphid control. NOTE: DO NOT USE Lorsban/Nufos/Chlorpyrifos on sweet sorghum varieties.
	<i>imidacloprid</i> Gaucho 600, Attendant 600, Axxess, others	4C	6.4 fl oz/ 100 lb of seed	0.25-100 lb	12 H/ 45 D grazing	
	<i>thiamethoxam</i> Cruiser 5FS	4C	5.1-7.6 fl oz/ 100 lb seed	0.062-0.093 mg/seed	12 H/ --	
	<i>clothianidin</i> Poncho 600, NipsIt Inside 5	4C	5.1-6.4 fl oz/ 100 lb seed	0.2-0.25/100 lb	12 H/ --	Post-emergence application: Greenbug: Treat when greenbugs are present and killing 3 leaves/plant before boot stage. Corn leaf aphid: Treat when a large population occurs and leaving are dying. Sugarcane aphid: Consult with local county extension office for the latest recommendations. In general treat when infestations reach 50-100 aphids/leaf OR when pre-boot stage 20% of plants are infested and after head emergence 30% of plants are infested and large numbers are present. Good spray coverage is critical, minimum of 10 gpa by ground and 5 gpa by air. Chlorpyrifos products may not provide more than 7 days control.
	POST-EMERGENCE TREATMENTS					
	<i>chlorpyrifos</i> Lorsban, Nufos, others 4E Chlorpyrifos 4EC Lorsban 75WG	1B	1-2 pt 0.67 lb	0.5-1 0.5	24 H/ 30 D at 1 pt 60 D at 2 pt	
	<i>flupyradifurone</i> Sivanto 200SL	4D	4-10 fl oz	0.052-0.13	4 H/ 21 D	
Chinch bug and False chinch bug (on seedlings), Billbugs, Sugarcane beetles	SEED TREATMENTS					CHINCH BUG, FALSE CHINCH BUG: In seedlings up to 6" tall, treat when 2 or more adults are found on 20% of seedlings. On taller plants, treat when 75% of the plants are infested, OR 5 or more chinch bugs/plant are present. For post-emergence applications, use at least 20 gal/A as a band directed at the base of plants. At planting, treatments generally are effective for 20-30 days after planting. Control after the boot stage is rarely effective.
	<i>imidacloprid</i> Gaucho 600, Attendant 600, Axxess, others	4C	6.4 fl oz/ 100 lb of seed	0.25-100 lb	12 H/ 45 D grazing	
	<i>thiamethoxam</i> Cruiser 5FS	4C	5.1-7.6 fl oz/ 100 lb seed	0.25-100 lb	12 H/ --	
	<i>clothianidin</i> Poncho 600, NipsIt Inside 5	4C	5.1-6.4 fl oz/ 100 lb seed	0.2-0.25/100 lb	12 H/ --	BILLBUGS, SUGARCANE BEETLES: Adult beetles burrow into stems at or below soil line killing main stems. Treat when 10% of plants are damaged and beetles are present. For post-emergence applications, use at least 20 gal/A as a band directed at the base of plants. Rescue treatments for sugarcane beetle are not effective. NOTE: DO NOT USE Lorsban/Nufos/Chlorpyrifos on sweet sorghum varieties. Apply chlorpyrifos products post-emergence at base of seedling plants in 8-12" band with adequate water. Concentrate full rate in the treated band.
	POST-EMERGENCY TREATMENTS					
	<i>alpha-cypermethrin</i> Fastac 0.83 (Cutworm only)	3A	2.6-3.6 oz	0.017-0.023	12 H/ 14 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	2.8 fl oz	0.022	12 H/ 14 D	
	<i>chlorpyrifos</i> Lorsban, Nufos, others 4E Chlorpyrifos 4EC Lorsban 75WG	3A	1.5 pt 2 pt 1.33 lb	0.75 1 1	24 H/ 30 D at 1 pt 60 D at 2 pt	
	<i>cyfluthrin</i> Tombstone 2	3A	2.8 fl oz	0.044	12 H/ 21 D	
	<i>deltamethrin</i> Delta Gold 1.5EC	3A	1.9 fl oz	0.022	12 H/ 14 day	

GRAIN SORGHUM INSECT CONTROL

PEST	INSECTICIDE ¹	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Chinch bug and False chinch bug (on seedlings), Billbugs, Sugarcane beetles (continued)	POST-EMERGENCY TREATMENTS					
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015 0.015	24 H/ 30 D	
	<i>lambda cyhalothrin</i> Karate Zeon 2.08 Warrior, Silencer, Lambda, others 1	3A	1.92 fl oz 3.84 fl oz	0.03 0.03	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Maxx	3A	4 fl oz	0.025	12 H/ 14 D	
European corn borer	Materials labeled for "foliage feeding larvae" will give helpful control.				Treat if numerous egg masses are found in the field (treat just before eggs hatch), or if shot-hole type leaf feeding by newly hatched larvae appears in 25% of the plants in a field. Insecticides are not effective once larvae bore in to the plant stem. Use products are listed for foliage-feeding larvae.	
Foliage-feeding Larvae: armyworms, fall armyworm, corn earworm Headworms (larvae feeding on grain heads): fall armyworm, corn earworm, sorghum webworm	<i>alpha-cypermethrin</i> Fastac 0.83 (Cutworm only)	3A	1.8-3.8 fl oz	0.12-0.025	12 H/ 14 D	ARMYWORM, FALL ARMYWORM, CORN EARWORM IN WHORL:
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	2.8 fl oz	0.022	12 H/ 14 D	<u>Seedling plants</u> , treat when stand loss reaches 10%, OR 30% or more plants are infested.
	<i>carbaryl</i> Sevin XLR Plus, 4F Sevin 80S	1A	1-2 qt	1-2	12 H/ Grain = 21 D Grazing = 14 D	<u>Whorl stage plants</u> , do not initiate controls unless 40% or more of the plants in a field are infested. Economic losses probably do not occur unless population levels exceed 1 larvae per plant. Apply spray by ground directing spray into whorls using cone nozzles with large droplet size and at least 25 gal/A of spray. For large infestation use tank mix of OP insecticide (Lannate or Lorsban) plus pyrethroid (Asana/Adjourn, Baythroid, Delta Gold, lambda/gamma cyhalothrin, Mustang, Tombstone). Pyrethroid insecticides alone are usually not effective for fall armyworm.
	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-20 fl oz	0.047-0.067	4 H/ 14 D	FALL ARMYWORM, CORN EARWORM, SORGHUM WEBWORM, FEEDING ON GRAIN HEADS: Treat when an average of 1 or more (1/2" or larger) of any of these insects are found per grain head. For sorghum webworm, treat when an average of 5 or more small (1/4") larvae are found per grain head. Higher dosages within the rate range may be needed to effectively control corn earworm or fall armyworms. Pyrethroid insecticides may not be effective for sorghum webworm.
	<i>chlorpyrifos</i> Lorsban, Nufos, others 4E Chlorpyrifos 4EC Lorsban 75WG	1B	1-2 pt 2 pt 1.33 lb	0.5-1 1 1	24 H/ 30 D at 1 pt 60 D at 2 pt	
	<i>deltamethrin</i> Delta Gold 1.5EC	3A	1.8 fl oz	0.025	12 H/ 14 D	
	<i>esfenvalerate</i> Asana XL, Adjourn 0.6 6EC (earworms on heads only)	3A	9.6 fl oz	0.05	12 H/ 21 D	
	Sorghum midge Declare 1.25 Proaxis 0.5	3A	1.54 fl oz 3.84 fl oz	0.015 0.015	24 H/ 30 D	
	<i>lambda cyhalothrin</i> Karate Zeon 2.08 Warrior, Silencer, Lambda, others 1	3A	1.92 fl oz 3.84 fl oz	0.03 0.03	24 H/ 30 D	NOTE: Tracer is most effective against smaller larvae.
	<i>flubendiamide</i> Belt 4SC	28	2-3 fl oz	0.0625-0.094	12 H/ 14 D	NOTE: DO NOT USE Lorsban/Nufos/Chlorpyrifos or Lannate on sweet sorghum varieties.

GRAIN SORGHUM INSECT CONTROL

PEST	INSECTICIDE ¹	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Foliage-feeding Larvae: armyworms, fall armyworm, corn earworm Headworms (larvae feeding on grain heads): fall armyworm, corn earworm, sorghum webworm	<i>methomyl</i> Lannate 2.4 LV Lannate 90SP	1A	2 pt 0.5 lb	0.45 0.45	48 H/ 14 D	
	<i>spinosad</i> Blackhawk 36%	5	1.7-3.3 oz	0.038-0.075	4 H/ 21 D	
	<i>zeta-cypermethrin</i> Mustang Maxx, Respect	3A	4 fl oz	0.025	12 H/ 14 day	
Mites	<i>propargite</i> Comite II 6	12C	1.5-2.25 pt	1.125-1.6875	7 D/ 30 D	Mites seldom require control on grain sorghum in Georgia. Treat if infestations become widespread and leaf discoloration is evident. Control after the boot stage rarely is effective. Comite II: Use minimum of 20 gal/A by ground application and 5 gal. per acre for aerial application. Only apply to dry foliage. Do not tank mix with other products. Do not use an oil-based surfactant. Due to large number of sorghum varieties, treating a small test plot is recommended to check for phytotoxicity before treating a large area.
	<i>dimethoate</i> Dimethoate 4EC, 400 Dimethoate 2.67EC	1B	1 pt 1.5 pt	0.5 0.5	48 H/ 28 D	
Sorghum midge	<i>alpha-cypermethrin</i> Fastac 0.83	3A	1.3-3.8 fl oz	0.008-0.025	12 H/ 14 D	Treat when an average of 1 adult/head is observed after 25-30% of the heads are blooming. Treat again 5-10 days later if there are still many heads blooming and at least 1 midge/head is found. The susceptible period for midge damage is the bloom period; treatment for midge after this time is too late. Remember that insecticidal controls are directed at the adult midge. The eggs or larvae of the pest cannot be killed inside the glumes with insecticide applications. If a "borderline" economic infestation of sorghum midge exists and there is good yield potential, spray. When an economic infestation exists, spray immediately. A delay of a few days may result in considerable damage. NOTE: DO NOT USE Lorsban/Nufos/Chlorpyrifos or Lannate on sweet sorghum varieties. NOTE: Some brands of dimethoate do not allow application after heading. Pyrethroid insecticides are not effective against sugarcane aphid and may flare infestations. If sugarcane aphid is present tank mix the pyrethroid (3A) product for midge control with either Transform or Sivanto as listed in the aphid section.
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1-1.3 fl oz	0.008-0.01	12 H/ 14 D	
	<i>chlorpyrifos</i> Lorsban, Nufos, others 4E Chlorpyrifos 4EC Lorsban 75WG	1B	0.5 pt 0.5 pt 0.33 lb	0.25 0.25 0.25	24 H/ 30 D at 1 pt	
	<i>cyfluthrin</i> Tombstone 2	3A	1-1.3 fl oz	0.016-0.020	12 H/ 14 D	
	<i>deltamethrin</i> Delta Gold 1.5EC	3A	1.3-1.9 fl oz	0.015-0.025	12 H/ 14 D	
	<i>dimethoate</i> Dimethoate, Cygon 4EC, 400 Dimethoate 2.67EC		0.25-0.5 pt 0.75 pt	0.125-0.25 0.25	48 H/ 28 D	
	<i>esfenvalerate</i> Asana XL, Adjourn 0.6 6EC	3A	2.9-5.8 fl oz	0.015-0.03	12 H/ 21 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	0.77-1.02 fl oz 1.90-2.56 fl oz	0.0075-0.01 0.0075-0.01	24 H/ 30 D	
	<i>lambda cyhalothrin</i> Karate Zeon 2.08 Warrior, Silencer, Lambda, others 1	3A	0.96-1.28 fl oz 1.9-2.56 fl oz	0.015-0.02 0.015-0.02	24 H/ 30 D	

GRAIN SORGHUM INSECT CONTROL

PEST	INSECTICIDE¹	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Sorghum midge (continued)	<i>methomyl</i> Lannate 2.4 LV Lannate 90SP	1A	0.75-1 pt 0.25-0.5 pt	0.225-0.45 0.225-0.45	48 H/ 14 D	
	<i>zeta-cypermethrin</i> Mustang Maxx	3A	1.76-3.2 fl oz	0.011-0.02	12 H/ 14 D	
Stink bugs, Leaffooted bugs, False chinch bugs on grain heads	<i>alpha-cypermethrin</i> Fastac 0.83	3A	3.8 fl oz	0.025	12 H/ 14 D	<p>STINK BUGS, LEAFFOOTED BUGS: Treat if combined numbers of adults and large nymphs exceed 3 bugs per head at milk stage or 6 bugs per head at soft dough stage. Damage not important during hard dough stage.</p> <p>FALSE CHINCH BUG: For grain head infestations, treat if populations exceed 100 bugs per grain head at milk stage. Damage not important during medium to hard dough stages.</p> <p>Pyrethroid insecticides are not effective against sugarcane aphid and may flare infestations. If sugarcane aphid is present tank mix the pyrethroid (3A) product with either Transform or Sivanto as listed in the aphid section.</p>
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1.3-2.8 fl oz	0.01-0.022	12 H/ 14 D	
	<i>cyfluthrin</i> Tombstone 2	3A	1-1.3 fl oz	0.016-0.020	12 H/ 14 D	
	<i>deltamethrin</i> Delta Gold 1.5EC	3A	1.5-1.8 fl oz	0.018-0.025	12 H/ 14 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.28-1.54 fl oz 3.20-3.84 fl oz	0.0125-0.015 0.0125-0.015	24 H/ 30 D	
	<i>lambda cyhalothrin</i> Karate Zeon 2.08 Warrior, Silencer, Lambda, others 1	3A	1.6-1.92 fl oz 3.2-3.84 fl oz	0.25-0.03 0.25-0.03	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Maxx	3A	1.76-3.2 fl oz	0.011-0.02	12 H/ 14 D	
Premixed or Co-Packed Insecticides: Products listed are available as premixes or co-packages of two insecticide active ingredients. User should check mixture labels for active ingredient, specific use rates, target pests, and precautions						
BRAND NAME (ACTIVE INGREDIENTS)				RANGE OF FORMULATION RATES		
Besiege (<i>lambda cyhalothrin, chloanthraniliprole</i>)				5-10 fl oz/A		
Cobalt Advanced (<i>chlorpyrifos, gamma-cyhalothrin</i>)				6-38 fl oz/A		
Consero (<i>spinosad, gamma-cyhalothrin</i>)				2-3 fl oz/A		
Stallion (<i>chlorpyrifos, zeta-cypermethrin</i>)				3.75-11.75 fl oz/A		

GRAIN SORGHUM WEED CONTROL

Eric P. Prostko, Extension Agronomist-Weed Science

		BROADCAST RATE/ACRE			
HERBICIDE	MOA	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
BURNDOWN (Reduced Tillage)					
<i>paraquat</i> Gramoxone Inteon /Gramoxone SL 2 lb/gal Firestorm/Parazone/Helmquat 3 lb/gal	22	1.88-3.76 pt 1.25-2.5 pt	0.47-0.94	24 H/ Grain = 48 D Forage = 20 D	Apply before, at, or immediately after planting but before crop emergence. Use low rate of paraquat if emerged annual weeds are less than 4" tall and high rate if emerged annual weeds are 4-6" tall. Add non-ionic surfactant at 0.25% v/v. Paraquat usually will not suppress bermudagrass, johnsongrass or other perennial weeds well enough to permit high yields. Tank-mix with Dual or Warrant (Concep treated seed only).
<i>glyphosate</i> numerous trade names 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9	32-64 oz 26-52 oz 24-48 oz 23-46 oz 21-42 oz 19-38 oz	0.75-1.50 ae	4 H/ 7 D	Apply before, at, or immediately after planting but before crop emergence. Use low rate of glyphosate to control emerged annual grass and broadleaf weeds; high rate for control of emerged johnsongrass and bermudagrass. Tank-mix with Dual or Warrant (Concep treated seed only).
<i>dicamba</i> Banvel, Clarity, Sterling, Vision 4 lb/gal	4	8 oz	0.25	24 H/ 30 D	Tank-mix with glyphosate or paraquat to improve burndown control of broadleaf weeds in reduced tillage system, especially where maretail/horseweed is a problem. Must be applied at least 15 days before planting sorghum. Rain-free period is 4 hours.
PREEMERGENCE					
<i>metolachlor</i> Stalwart, Parallel PCS, Me-Too-Lachlor <hr style="border-top: 1px dashed black;"/> <i>S-metolachlor</i> Dual Magnum 7.62EC Cinch 7.64EC	15	1-1.33 pt 1-1.33 pt	1-1.33 0.96-1.27	24 H/ 75 D	Use only with sorghum seed that have been treated by the seed company with Concep. If sorghum seed are not properly treated, metolachlor will severely injure sorghum. Apply after planting before weeds and sorghum emerge. Metolachlor can be applied with fluid fertilizer. Can also be applied POST for residual weed control. The generic formulations of metolachlor (Parallel, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.
<i>acetochlor</i> Warrant 3ME	15	1.5-2.25 qt	1.13-1.69	12 H/ Forage = 60 D	Use only with sorghum seed that have been treated by the seed company with Concep. Can be applied preemergence up to 11" tall sorghum. Will provide residual control of many annual grass weeds and certain annual broadleaf weeds, especially crabgrass, Florida pusley, and Palmer amaranth. Weed control will be similar to Dual Magnum, or Intro. Can be tank-mixed with glyphosate or paraquat for use as a burndown in minimum tillage systems. Warrant does not control emerged weeds. For the following soil types, do not apply Warrant within 50 feet of any well where the depth to groundwater is 30 feet or less : sands <3% OM; loamy sands < 2% OM; sandy loams <1% OM. These restrictions do not apply for areas more than 50 feet from a well or if groundwater is more than 30 feet below land surface.

GRAIN SORGHUM WEED CONTROL

		BROADCAST RATE/ACRE			
HERBICIDE	MOA	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
CENTER PIVOT IRRIGATION APPLICATION					
<i>metolachlor</i> Stalwart, Parallel PCS Me-To-Lachlor	15	1-1.33 pt	1-1.33		May be applied by injection through center pivot irrigation systems. Apply in maximum of 1/2" water/A on coarse textured soils. Apply after planting but before sorghum and weeds emerge. Equipment must have appropriate check valves or other suitable devices in the system to ensure that the herbicide solution cannot siphon back into water supply. Use Dual only with Concep treated sorghum seed. The generic formulations of metolachlor (Parallel, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.
<i>S-metolachlor</i> Dual Magnum 7.62EC Cinch 7.64EC	15	1-1.33 pt	0.96-1.27		
POSTEMERGENCE					
<i>atrazine</i> numerous trade names 80W 90DG 4L	5	24 oz 21 oz 38 oz	1.2	12 H/ Forage = 45 D	Generally, sorghum is less tolerant of atrazine than corn. Apply with crop oil concentrate (1% V/V) after sorghum reaches the three-leaf stage but before it reaches 12" tall . Controls broadleaf weeds 2 to 3 in. tall and newly emerged (1-leaf) annual grasses. DO NOT use on sands or loamy sands. DO NOT apply with fluid fertilizers or crop injury may occur. DO NOT apply when sorghum is under stress from cold wet weather, poor fertility, or other factors, or when crop is wet and tender from recent rainfall. Follow label directions for crop rotation. Rain-free period = 2 hours.
<i>2,4-D amine</i> numerous trade names 3.8 lb/gal	4	1 pt	0.48	48 H/ 30 D	Sorghum is not as tolerant to 2,4-D as corn. Apply over-the-top for control of annual broadleaf weeds when sorghum is 6-8" tall. Arrange nozzles to keep spray out of crop whorl. If sorghum is 8-15" tall, apply as directed spray-see recommendation under POST-EMERGENCE (Directed Spray). Sorghum is most subject to 2,4-D injury from over-the-top treatments, use of high rates or applications made during high soil moisture and high air temperatures. DO NOT (a) apply during boot, bloom, or early dough stages, or (b) apply in fluid fertilizers. Use only the amine formulation to help prevent drift to susceptible crops. DO NOT use with adjuvants.
<i>bentazon</i> Basagran/Broadloom 4 lb/gal	6	1.5-2 pt	0.75-1	48 H/ Forage = 12 D	Apply over-the-top when sorghum has 1-5 leaves. Grain sorghum is tolerant at all stages of growth up to, and including the early boot stage. Can be tank-mixed with atrazine if necessary. DO NOT apply to grain sorghum that is heading or blooming. Add oil concentrate (1% v/v) according to label directions for the weed species present. DO NOT apply more than 2 pt of bentazon per season. DO NOT apply with fluid fertilizers. Rain-fall period is 4 hours.
<i>bromoxynil</i> Buctril 2E	6	1-1.5 pt	0.25-0.38	24 H/ Forage = 45 D	Apply over-the-top when sorghum has 3 leaves (up to pre-boot stage). Controls cocklebur, bristly starbur, smartweed and certain other broadleaf weeds less than 3" tall. DO NOT add spray additives or mix with fluid fertilizers. Spray when sorghum foliage is dry to decrease risk of sorghum leaf burn. Temporary sorghum leaf burn may occur.

GRAIN SORGHUM WEED CONTROL

		BROADCAST RATE/ACRE			
HERBICIDE	MOA	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
POSTEMERGENCE					
<i>pyrasulfotole + bromoxynil</i> Huskie 2.06EC	6 + 27	12.8-16 oz	0.03-0.04 + 0.18-0.22	24 H/ Grain = 60 D Forage = 7 D	For broadleaf weed control including annual morningglory and Palmer amaranth. Apply from 3 leaf stage up to 30" tall and/or prior to flag leaf emergence, whichever comes first. Huskie will cause temporary crop stunting, leaf burn, and chlorosis (whitening). Tank-mix with atrazine to improve broadleaf control (up to 12" tall sorghum) and reduce initial crop injury. Include a NIS at 0.25% v/v. Do not tank-mix with Lorsban. Crop rotation restrictions: wheat, barley, o ats, annual ryegrass-1 month; soybean, grain sorghum-4 months; canola, corn,-9 months; cotton, peanut-field bioassay. Rain-free period is 1 hour.
<i>halosulfuron</i> Profine, Sandea 75 DF	2	0.67 oz	0.032	12 H/ Forage = 30 D	Controls many annual broadleaf weeds and suppression of nutsedge. Can be applied over-the-top from the 2 leaf stage through layby stage of grain sorghum (before grain head emergence). Can be tank-mixed with Banvel, 2,4-D, Buctril or atrazine. The use of a non-ionic surfactant or crop oil is recommended. Rotational restrictions include the following: barley, oats, rye, wheat-2 months; cotton-4 months; peanuts-6 months; soybeans-9 months; onions-18 months. Refer to product label for additional crop rotation information. Rain-free period is 4 hours.
<i>dicamba</i> Banvel, Clarity, Sterling, Vision 4 lb/gal	4	8 oz	0.25	24 H/ 30 D	Apply over-the-top when sorghum is in the 3 leaf stage to 8" tall. If sorghum is 8-15" tall, apply only as a directed spray--see recommendation under POSTEMERGENCE (Directed Spray). DO NOT apply to sorghum grown for seed production. Make only one POST application per season. Prevent drift to susceptible crops. Do not graze or feed treated sorghum forage or silage prior to mature grain stage. Do not use adjuvants. If dicamba is applied during periods of rapid growth, temporary leaf rolling and plant leaning may occur. Rain-free period is 4 hours.
POSTEMERGENCE (Directed Spray)					
<i>2,4-D amine</i> numerous trade names 3.8 lb/gal	4	0.5-1 pt	0.24-0.48	48 H/ 30 D	Apply as a directed spray to sorghum 8-15" tall. Use low rate if applications are made under conditions of high soil moisture and high air temperatures. DO NOT (a) apply during boot, bloom, or early dough stages, or (b) apply in fluid fertilizers. Use only the amine formulation and prevent drift to susceptible crops.
<i>dicamba</i> Banvel, Clarity, Sterling, Vision 4 lb/gal	4	8 oz	0.25	24 H/ 30 D	Apply as a directed spray to sorghum 8-15" tall. DO NOT apply to sorghum grown for seed production. Make only one application per season. Prevent drift to susceptible crops. Do not graze or feed treated sorghum or silage prior to mature grain stage. If dicamba is applied during periods of rapid growth, temporary leaf rolling and plant leaning may occur.
<i>linuron</i> 4L 50DF numerous trade names	7	1-2 pt 1-2 lb	0.5-1	24 hours/ 75 days	Apply as a directed spray after sorghum is 12" tall. Use low rate when sorghum is 12-15" tall, and a sprayer equipped with skids, shoes or shields. Use the high rate when sorghum is 15" tall and weeds are up to 4" in height. Make only one application per season. Add nonionic surfactant (0.5 % v/v).
<i>paraquat</i> Gramoxone Inteon /Gramoxone SL 2 lb/gal Firestorm/Parazone/Helmquat 3 lb/gal	22	1-2 pt 0.7-1.3 pt	0.25-0.50	24 H/ Grain = 48 D Forage = 20 D	Apply with a nonionic surfactant (1 qt/100 gals. spray solution) when sorghum is at least 12" tall. Use low rate for weeds less than 2" tall; high rate for weeds 2-3" tall. DO NOT apply with (a) drop nozzles mounted on a boom or (b) fluid fertilizers. Use 20-40 gals of water/A and do not exceed 30 psi pressure. Do not spray higher than 3" on the sorghum stalks. <u>Can also be used with hooded-sprayer.</u>

GRAIN SORGHUM WEED CONTROL

		BROADCAST RATE/ACRE			
HERBICIDE	MOA	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
POSTEMERGENCE (Directed Spray)					
<i>carfentrazone</i> Aim 2EC	14	0.5-1 oz	0.08-0.016	12 H/ Leaf Collars = 6 D	Use Aim for the post-directed control of annual morningglory (except smallflower), pigweed, and tropical spiderwort. Add NIS at 0.25% v/v (1 qt/100 gals). Use drop nozzles or other spray methods to minimize the amount of Aim deposited on sorghum leaves or in whorl. Aim provides no residual control. Rain-free period for Aim is 6-8 hours.
POSTEMERGENCE - INCORPORATED (Culti-Spray)					
<i>pendimethalin</i> Prowl/Pendimax 3.3EC Prowl H20 3.8 ACS	3	1.2-1.8 pt 1.5 pt	0.50-0.75 0.71		These treatments will provide residual control of annual grasses, including Texas panicum. They will not control existing grasses. They should be used to augment other weed control tactics. When using either of the treatments, the following steps must be followed. 1. The herbicides must be applied to weed free soil. 2. Sorghum brace roots must be protected by soil thrown to the base of the stalk with a sweep or rolling cultivator prior to application. 3. The herbicides can be applied over-the-top or with drop nozzles, depending on sorghum size. Pendimethalin can be applied from the 4" growth stage up until layby. Trifluralin can be applied when the sorghum is 8-24" tall 4. A shallow follow-up cultivation is required after application to minimize herbicide loss. Rainfall or irrigation amounts of 0.5-1" can be used instead of mechanical cultivation.
<i>trifluralin</i> numerous trade names 4 lb/gal	3	1 pt	0.50		
HARVEST AID					
<i>carfentrazone</i> Aim 2EC	14	1 oz	0.016	12 H/ 3 D	For the pre-harvest desiccation of pigweed and morningglories. Can be applied by ground or air. Use with a crop oil concentrate at 1% v/v (1 gal/100 gal). Can be tank-mixed with glyphosate to improve the spectrum of control.
glyphosate numerous trade names 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9	32-64 oz 26-52 oz 24-48 oz 23-46 oz 21-42 oz 19-38 oz	0.75-1.50 ae	4 H/ 7 D	Apply when grain moisture is 30% or less. Do not use on sorghum grown for seed because a reduction in seed germination or vigor may occur. Not all formulations of glyphosate may be labeled for this use. Refer to specific product label.

¹Nitrogen solutions or complete fluid fertilizers may replace all or part of the water as a carrier for some preemergence herbicides. Proper agitation is necessary. Follow label instructions concerning tests for potential compatibility problems. Do not use fluid fertilizers with postemergence herbicides since possible crop injury may occur from the use of the fluid fertilizer.

HERBICIDE PROGRAMS FOR MANAGING HERBICIDE-RESISTANT PALMER AMARANTH IN GRAIN SORGHUM

PREEMERGENCE ¹	POSTEMERGENCE ² (OVER THE TOP)	POSTEMERGENCE ³ (DIRECTED SPRAY)	HOODED SPRAYER
Dual Magnum or Warrant	Atrazine or Huskie + Atrazine	2,4-D or Clarity	Gramoxone Inteon or Gramoxone SL or Firestorm or Parazone or Helmquat

¹Must use Concep treated seed. ²leaf sorghum up until 12" in height. ³8-15" tall sorghum.

GRAIN SORGHUM WEED RESPONSE TO HERBICIDES

Eric P. Prostko, Extension Agronomist - Weed Science

	Intrro* Micro-Tech	Dual Magnum* ¹	Outlook Propel*	Warrant*	Atrazine	LinexLorox	Paraquat**	2,4-D	Banvel	Buctril	Huskie	Sandea/ Profine	Basagran
	PRE	PRE	PRE	PRE	POT	PDS	PDS	POT/ PDS	POT/ PDS	POT	POT	POT	POT
PERENNIAL WEEDS													
johnsongrass, rhizome	P	P	P	P	P	P	P	P	P	P	P	P	P
nutsedge, purple	P	P	P	P	P	P-F	P	P	P	P	P	F-G	P
nutsedge, yellow	F-G	F-G	F-G	F	P	P-F	P	P	P	P	P	F-G	F-G
ANNUAL GRASSES													
crabgrass	E	E	E	E	P-F	G	G	P	P	P	P	P	P
crowfootgrass	E	E	E	E	P	E	G	P	P	P	P	P	P
goosegrass	E	E	E	E	P	E	G	P	P	P	P	P	P
fall panicum	G	G	G	G	P	E	G	P	P	P	P	P	P
johnsongrass (seedling)	P	P	P	P	P	G	G	P	P	P	P	P	P
sandbur	F-G	F-G	F-G	F-G	F	E	G	P	P	P	P	P	P
signalgrass, broadleaf	F-G	F-G	F-G	F-G	P	G	G	P	P	P	P	P	P
Texas panicum	P-F	P-F	P-F	P-F	P	G	E	P	P	P	P	P	P
BROADLEAF WEEDS													
bristly starbur	P	P	P	P	E	G	G	G	E	G	G	G	E
citronmelon	P	P	P	P	G	E	F	E	E			P-F	P
cocklebur	P	P	P	P	E	E	G	E	E	E	G-E	G	E
cowpea	P	P	P	P	G	G	G	E	E				P
crotalaria	P	P	P	P	G	E	G	G	G				P
croton, tropic	P	P	P	P	G	G	G	G	G				P
Florida beggarweed	F	F	F	F	G	E	G	P	G	G	G	P	P
Florida pusley	G-E	G-E	G-E	G-E	G	G	F-G	G	G	G-E	G-E		P
jimsonweed	P	P	P	P	E	E	G	E	E		G		E

Key to response symbols:

E = Excellent control, weed kill 90% or above

G = Good control, weed kill 80% or above

F = Fair control, weed kill 70% or above

P = Poor control, less than 70% control

If no symbol is given, weed response is unknown.

Ratings are based on average to good soil and weather conditions for herbicide performance.

¹ The generic formulations of metolachlor (**Parallel, Stalwart, Me-Too Lachlor**) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.

*Use only where Concep treated grain sorghum seed is planted.

**Commercially available as Gramoxone Inteon, Gramoxone SL, Parazone, or Firestorm.

PRE = Preemergence

POST = Postemergence over-the-top

PDS = Postemergence directed spray.

GRAIN SORGHUM WEED RESPONSE TO HERBICIDES

	Intrro* Micro-Tech	Dual Magnum* ¹	Outlook Propel*	Warrant*	Atrazine	Linex Lorox	Paraquat**	2,4-D	Banvel	Buctril	Huskie	Sandea/ Profine	Basagran Broadloom
	PRE	PRE	PRE	PRE	POT	PDS	PDS	POT/ PDS	POT/ PDS	POT	POT	POT	POT
BROADLEAF WEEDS (continued)													
lambsquarters	F	F	F-G	F-G	E	E	F-G	E	E	G	G	F	P
morningglories	P	P	P	P	E	G	G	G	E	G	G-F	P	F
Pigweed	G	G	G	G	E	E	G	G-E	G-E	G	G	F-G	P
ALS-resistant	G	G	G	G	E	E	G	G-E	G-E	G	G	P	P
Atrazine-resistant	G	G	G	G	P	E	G	G-E	G-E	G	G	F-G	P
prickly sida	F	F	F		E	G	F-G	E	E	G	G	F	F-G
purslane	G	G	G		E	G	G	G	E				P
ragweed, common	F	F	F	F	E	E	G	E	E	G	G	G	F
sesbania, hemp	P	P	P		F-G	G	P-F	G	E	G	G	F-G	P
sicklepod	P	P	P	P	G	E	G	E	E	P	P	P	P

Key to response symbols:

E = Excellent control, weed kill 90% or above

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PDS = Postemergence directed spray.

INSECTICIDAL TRANSGENIC CROPS (PIP - PLANT INCORPORATED PROTECTANTS)

John All, Entomologist

A “transgenic” crop is a cultivar or variety that expresses a trait or traits derived from genetic sources (transgenes) that are not inherent in the plant. An insecticidal transgenic crop produces toxic components to insects, but these materials supposedly have no impact on other organisms. To date, all insecticidal transgenic crops have resulted from transgenes (referred to as cry transgenes) derived from the insect pathogenic bacteria *Bacillus thuringiensis* (Bt), which produces protein (referred to as Cry toxins) that is lethal to certain insects. Different Cry toxins are highly lethal to specific insects and have little or no toxicity to others. Cry toxins are not considered to be broad spectrum insecticides. It is important to understand which cry transgenes are present in a crop cultivar and whether or not the Cry toxin(s) that the plant produces has high toxicity to a target pest of interest. The Environmental Protection Agency registers and regulates insecticidal transgenes and the Cry protein toxin that is produced by the transgene, and together these are called Plant Incorporated Protectants (PIP). Currently, sweet corn, potato, field corn, and cotton have PIP registrations (see table). Note that herbicide resistant transgenes and others are not regulated by EPA since they do not produce toxins. Most transgenic crops have multiple transgenes (one or more insecticidal or herbicidal transgenes) present and there is a loose terminology associated with these plants that express more than one transgenic trait. Transgenic crops that possess multiple transgenes are termed either “stacked gene” or “pyramided gene” crops.

Current & Previously Registered Section 3 PIP Registrations (Table modified from U.S. Environmental Protection Agency: Pesticides: Regulating Pesticides, http://www.epa.gov/opppbd1/biopesticides/pips/pip_list.htm. Revised by EPA on 11/30/11.) Note that several PIP registrations have expired, they are included in the table to provide an historical perspective of PIP utilization.

PLANT-INCORPORATED PROTECTANT	REGISTRANT	DATE REGISTERED	DATE EXPIRES
Bt potato Cry 3A	Monsanto 524-474	May 1995	No expiration date
Bt corn Event 176 with Cry1Ab	Mycogen 68467-1	August 1995	April 1, 2001
Bt corn Event 176 with Cry1Ab (2 products--field corn, popcorn)	Syngenta 66736-1	August 1995 March 1998	June 30, 2001
Bt cotton Cry 1Ac (Bollgard)	Monsanto 524-478	October 1995	Voluntarily cancelled September 15, 2010
Bt corn Event MON 801 with Cry1Ab	Monsanto 524-492	May 1996	Voluntarily cancelled May 8, 1998
Bt corn Event BT11 with Cry 1Ab (field corn – AgriSure CB and sweet corn – Attribute – no refugia for sweet corn) (PDF) (253 pp, 1.34 mb) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Syngenta field corn 67979-1 sweet corn 65268-1	August 1996 February 1998	September 30, 2015
Bt corn Event MON 810 Cry1Ab (YieldGard) (PDF)(253 pp, 1.34 mb) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Monsanto 524-489	December 1996	September 30, 2015
Bt corn Cry 9C (domestic field corn for feed and non-food uses) (StarLink)	Aventis 264-669	May 1998	Voluntarily cancelled October 2000
Bt corn Event TC1507 with plant-optimized (PO) Cry1F (Herculex I) (PDF) (253 pp, 1.34 mb) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Dow/Mycogen 68467-2	May 2001	September 30, 2015
Bt corn Event TC1507 with POCry1F (Herculex I) (PDF)(253 pp, 1.34 mb) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Pioneer/Dupont 29964-3	May 2001	September 30, 2015
Bt cotton Cry2Ab2 in combination with Cry1Ac (Bollgard II)	Monsanto 524-522	December 2002	No expiration date
Bt corn Event MON863 with Cry3Bb1 (YieldGard RW) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Monsanto 524-522	February 2003	September 30, 2010
Bt corn stack Events MON863 + MON810 with Cry3Bb1 + Cry1Ab (YieldGard Plus) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Monsanto 524-545	October 31, 2003	September 30, 2010
Bt cotton Cry1Ac + Cry1F (WideStrike) (PDF) (94 pp,777 K)	Dow AgroSciences 68467-3	September 30, 2004	No expiration date

INSECTICIDAL TRANSGENIC CROPS (PIP - PLANT INCORPORATED PROTECTANTS)

PLANT-INCORPORATED PROTECTANT	REGISTRANT	DATE REGISTERED	DATE EXPIRES
Bt corn Event DAS-06275-8 with MOCry1F (Mycogen Brand B.t. Cry1F Event DAS-06275-8 corn) (253 pp, 1.34 mb) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Dow AgroSciences 68467-4	May 27, 2005	September 30, 2015
Bt corn Event DAS-591227-7 with Cry34Ab1 + Cry35Ab1 (Herculex RW (PDF) (205 pp, 1.19 mb) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Dow AgroSciences 68467-5	August 31, 2005	September 30, 2015
Bt corn Event DAS-59122-7 with Cry34Ab1 + Cry35Ab1 (Herculex RW) (PDF) (253 pp, 1.34 mb) Reregistration Terms and Conditions (PDF) (205 pp, 1.12 mb)	Pioneer/Dupont 29964-4	August 31, 2005	September 30, 2015
Bt corn Events DAS-59122-7 + TC1507 with Cry34Ab1 + Cry35Ab1 + PO Cry1F (Herculex Xtra) (205 pp, 1.19 mb) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Dow AgroSciences 68467-6	October 27, 2005	September 30, 2015
Bt corn Events DAS-59122-7 + TC1507 with Cry34Ab1 + Cry35Ab1 + PO Cry1F (Herculex Xtra) Reregistration Terms and Conditions (PDF) (205 pp, 1.19 mb)	Pioneer/Dupont 29964-5	October 27, 2005	September 30, 2015
Bt cotton Event MON531 with Cry1Ac (breeding nursery use only)	Monsanto 524-555	September 1, 2005	No expiration date
Bt cotton Event MON15947 with Cry2Ab2 (breeding nursery use only)	Monsanto 524-556	September 1, 2005	No expiration date
Bt corn Event MON88017 with Cry3Bb1 (YieldGard VT RW) (PDF) (234 pp, 978k) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Monsanto 524-551	December 13, 2005	September 30, 2015
Bt corn Events MON88017 + MON 810 with Cry1AB + Cry3Bb (YieldGard VT Plus (PDF) (234 pp, 978k) Reregistration Terms and Conditions (PDF) (238 pp, 1.12 mb)	Monsanto 524-552	December 13, 2005	September 30, 2015
Bt corn Event MIR 604 with modified Cry3A (Agrisure RW)(PDF) (234 pp, 978k) Reregistration Terms and Conditions (PDF) (171 pp, 578k)	Syngenta 67979-5	October 3, 2006	September 30, 2015
Bt corn Events MIR 604 + Bt11 with modified Cry3A + Cry1Ab (Agrisure CB/RW)(PDF) (234 pp, 978k) Reregistration Terms and Conditions (PDF) (171 pp, 578k)	Syngenta 67979-8	January 24, 2007	September 30, 2015
Bt corn Event Mon 89034 With Cry1A.105 + CryAb2 (PDF) (166 pp, 826k) Reregistration Terms and Conditions (PDF) (171 pp, 578k)	Monsanto 524-575	June 10, 2008	September 30, 2015
Bt corn Events Mon 89034 + Mon 88017 With Cry1A.105 + Cry2Ab2 + Cry3Bb1 (PDF) (166 pp, 826k) Reregistration Terms and Conditions (PDF) (171 pp, 578k)	Monsanto 524-576	June 10, 2008	September 30, 2015
Bt cotton Vip3Aa19 plus Modified Cry1Ab	Syngenta 67979-9	June 26, 2008	September 30, 2015
Bt corn Vip3Aa20 (MIR162)	Syngenta 67979-14	November 26, 2008	December 31, 2011
Bt corn Bt Cry 1Ab (Bt11) + Vip 3Aa 20 (MIR 162)	Syngenta 67979-12	February 13, 2009	December 31, 2011
Bt corn Bt Cry 1Ab (Bt11) + Vip 3Aa 20 (MIR 162) + modified Cry3A (MIR 604)	Syngenta 67979-13	February 13, 2009	December 31, 2011
(SmartStax) Bt Corn Events MON 89034 x TC1507 x MON 88017 x DAS-59122-7 (PDF) (19 pp, 79k)	Monsanto Company 524-581 Mycogen Seeds c/o Dow Agro-Sciences LLC 68467-7	July 20, 2009	November 30, 2013
(SmartStax) Bt Corn Events MON 89034 x TC1507 x MON 88017 x DAS-59122-7 Seed Blend (PDF) (42 pp, 899k)	Monsanto Company 524-595 Mycogen Seeds c/o Dow Agro-Sciences LLC 68467-16	April 8, 2011	November 30, 2013
Bt corn Optimum AcreMax 1 (OAM 1) Seed Blend of Herculex Xtra + Herculex I (PDF) (23 pp, 164k) Reregistration Terms and Conditions (PDF) (171 pp, 578k)	Pioneer/Dupont 29964-6	April 30, 2010	September 30, 2012

INSECTICIDAL TRANSGENIC CROPS (PIP - PLANT INCORPORATED PROTECTANTS)

PLANT-INCORPORATED PROTECTANT	REGISTRANT	DATE REGISTERED	DATE EXPIRES
Bt corn Optimum AcreMax RW (OAM RW) Seed Blend of Herculex RW + Non-Bt corn (PDF) (23 pp, 164k) Reregistration Terms and Conditions (PDF) (171 pp, 578k)	Pioneer/Dupont 29964-6	April 30, 2010	September 30, 2012
Bt corn 1507 (PO Cry1F) x MON 810 (PO Cry1Ab)	Pioneer/Dupont 29964-7	February 24, 2010	October 31, 2010
Bt corn 1507 (PO Cry1F) x 59122 (PO Cry34Ab1 + Cry35Ab1) x MON 810 (PO Cry1Ab)	Pioneer/Dupont 29964-8	February 24, 2010	October 31, 2010
Bt corn 59122 (PO Cry34Ab1 + Cry35Ab1) x MON 810 (PO Cry1Ab)	Pioneer/Dupont 29964-9	February 24, 2010	October 31, 2010
Bt Cry1Ac Soybean MON-877Ø1-2 (PDF) (39 pp, 197k)	Monsanto 524-594	September 9, 2010	September 30, 2013

PEANUT: PEANUT INSECT CONTROL

Mark R. Abney, Research and Extension Entomologist

Insecticides are placed into IRAC groups based on their mode of action (insecticides in the same IRAC group have the same mode of action). Effective insecticide resistance management involves the use of alternations, rotations, or sequences of different insecticide modes of action. To prevent the development of resistance, it is important not to apply insecticides with the same mode of action (IRAC group number) to successive generations of the same insect.

PEST	INSECTICIDE	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS
Beet Armyworm ¹	<i>chlorantraniliprole</i> Prevathon	28	14-20 fl oz	0.047-0.067	4 H/ 1 day	Do not apply more than 0.2 lb ai of chlorantraniliprole/A/ year.
	<i>diflubenzuron</i> Dimilin 2L	15	4-8 fl oz	0.06-0.125	12 H/ 28 D	Do not make more than 3 applications/season.
	<i>flubendiamide</i> Belt 4SC	28	2-4 fl oz	0.0625-0.125	12 H/ 3 D	Do not apply more than 4 oz/7-day interval and more than 12 oz/crop season.
	<i>indoxacarb</i> Steward 1.25EC	22	9.2-11.3 fl oz	0.09-0.11	12 H/ 14 D	Do not apply more than 45 fl oz/A/season. Minimum interval between treatments is 5 days.
	<i>methoxyfenozide</i> Intrepid 2F	18	6-10 fl oz	0.09-0.16	4 H/ 7 D	
	novaluron Diamond 0.83 EC	15	6-12 fl oz	0.039-0.077	12 H/ 28 D	Do not apply more than 36 fl oz/A/season. Do not feed treated peanut hay or vines to livestock.
	<i>spinosad</i> Blackhawk 36WG	5	1.7-3.3 oz	0.038-0.074	4 H/ 3 D of harvest; Forage = 14 D	Do not apply more than 12.4 oz/A/crop. Do not make applications less than 7 days apart.
Burrower Bug ⁵	<i>chlorpyrifos</i> Lorsban 15G	1B	13.6 lb broadcast or banded	2	24 H/ 21 D	Maximum single application rate is 15 oz/1000 ft of row. Do not exceed 26.4 lb Lorsban 15G/A/season. For banded applications use a 10-18" band.
Corn Earworm	<i>acephate</i> Orthene 97	1B	12-16 oz	0.72-0.97	24 H/ 14 D (of digging)	Repeat as needed. Do not feed treated forage or hay to livestock or allow animals to graze treated areas.
	<i>chlorantraniliprole</i> Prevathon	28	14-20 fl oz	0.047-0.067	4 H/ 1 day	Do not apply more than 0.2 lb ai of chlorantraniliprole/A/year.
	<i>flubendiamide</i> Belt 4SC	28	2-4 fl oz	0.0625 - 0.125	12 H/ 3 D	Do not apply more than 12 oz per crop season
	<i>indoxacarb</i> Steward 1.25EC	22	9.2-11.3 fl oz	0.09-0.11	12 H/ 14 D	Do not apply more than 45 fl oz/A/season. Minimum interval between treatments is 5 days.
	<i>methomyl</i> Lannate 90SP Lannate 2.4LV	1A	0.25-1 lb 0.75-3 pt	0.225-0.9 0.225-0.9	48 H/ 21 D	Up to 3 applications. Do not feed treated vines.
	pyrethroids <i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1.8-2.4 fl oz	0.014-0.019	12 H/ 14 D	Do not exceed 3 applications/season of 2.8 fl oz/10 day interval.
	<i>bifenthrin</i> Brigade 2EC		2.1-6.4 fl oz	0.033-0.1	12 H/ 14 D	Do not apply more than 0.5 lb ai/A/season. Do not feed peanut hay to livestock.
	<i>esfenvalerate</i> Asana XL 0.66EC		2.9-5.8 fl oz	0.015-0.03	12 H/ 21 D	Do not exceed 0.15 lb ai/A/season. Do not feed or graze livestock on treated vines.
	<i>lambda-cyhalothrin</i> Karate Z 2.08CS		1.28-1.92 fl oz	0.02-0.03	24 H/ 14 D	Do not apply more than 1 pt/A/season. Do not graze livestock in treated areas or use treated vines for animal feed.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC		3.2-4 oz	0.02-0.025	12 H/ 7 D	Do not apply more than 0.15 lb ai/season. Do not graze livestock in treated areas. Do not use treated vines for animal feed.

PEANUT INSECT CONTROL

PEST	INSECTICIDE	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS
Cutworm ¹	<i>flubendiamide</i> Belt 4SC	28	2-4 fl oz	0.0625-0.125	12 H/ 3 D	Do not apply more than 12 oz/crop season.
	<i>indoxacarb</i> Steward 1.25EC	22	9.2-11.3 fl oz	0.09-0.11	12 H/ 14 D	Do not apply more than 45 fl oz/A/season. Minimum interval between treatments is 5 days.
	<i>methomyl</i> Lannate 90SP Lannate 2.4LV	1A	0.5-1 lb 1.5-3 pt	0.45-0.9 0.45-0.9	48 H/ 21 D	Spray late in the afternoon for maximum efficacy. Do not feed treated vines.
	pyrethroids <i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1-1.8 fl oz	0.008-0.014	12 H/ 14 D	Do not exceed 3 applications per season of 2.8 fl oz/10 day intervals.
	<i>bifenthrin</i> Brigade 2EC		2.1-6.4 fl oz	0.033-0.1	12 H/ 14 D	Do not apply more than 0.5 lb ai/A/season. Do not feed peanut hay to livestock.
	<i>esfenvalerate</i> Asana XL 0.66EC		9.6 oz	0.05	12 H/ 21 D	Do not exceed 0.15 lb ai/A/season. Do not feed or graze livestock on treated vines.
	<i>lambda- cyhalothrin</i> Karate Z 2.08CS		1.28-1.92 fl oz	0.015-0.025	24 H/ 14 D	Do not apply more than 1 pt/A/season. Do not graze livestock in treated areas or use treated vines for animal feed.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC		1.28-4 oz	0.008-0.025	12 H/ 7 D	Do not apply more than 0.15 lb ai/season. Do not graze livestock in treated areas. Do not use treated vines for animal feed.
Fall Armyworm ¹	<i>acephate</i> Orthene 97	1B	12-16 oz	0.72-0.97	24 H/ 14 D (of digging)	Do not feed treated forage or hay to livestock or allow animals to graze treated areas.
	<i>chlorantraniliprole</i> Prevathon	28	14-20 fl oz	0.047-0.067	4 H/ 1 day	Do not apply more than 0.2 lb ai of chlorantraniliprole/A/year.
	<i>diflubenzuron</i> Dimilin 2L	15	4-8 fl oz	0.06-0.125	12 H/ 28 D	Do not make more than 3 applications/season.
	<i>flubendiamide</i> Belt 4SC	28	2-4 fl oz	0.0625-0.125	12 H/ 3 D	Do not apply more than 12 oz/crop season.
	<i>indoxacarb</i> Steward 1.25EC	22	9.2-11.3 fl oz	0.09-0.11	12 H/ 14 D	Do not apply more than 45 fl oz/A/season. Minimum interval between treatments is 5 days.
	<i>methomyl</i> Lannate 90SP Lannate 2.4LV	1A	0.25-0.5 lb 0.75-1.5 pt	0.225-0.45 0.225-0.45	48 H/ 21 D	Do not feed treated vines.
	<i>methoxyfenozide</i> Intrepid 2F	18	6-10 fl oz	0.09-0.16	4 H/ 14 D	Do not make more than 3 applications/year.
	<i>novaluron</i> Diamond 0.83 EC	15	6-12 fl oz	0.039-0.077	12 H/ 28 D	Do not apply more than 36 fl oz/A/season. Do not feed treated peanut hay or vines to livestock.
	<i>spinosad</i> Blackhawk 36WG	5	1.7-3.3 oz	0.038-0.074	4 H/ 3 D of harvest; Forage = 14 D	Do not apply more than 12.4 oz/A/crop. Do not make applications less than 7 days apart.
Green Cloverworm	<i>flubendiamide</i> Belt 4 SC	28	2-4 fl oz	0.0625-0.125	48 H/ 3 D	Do not apply more than 12 oz/crop season.
	<i>methoxyfenozide</i> Intrepid 2F	18	6-10 fl oz	0.09-0.16	4 H/ 14 D	Do not make more than 3 applications/ year.

PEANUT INSECT CONTROL

PEST	INSECTICIDE	MOA	AMOUNT OF FORMUALTION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS
Green Cloverworm (continued)	novaluron Diamond 0.83 EC	15	6-12 fl oz	0.039-0.077	12 H/ 28 D	Do not apply more than 36 fl oz/A/season. Do not feed treated peanut hay or vines to livestock.
	<i>spinosad</i> Blackhawk 36 WG	5	1.7-3.3 oz	0.038-0.074	4 hours/ 3 days of harvest; Forage = 14 days	Do not apply more than 12.4 oz/A/crop. Do not make applications less than 7 days apart.
Lesser cornstalk borer ²	<i>chlorpyrifos</i> Lorsban 15G	1B	13.6 lb broadcast or banded	2	24 H/ 21 D	Maximum single application rate is 15 oz/1,000 ft of row. Do not exceed 26.4 lb Lorsban 15G/A/season. For rescue treatment apply in a 10-18" band over the fruiting zone.
Potato leafhopper	<i>acephate</i> Orthene 97	1B	12-16 oz	0.72-0.97	24 H/ 14 D (of digging)	Do not feed treated forage or hay to livestock or allow animals to graze treated areas.
	<i>carbaryl</i> Sevin XLR or 4F Sevin 80S	1A	1 qt 1.25 lb	1 1	12 H/ 14 D	
	pyrethroids <i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1-1.8 fl oz	0.008-0.014	12 H/ 14 D	Do not exceed 3 applications per season of 2.8 fl oz/10 day intervals.
	<i>bifenthrin</i> Brigade 2EC		2.1-6.4 fl oz	0.033-0.1	12 H/ 14 D	Do not apply more than 0.5 lb ai/A/season. Do not feed peanut hay to livestock.
	<i>esfenvalerate</i> Asana XL 0.66EC		2.9-5.8 fl oz	0.015-0.03	12 H/ 14 D	Do not exceed 0.15 lb ai/A/season. Do not feed or graze livestock on treated vines.
	<i>lambda-cyhalothrin</i> Karate Z 2.08CS		0.96-1.6 fl oz	0.015-0.025	24 H/ 7 D	Do not apply more than 1 pt/A/season. Do not graze livestock in treated areas or use treated vines for animal feed.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC		1.76-4 oz	0.011 - 0.025	12 H/ --	Do not apply more than 0.15 lb ai/season. Do not graze livestock in treated areas. Do not use treated vines for animal feed.
Rednecked peanut worm	<i>flubendiamide</i> Belt 4 SC	28	2-4 fl oz	0.0625-0.125	12 H/ 3 D	Do not apply more than 12 oz/crop season.
	pyrethroids <i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1-1.8 fl oz	0.008-0.014	12 H/ 14 D	
	<i>bifenthrin</i> Brigade 2EC		2.1-6.4 fl oz	0.033-0.1	12 H/ 14 D	Do not apply more than 0.5 lb ai/A/season. Do not feed peanut hay to livestock.
	<i>esfenvalerate</i> Asana XL 0.66EC		2.9-5.8 fl oz	0.015-0.03	12 H/ 21 D	Do not exceed 0.15 lb ai/A/season. Do not feed or graze livestock on treated vines.
	<i>lambda-cyhalothrin</i> Karate Z 2.08CS		0.96-1.6 fl oz	0.015-0.025	24 H/ 14 D	Do not apply more than 1 pt/A/season. Do not graze livestock in treated areas or use treated vines for animal feed.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC		1.28-4 oz	0.008-0.025	12 H/ 7 D	Do not apply more than 0.15 lb ai/season. Do not graze livestock in treated areas. Do not use treated vines for animal feed.
Southern Armyworm	<i>flubendiamide</i> Belt 4SC	28	12-4 fl oz	0.0625-0.125	12 H/ 3 D	Do not apply more than 12 oz/crop season.

PEANUT INSECT CONTROL

PEST	INSECTICIDE	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS
Southern corn rootworm ²	<i>chlorpyrifos</i> Lorsban 15G	1B	13.6 lb banded	2	24 H/ 21 D	Maximum single application rate is 15 oz/1,000 ft of row. Do not exceed 26.4 lb Lorsban 15G/A/season. Do not feed peanut forage or hay to meat or dairy animals.
Soybean loopers	<i>chlorantraniliprole</i> Prevathon	28	20 fl oz	0.067	4 H/ 1 D	Do not apply more than 0.2 lb ai of chlorantraniliprole/A/year.
	<i>diflubenzuron</i> Dimilin 2L Suppression only	15	4-8 fl oz	0.06-0.125	12 H/ 28 D	Do not make more than 3 applications/season.
	<i>flubendiamide</i> Belt 4SC	28	2-4 fl oz	0.0625-0.125	12 H/ 3 D	Do not apply more than 12 oz/crop season.
	<i>indoxacarb</i> Steward 1.25EC	22	9.2-11.3 fl oz	0.09-0.11	12 H/ 14 D	Do not apply more than 45 fl oz/A/season. Minimum interval between treatments is 5 days.
	<i>methoxyfenozide</i> Intrepid 2F	18	6-10 fl oz	0.09-0.16	4 H/ 7 D	Do not make more than 3 applications/year.
	<i>novaluron</i> Diamond 0.83 EC	15	6-12 fl oz	0.039-0.077	12 H/ 28 D	Do not apply more than 36 fl oz/A/season. Do not feed treated peanut hay or vines to livestock.
	<i>spinosad</i> Blackhawk 36WG	5	1.7-3.3 oz	0.038-0.074	4 H/ 3 D of harvest; Forage = 14 D	Do not apply more than 12.4 oz/A/crop. Do not make applications less than 7 days apart.
Spider mites	<i>fenpropathrin</i> Danitol 2.4EC	3A	10.6-16 fl oz	0.2-0.3	24 H/ 14 D (of digging)	Do not feed treated forage or dried hay within 14 days of last application. Do not exceed 0.8 lb ai/A/season.
	<i>propargite</i> Comite 6.55EC	12C	2 pt	1.64	48 H/ 14 D	Do not apply more than twice per season. Do not graze or feed livestock on treated areas or cut treated forage for hay. When temperatures are greater than 90°F with high humidity, some leaf phytotoxicity may occur.
	Comite II 6EC		2.25 pt	1.68	48 H/ 14 D	Do not apply more than twice per season. Use a minimum of 20 gal/A for ground application and 5 gal/A for aerial application.
	Omite 30W		3-5 lb	0.9-1.5	48 H/ 14 D	Do not apply more than twice per season. Do not graze or feed livestock on treated areas or cut treated forage for hay. Do not plant unregistered crops within 6 months of last application.
Three cornered alfalfa hopper	<i>carbaryl</i> Sevin XLR or 4F Sevin 80S	1A	1 qt 1.25 lb	1 1	12 H/ 14 D	
	pyrethroids <i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1.8-2.4 fl oz	0.014-0.019	12 H/ 14 D	Do not exceed 3 applications per season of 2.8 fl oz/10 day intervals.
	<i>bifenthrin</i> Brigade 2EC		2.1-6.4 fl oz	0.033-0.1	12 H/ 14 D	Do not apply more than 0.5 lb ai/A/season. Do not feed peanut hay to livestock.
	<i>lambda-cyhalothrin</i> Karate Z 2.08CS		0.96-1.6 fl oz	0.015-0.025	24 H/ 14 D	Do not apply more than 1 pt/A/eason. Do not graze livestock in treated areas or use treated vines for animal feed.

PEANUT INSECT CONTROL

PEST	INSECTICIDE	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS
Thrips ³	<i>acephate</i> Orthene 97	1B	6-12 oz	0.36-0.73	24 H/ 14 D (of digging)	Do not feed treated forage or hay to livestock or allow animals to graze treated areas. Good results have been obtained by tank mixing with early post-emergence herbicides such as paraquat combinations in lieu of in-furrow treatments. However, timing is critical for adequate thrips control and may not coincide with optimum timing for post-emergence weed control.
	<i>imidacloprid</i> Admire Pro 4.6F	4A	7-10.5 fl oz	0.25-0.377	12 H/ 14 D	Apply as an in-furrow spray at planting. Do not apply more than 10.5 oz/crop season. Do not apply to Virginia type varieties.
	pyrethroids <i>beta-cyfluthrin</i> Baythroid XL 1EC suppression only	3A	2.8 fl oz	0.022	12 H/ 14 D	
	<i>bifenthrin</i> Brigade 2EC		5.12-6.4 fl oz	0.08-0.1	12 H/ 14 D	Do not apply more than 0.5 lb ai/A/season. Do not feed peanut hay to livestock.
	<i>lambda-cyhalothrin</i> Karate Z 2.08CS		1.28-1.92 fl oz	0.02-0.03	--/ 14 D	Do not apply more than 1 pt/A/season. Do not graze livestock in treated areas or use treated vines for animal feed.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC		3.2-4 oz	0.02-0.025	12 H/ 7 D	Do not apply more than 0.15 lb ai/season. Do not graze livestock in treated areas. Do not use treated vines for animal feed.
	<i>phorate</i> Thimet 20G ⁴	1B	5 lb	1	48 H/ See note	Apply in the furrow at planting. Do not graze or feed treated hay or forage to livestock. In furrow applications on row spacings other than 36", use 7.3 oz of 15G/1,000 ft of row or 5.5 oz of 20G/1,000 ft of row. Soil moisture is necessary for adequate uptake. Young seedlings may exhibit varying degrees of leaf damage.
Tobacco budworm ¹	<i>acephate</i> Orthene 97	1B	12-16 oz	0.72-0.97	24 H/ 14 D (of digging)	Repeat as needed. Do not feed treated forage or hay to livestock or allow animals to graze treated areas.
	<i>chlorantraniliprole</i> Prevathon	28	14-20 fl oz	0.047-0.067	4 H/ 1 D	Do not apply more than 0.2 lb ai of chlorantraniliprole/A/year.
	<i>flubendiamide</i> Belt 4 SC	28	2-4 fl oz	0.0625-0.125	12 H/ 3 D	Do not apply more than 12 oz/crop season.
	<i>indoxacarb</i> Steward 1.25 EC	22	9.2-11.3 fl oz	0.09-0.11	12 H/ 14 D	Do not apply more than 45 fl oz/A/season. Minimum interval between treatments is 5 days.
	<i>spinosad</i> Blackhawk 36WG	5	1.7-3.3 oz	0.038-0.074	4 H/ 3 D of harvest; Forage = 14 D	Do not apply more than 12.4 oz/A/crop. Do not make applications less than 7 days apart.
	NOTE: Lannate as applied for corn earworm gives good control.					
Velvetbean caterpillar ¹	<i>carbaryl</i> Sevin XLR or 4F Sevin 80S	1A	1 qt 1.25 lb	1 1	12 H/ 14 D	
	<i>diflubenzuron</i> Dimilin 2L	15	2-4 fl oz	0.03-0.06	12 H/ 28 D of harvest	Do not make more than 3 applications/season.
	<i>flubendiamide</i> Belt 4SC	28	2-4 fl oz	0.0625-0.125	12 H/ 3 D	Do not apply more than 12 oz/crop season.

PEANUT INSECT CONTROL

PEST	INSECTICIDE	MOA	AMOUNT OF FORMULATION PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS
Velvetbean caterpillar ¹ (continued)	<i>methoxyfenozide</i> Intrepid 2F	18	6-10 fl oz	0.09-0.16	4 H/ 7 D	Do not make more than 3 applications/year.
	<i>novaluron</i> Diamond 0.83 EC	15	6-12 fl oz	0.039-0.077	12 H/ 28 D	Do not apply more than 36 fl oz/A/season. Do not feed treated peanut hay or vines to livestock.
	pyrethroids <i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	1-1.8 fl oz	0.008-0.014	12 H/ 14 D	Do not exceed 3 applications per season of 2.8 fl oz/10 day intervals.
	<i>bifenthrin</i> Brigade 2EC		2.1-6.4 fl oz	0.033-0.1	12 H/ 14 D	Do not apply more than 0.5 lb ai/A/season. Do not feed peanut hay to livestock.
	<i>esfenvalerate</i> Asana XL 0.66EC		2.9-5.8 fl oz	0.015-0.03	12 H/ 21 D	Do not exceed 0.15 lb ai/A/season. Do not feed or graze livestock on treated vines. Suspected resistance has been observed in extreme SW Georgia.
	<i>lambda-cyhalothrin</i> Karate Z 2.08CS		0.96-1.6 fl oz	0.015-0.025	24 H/ 14 D	Do not apply more than 1 pt/A/season. Do not graze livestock in treated areas or use treated vines for animal feed. Suspected resistance has been observed in extreme SW Georgia.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC		1.28-4 oz	0.008-0.025	12 H/ 7 D	Do not apply more than 0.15 lb ai/season. Do not graze livestock in treated areas. Do not use treated vines for animal feed.
	<i>spinosad</i> Blackhawk 36WG	5	1.7-3.3 oz	0.038-0.074	4 H/ 3 D of harvest; Forage = 14 D	Do not apply more than 12.4 oz/A per crop. Do not make applications less than 7 days apart.
Wireworms ²	<i>chlorpyrifos</i> Lorsban 15G	1B	13.6 lb banded	2	24 H/ 21 D	Suppression only. Maximum single application rate is 15 oz/1,000 ft of row. Do not exceed 26.4 lb Lorsban 15G/A/ season. If used in combination with Lorsban 4E do not exceed 4 lb ai/crop season. For banded applications, use a 10-18" band.
	Lorsban 75WG		2.67 lb	2	24 H/ --	Suppression only. Broadcast pre-plant and incorporate.
	Lorsban 4E		4 pt	2	24 H/ --	Suppression only. Broadcast pre-plant and incorporate.

¹ The treatment threshold for combined foliage feeders is 4-8 per foot of row depending on the size and condition of the peanut plants. Use a lower threshold for very young plants or plants that are stressed from other factors. Use a higher threshold for healthy plants with ample vine growth.

² Preventive treatments are usually more effective than rescue treatments. The need for a rescue treatment should be dependent upon the presence of the insect pest, not just damage. Rainfall or irrigation is necessary after application to obtain adequate control.

³ Thrips control is recommended only during the first 3-4 weeks after emergence and is more important when herbicide-induced stress also occurs during early season growth. Attempts to control tomato spotted wilt by controlling the thrips vectors are not economically justified.

⁴ Suppresses tomato spotted wilt.

⁵ Risk of burrower bug is generally reduced in conventional tillage situations.

PEANUT DISEASE CONTROL

Bob Kemerait, Extension Plant Pathologist & Tim Brenneman and Albert Culbreath, Plant Pathologists

PEST	FUNGICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Seedling Disease	Abound 2.08F	11	6 fl oz		Abound is active against Rhizoctonia damping off and Aspergillus crown rot.
Southern Stem Rot (White Mold) and Rhizoctonia Limb Rot	<i>azoxystrobin</i> Abound 2.08F	11	18.5-24.6 fl oz 12.3 fl oz (dryland only) These rates are for soilborne diseases to include suppression of CBR and for leaf spot diseases. Maximum rate is 49 fl oz/A/season.	4 H/ 14 D	Apply Abound, Artisan (26-32 fl oz/A), Evito or Convoy (26 fl oz/A) as a foliar spray at 50-60 days after planting and reapply 28 days later. Note: Convoy and Artisan may also be applied on a 4-spray program. Consult label for more information. Begin treating immediately if active white mold is observed before the first scheduled application. Consult label for application strategies concerning the use of each product. Note: A fungicide to control leafspot must always be mixed with Convoy. Additional leaf spot control is not needed if Artisan is used twice in a season at 26-32 fl oz/A; however, if Artisan is applied in four applications, additional fungicides such as chlorothalonil or thiophanate methyl (e.g. Topsin M) will need to be added to supplement control of leaf spot.
	<i>azoxystrobin</i> + <i>benzobendiflupyr</i> (solatenol) Elatus	11 + 7	0.5-0.65 fl oz/1000 linear feet. 7.3-9.5 fl oz/A	12 H/ 30 D	For suppression of stem rot/white mold, CBR and other diseases. Apply in a 7-10 inch band approximately 14-21 days after planting. For foliar diseases begin 30-40 days after planting. Apply 7.3 fl oz/A on a 14-day schedule, or 9.5 fl oz/A on a 21-28 day interval. For soilborne diseases apply 7.3 fl oz/A 3 times on a 14-day interval, or 9.5 fl oz/A 2 times on a 21-28 day interval beginning 45-60 days after planting. Do not apply for than 21.9 fl oz/A per season
	<i>flutolanil</i> Convoy	7	2 pt (1 application) 1-2 pt (2 applications) 0.5-1 pt (4 applications) Convoy is for used for management of white mold (stem rot) and Rhizoctonia limb rot. See additional notes at right for comments on management of foliar diseases. Maximum rate is 64 fl oz/A/season.	12 H/ 14 D	
	<i>flutolanil</i> + <i>propiconazole</i> Artisan	7, 3	26 or 32 fl oz (2 applications) 13 or 16 fl oz (4 applications) Artisan is for used for management of white mold (stem rot) Rhizoctonia limb rot and foliar diseases. See additional notes at right for important comments on management of foliar diseases. Maximum rate is 84 fl oz/A/season.	12 H/ 40 D	
	<i>fluxapyroxad</i> + <i>pyraclostrobin</i> Priaxor	7, 11	4-8 fl oz This rate is for management of foliar and soilborne diseases of peanut. Maximum rate is 24 fl oz/A/season.	12 H/ 14 D	Priaxor: data on this product is limited at this time from the University of Georgia; however Priaxor is now labeled for peanuts.
	<i>fluoxastrobin</i> Evito 480 SC	11	5.7 fl oz This rate is for control of white mold (stem rot), Rhizoctonia limb rot, and foliar diseases. Maximum rate is 22.8 fl oz/A/season.	12 H/ 14 D	Evito 480 SC: This strobilurin fungicide is in the same chemical class as Abound, Headline, and Stratego and should not be used in the same program with these products.

PEANUT DISEASE CONTROL

PEST	FUNGICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Southern Stem Rot (White Mold) and Rhizoctonia Limb Rot (continued)	<i>fluoxastrobin + tebuconazole</i> Evito T	3	9-11.2 fl oz Maximum rate is 44.8 fl oz/A/season.	12 H/ 14 D	For control of white mold (stem rot), Rhizoctonia limb rot, and foliar diseases of peanut.
	Labeled formulations of tebuconazole include, among others	3			Apply tebuconazole products, or Quash (metconazole) 4 times per season starting at the second or third leaf spot spray. Growers are typically advised to tank-mix an additional leaf spot fungicide with tebuconazole products. Growers may also wish to tank-mix a fungicide with Quash for additional leaf spot control where leaf spot resistance to triazole fungicides has occurred.
	<i>metconazole</i> Quash	3	2.5-4 fl oz The lower rate is generally considered effective for low-to-moderate pressure from white mold (stem rot) and Rhizoctonia limb rot. The higher rate is appropriate for more severe pressure from these diseases. See notes for additional comments on leaf spot diseases. Maximum rate is 16.02 fl oz/A/season.	12 H/ 14 D	Note: Research has shown that tebuconazole is often less effective in control of leaf spot than in the past. Where leaf spot is likely to be a problem, growers may consider tank-mixing the tebuconazole with 0.75-1 pt/A chlorothalonil or 5 fl oz Topsin (1 st and 3 rd applications only) to ensure adequate leaf spot control.
	Orius 3.6F, TriSum 3.6F, Integral 3.6F, T ebustar 3.6F, Muscle 3.6F, Tebuzol 3.6F	3	7.2 fl oz See comments to right regarding additional protection against leaf spot diseases. Maximum rate is 28.8 fl oz/A/season, except for Muscle 3.6 F (16 fl oz).	12 H/ 14 D	For increased disease control, growers should consider tank-mixing Alto (cyproconazole, 5.5 fl oz/A) with Abound (12-24.5 fl oz/A) at approximately 60-90 days after planting.
	<i>penthiopyrad</i> Fontelis	7	12-24 fl oz These rates are for control of white mold (stem rot), Rhizoctonia limb rot, and foliar diseases. Make no more than 3 sequential applications before switing to a fungicide with a diffrent mode of action. Maximum rate is 72 fl oz/A/season.	12 H/ 14 D	Fontelis : a new fungicide in the SDHI class for disease management in peanut will work well with triazole and strobilurin fungicides for resistance management.
	<i>pyraclostrobin</i> Headline	11	12-15 fl oz These rates are for control of white mold (stem rot), Rhizoctonia limb rot, suppression of CBR, and foliar diseases. Maximum rate is 45 fl oz/A/season.	12 H/ 14 D	Headline at this rate is an effective component of a soilborne program that also includes use of Provost, tebucoanzole, Convoy, Quash, or Artisan.
	<i>tebuconazole + prothioconazole</i> Provost	3	8-10.7 fl oz These rates are for control of white mold (stem rot), Rhizoctonia limb rot, leaf spot diseases, and suppression of CBR. Maximum rate is 42.8 fl oz/A/season.	12 H/ 14 D	Provost is a new fungicide labeled for the control of leaf spot diseases, peanut rust, white mold, and Rhizoctonia limb rot. It is also labeled for suppression of CBR. Provost is applied in a 4-block program. Higher rates can be used in fields where disease is a particular problem.
Early emergence applications for management of White Mold and other Soilborne Diseases	<i>azoxystrobin</i> Abound 2.08F	11	0.4-0.8 fl oz/1000-row feet applied in a 4-6" band at 100% emergence. Maximum rate is 49 fl oz/A/season.	4 H/ 14 D	Banded at 100% emergence for suppression of white mold. For greatest efficacy, concentrate the entire broadcast rate into a band wide enough to cover the peanuts. Please check with your local Cooperative Extension office for recommendations on optimum timing of an early emergent application of Proline.
	<i>prothioconazole</i> Proline 480SC	3	5.7 fl oz/A Maximum rate is 22.8 fl oz/A/season.	24 H/ 14 D	
SUPPRESSION ONLY					
Southern Stem Rot (White mold)	Lorsban 15G	1B	13 lb Maximum rate is 4 lb ai/A/season	24 H/ 21 D	Apply in a 12" band over the row, 40-60 days after planting. This product only suppresses stem rot. Do not feed hay treated with Lorsban to livestock.

PEANUT DISEASE CONTROL

PEST	FUNGICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
FOLIAR DISEASES					
Late leafspot (<i>Cercosporidium personatum</i>),	<i>fluoxastrobin + tebuconazole</i> Evito T	3	6-9 fl oz Maximum rate is 44.8 fl z/A/season.	24 H/ 14 D	Fungicide resistance management should be considered when this product is used with other tebuconazole products, Evito, Evito T, Stratego, Abound, Headline, Absolute, and Evito.
Early leafspot (<i>Cercospora arachidicola</i>)	<i>propiconazole, trifloxystrobin</i> Stratego	3	7 fl oz Maximum of 6 applications/season.	24 H/ 14 D	Fungicide resistance management should be considered when this product is used with tebuconazole products, Absolute, Evito, Evito T, Headline, or Abound.
Rust (<i>Puccinia arachidis</i>)	<i>pyraclostrobin</i> Headline	11	6-9 fl oz Maximum rate is 45 fl oz/A/season.	24 H/ 12 D	NOTE: all soilborne fungicides described in the section “Control of Southern stem rot/white mold” area also active against leaf spot diseases EXCEPT for Convoy. Efficacy of these fungicides ranges from fair/good for tebuconazole to excellent for Pro-vost and Headline. Most of the fungicides listed above fall into the “good” category. Headline (pyraclostrobin) is a strobilurin fungicide and is in the same chemical class as Abound, Evito, the fluoxastrobin component of Evito T, and the trifloxystrobin component of Stratego and Absolute. To best adhere to fungicide resistance management guidelines, Headline should not be used in the same program with these fungicides.
	<i>tebuconazole, trifloxystrobin</i> Absolute	3	3.5 fl oz Maximum of 4 applications/season.	12 H/ 14 D	Absolute is a combination of tebuconazole and trifloxystrobin. Fungicide resistance management should be considered when this product is used with tebuconazole products, Stratego, or Abound.
	<i>cyproconazole</i> Alto 100SL	3	5.5 fl oz/A Maximum rate is 11 fl oz/A/season.	12 H/ 30 D	NOTE: Eminent 125S (7.2 fl oz/A) should be tank mixed with 16 fl oz/A Echo (chlorothalonil).
	<i>tetraconazole</i> Eminent 125S	3	7.2 fl oz/A Maximum rate is 52 fl oz/A/season.	12 H/ 14 D	For foliar disease control, apply Alto 100SL up to two times as a part of a season-long disease management program; especially as a tank-mix partner for Abound.
Foliar Diseases	Bravo S pre-mix combinations of <i>chlorothalonil</i> and <i>sulfur</i>		68 fl oz		
	Formulations of <i>chlorothalonil</i> : Bravo Ultrex	M5	1.36 lb	12 H/ 14 D	Apply chlorothalonil or chlorothalonil + copper on a 10-14 day interval. The exact interval between applications depends on rotation, weather, etc. Do not feed peanut hay treated with chlorothalonil to livestock. If rust is found in a field, and the peanuts are more than 3 weeks from expected harvest, apply chlorothalonil every 10 days until 2 weeks from harvest. If peanuts are 2 weeks or less from harvest, no control is necessary.
	Bravo Weather Stik		1.5 pt	Expect for Bravo S (24 H)	
	Chemnut 720		1.5 pt		
	Chlorothalonil 720		1.5 pt		
	Terranil 6L		1.5 pt		
	Echo 90DF		1.25 lb		
	Echo 720		1.5 pt		
	Equus 720		1.5 pt		
	Equus DF		1.36 lb		
	GK-Aragold 720		1.5 pt		
	<i>chlorothalonil</i> + Kocide 4.5LF tankmix combinations of <i>chlorothalonil</i> and <i>copper hydroxide</i>	M5	(0.75 lb ai/A) 1 pt		Do not mix any copper fungicide with Folicur.

PEANUT DISEASE CONTROL

PEST	FUNGICIDE	MOA	AMOUNT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
FOLIAR DISEASES					
Foliar Diseases (continued)	Bravo + Tilt tankmix combinations of <i>chlorothalonil</i> <i>propiconazole</i> Chlorothalonil + Tilt	M5, 3	(0.75 lb ai/A) 2 oz Maximum rate is 12 pints/A/season.	12 H/ 14 D	The rate of chlorothalonil when tankmixed with Tilt will vary depending on formulation (ie. 6 lb/gal would require 16 oz and 4.23 would require 22.6 oz) If RUST is detected and peanuts are more than 3 weeks from expected harvest, use a full rate of chlorothalonil every 10 days until 2 weeks from harvest. Using DMIs (ie. Folicur and Tilt) full season increases the possibility for fungal resistance. If DMIs are used full season make the last leaf spot application with chlorothalonil. Tilt does not control rust.
	<i>chlorothalonil + propiconazole</i> Echo-PropiMax	M5, 3	(0.75 lb ai/A) 2 oz	12 H/ 14 D	
	Tilt/Bravo pre-mix combination of <i>chlorothalonil</i> and <i>propiconazole</i>	M5, 3	1.5 pt	12 H/ 14 D	
	<i>thiophanate methyl</i> Topsin M 70WP T-Methyl 70W Topsin 4.5FL Topsin 4.5 FL + <i>tebuconazole</i>	1	1/2 lb 1/2 lb 10 fl oz 5 fl oz + 7.2 fl oz	24 H/ 14 D	NOTE: Neither Topsin nor Thiophanate Methyl 85WDG or any other formulation of thiophanate methyl should be used alone for control of foliar diseases of peanut, but should be tank mixed and/or rotated with other non-benzimidazole fungicides such as chlorothalonil. Use of thiophanate methyl should be restricted to a single solo application or 2 tank- mix applications per season.
	Thiophanate Methyl 85WDG	1	0.4 lb Maximum rate is 1.65 lb/A/season.	24 H/ 14 D	
	<i>dodine</i> ELAST 400F	U12	15 fl oz (if used alone or tank-mixed with fungicide not effective against leaf spot). 12.8 fl oz (if tank- mixed with another fungicide, e.g. tebuconazole) for added control of peanut leaf spot.	48 H/ 14 D	
Cylindrocladium Black Rot (CBR)	<i>metam sodium</i> 42%	M3	10 gal/A		To be effective, the fumigant metam sodium must be applied very carefully. To avoid injury to the seed and the seedlings, the fumigant must be applied at least 14 days before planting to a depth of approximately 8-10". Metam sodium should be applied only when the soil temperature is greater than 60°F and when the soil moisture is like it would be for suitable seed germination. It is critical to get a good seal on the chisel trace left after fumigation so that the metam sodium does not escape directly to the atmosphere. The rows must be marked so that seed can be planted directly above where the fumigant was applied. Growers who are using this treatment for the first time may want to consult with their local county agent.
	<i>prothioconazole</i> Proline 480SC In-furrow fungicide application for management of CBR. See label for rate information	3	0.4 fl oz/1000 row ft 5.7 fl oz/A Maximum rate is 22.8 fl oz/A/season.	48 H/ 14 D	Proline 480SC is applied in-furrow for the management of CBR. See label for additional application strategies for management of CBR and perhaps white mold (stem rot).
	For suppression of CBR only: Abound 2.08F tebuconazole 3.6F Headline Provost Fontelis	11 3 11 3 7	18.5-24.6 fl oz 7.2 fl oz 12-15 fl oz 8-10.7 fl oz 16-24 fl oz	12 H/ 14 D Expect Headline = 4 H	Provost tebuconazole, Abound, Fontelis and Headline are labeled for the "suppression" of CBR. This means that they may have some limited benefit to the grower in the management of this disease; however neither is likely to result in significant reduction in CBR when compared to the benefits of metam sodium.

**RECOMMENDATIONS SET FORTH BY THE NORTH AMERICAN FUNGICIDE
RESISTANCE ACTION COMMITTEE**

1. Reduce initial inoculum (fungal populations) through good cultural practices.
2. Do not use less than the minimum label rate alone or in tank mixtures.
3. If more than four sprays of DMI (for example tebuconazole and propiconazole) fungicides will be made in a season, it is strongly recommended that all DMI sprays be mixed with an effective non-DMI fungicide.
4. Use in a preventative application schedule.
5. Calibrate sprayer and configure spray tips to ensure thorough coverage of peanut foliage.
6. DMI fungicides are not recommended for season-long use alone. Use alternating blocks of sprays of DMI fungicides with non-DMI fungicides, OR use tank mixes of DMI and non-DMI fungicides. See label directions!
7. Alternating sprays or tank mixtures with other DMI fungicides will not help prevent resistance development
8. When using a strobilurin fungicide as a solo product, for example Headline, Abound, or Evito, the number of applications should be no more than 1/3 (33%) of the total number of fungicide applications per season.
9. For strobilurin mixes (e.g. Absolute, Evito T and Stratego) in programs which tank mixes or pre mixes of a strobilurin with mixing partners of a different mode of action are used, the number of strobilurin containing applications should be no more than 1/2 (50%) of the total number of fungicide applications per season.
10. In programs in which applications of strobilurin fungicides are made with both solo products and mixtures, the number of strobilurin containing applications should be no more than 1/2 (50%) of the total number of fungicide applications per season.

PEANUT SEED TREATMENT

Bob Kemerait, Extension Plant Pathologist
Tim Brenneman and Albert Culbreath, Plant Pathologists

Dynasty PD (azoxystrobin + fludioxonil + mefenoxam)	3-4 fl oz/100 lb
Vitavax PC	4-5 oz/100 lb

PEANUT NEMATODE CONTROL

PEST	NEMATICIDE	AMOUNT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Nematodes	Enclosure	2-3 pt/A		Enclosure is a formulation of iprodione; efficacy of this product continues to be assessed. Please see label for additional information.
	<i>fluopyram + imidacloprid</i> Velum Total	18 fl oz	12 H/ 14 D	
	Telone II	4.5-9 gal	5 D Post application/ --	Apply 6-9 gal/A rates broadcast with a moldboard plow. Apply 4.5-6 gal/A rates with a single chisel in-row application. All applications should be made at least 7-14 days before planting.
	Vydate C-LV	17-34 fl oz Maximum rate is 136 fl oz/A/season.	48 H/ --	Vydate C-LV is used to supplement use of a pre-plant or at-plant application of a nematicide. Recommended is a split application of 17 fl oz/A at 14-28 days after planting followed by a second application of 17 fl oz/A 14 days later. Best used in low nematode fields.
				A nematicide application at pegging is recommended regardless of which nematicide is used at planting. DO NOT FEED PEANUT HAY TREATED WITH THESE NEMATICIDES TO LIVESTOCK.

NEMATICIDE CONTROL RATING

Nematicides listed below are rated on a scale of excellent, good, fair and poor. Those listed as poor to fair would be acceptable in low nematode population fields, but should not be used in fields where root-knot nematodes cause severe problems	
NEMATICIDE	RATING
Telone II	excellent
Vydate	poor to fair.

PEANUT WEED CONTROL

Eric P. Prostko, Extension Agronomist – Weed Science

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION/A	LBS ACTIVE INGREDIENT/A		
EARLY PREPLANT FOLIAR BURNDOWN OF EMERGED ANNUAL WEEDS AND/OR COVER CROPS IN REDUCED TILLAGE SYSTEMS					
<i>glyphosate</i> Various trade names 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9	16-48 oz 13-39 oz 12-36 oz 11.7-35 oz 11-32 oz 10-29 oz	0.38-1.13 ae	4 H/ --	Apply any time prior to planting to control emerged weeds. Refer to specific label for weeds controlled, application rates, adjuvants, and precautions. Glyphosate does not adequately control cutleaf eveningprimrose or Carolina geranium, and may not provide acceptable control of wild radish. For cover crop control only, use the following rates: wheat < 12", 0.56 lb ae/A; wheat > 12", 0.75 lb ae/A; rye < 18", 0.56 lb ae/A; rye > 18", 0.75 lb ae/A. Glyphosate can also be tank-mixed with Valor (1-3 ozs/A), Aim (1-2 ozs/A), or ET (0.5-2 oz/A) to improve the spectrum of control, particularly for annual morningglories. Refer to specific comments for Valor. Sequence 5.25EC (glyphosate + S-metolachlor) is also labeled for preplant use in peanut at 2.5-3.4 pt/A. Sequence at 3.4 pt/A is equivalent to 1.28 lb ai/A of S-metolachlor + 0.96 lb ai/A glyphosate. Applications of glyphosate to wheat and rye should be made before the boot stage or after the small grain is fully headed.
<i>paraquat</i> Gramoxone Inteon/Gramoxone SL 2 SL Firestorm/Parazone/Helmquat 3 SL	22	2.5-3.75 pt 1.7-2.5 pt	0.63-0.94	12 H/ --	Apply anytime prior to planting to control emerged weeds. Add non-ionic surfactant at 1qt/100 gals or crop oil at 1 gal/100 gals. Paraquat will not adequately control horseweed, swinecress, purslane speedwell, curly dock, cutleaf eveningprimrose, and larger wild radish. For cover crop control only, use the following rates: wheat, 0.63 lb ai/A (2.5 pt/A of 2 lb/gal or 1.7 pt/A of 3 lb/gal); rye, 0.50 lb ai/A (2 pt/A of 2 lb/gal or 1.3 pt/A of 3 lb/gal). Cover crops must be mature (seedheads) for adequate control. Can also be tank-mixed with Valor (1-3 ozs/A) to improve the spectrum of control and provide residual weed control. Refer to specific comments for Valor.
<i>2,4-D amine</i> Various trade names 3.8 lb/gal	4	0.5-1 pt	0.24-0.48	48 H/ --	Tank-mix with glyphosate or paraquat. 2,4-D is the most cost-effective option available for burndown of cutleaf evening-primrose. 2,4-D does not control Carolina geranium. Some 2,4-D products are labeled for application to previous crop stubble or fallow land. In this case, the label directs the user to not plant a crop "until 3 months after application or until the product disappears from the soil." UGA research suggests that peanut can be planted 7 days after a preplant burndown application of 2,4-D.
<i>thifensulfuron + tribenuron</i> FirstShot 50SG	2	0.5-0.8 oz	0.008-0.013 + 0.008-0.013	12 H/ --	Tank-mixed with glyphosate or paraquat. FirstShot will help improve the control of many broadleaf weeds such as henbit, wild radish, Carolina geranium, and chickweed. Peanut can be planted 30 days after application. Add a NIS at 0.25% v/v or COC at 1% v/v unless tank-mixed with a loaded glyphosate formulation.
<i>carfentrazone</i> Aim 2EC	14	1-2 oz	0.016-0.031	12 H/ 7 D	Tank-mix with glyphosate to improve the burndown control of annual morningglory, tropical spiderwort, and small pigweed (<1" tall). Apply prior to planting or up until 24 hours after planting. Add a NIS at 0.25% v/v or COC at 1% v/v unless tank-mixed with a "loaded" glyphosate formulation .
<i>pyraflufen</i> ET 0.208EC	14	0.5-2 oz	0.001-0.003	12 H/ 7 D	Tank-mix with glyphosate to improve the burndown control of annual morningglory and small pigweed (<1" tall). Apply as preplant burndown or after planting but before crop emergence. Add a COC at 1% v/v unless tank-mixing with a "loaded" glyphosate formulation.

PEANUT WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION/A	LBS ACTIVE INGREDIENT/A		
PREPLANT SOIL INCORPORATED					
<i>ethalfuralin</i> Sonalan HFP 3EC	3	2 pt	0.75	24 H/ --	Controls annual grasses and small-seeded broadleaf weeds. Soil incorporate 2-3 inches deep within 2 days of application. Incorporation with implements other than power tiller requires two passes, preferably at cross angles. May be tank-mixed with Frontier/Outlook or Dual for control of mixed infestations of annual grasses and nutsedge. <i>Sonalan may also be applied as a surface application to freshly prepared seedbeds but must be incorporated by 0.5-1.0" of rainfall or irrigation within 2 days after application.</i>
<i>pendimethalin</i> Prowl/Pendimax 3.3EC Prowl H ₂ O 3.8 ACS	3	1.8-2.4 pt 2 pt	0.75-1 0.95	24 H/ --	Controls annual grasses and small-seeded broadleaf weeds. Soil incorporate 1-2 inches deep within 7 days of application. Incorporation with implements other than power tiller requires two passes, preferably at cross angles. Use high rate for Texas panicum or where heavy weed populations are anticipated. May be tank-mixed with Frontier/Outlook, Dual, or Pursuit for control of mixed infestations of annual grasses and nutsedge. Prowl can be applied immediately after planting to a freshly prepared seedbed up to 2 days after planting but before crop emergence. However, adequate incorporation in the form of 0.75" of irrigation or rainfall is needed within 48 hours for optimum activation when applied by this method. In strip-tillage production systems, the rate of pendimethalin should be increased to 2.6 pt/A (Prowl 3.3EC) or 2.2 pt/A (Prowl H₂O).
<i>metolachlor</i> Stalwart, Parallel PCS, Me-Too Lachlor 8EC <i>S-metolachlor</i> Dual Magnum 7.62EC Dual II Magnum 7.64EC Cinch 7.62EC	15	1-1.33 pt 1-1.33 pt	1-1.33 0.95-1.27	24 H/ 90 D	Controls some annual grasses (not Texas panicum) and small-seeded broadleaf weeds. May provide limited Florida beggarweed suppression. Controls or suppresses yellow nutsedge but not purple nutsedge. Incorporation with implements other than power tiller requires two passes, preferably at cross angles. Deep incorporation may reduce effectiveness. May be tank-mixed with Prowl/Pendimax or Sonalan to control mixed infestations of annual grasses and yellow nutsedge. PPI treatments generally provide better control of nutsedge. Heavy rainfall after planting and/or non-uniform incorporation may result in crop injury expressed as delayed emergence and stunted growth of emerging plants. The generic formulations of metolachlor (Parallel PCS, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.
<i>diclosulam</i> Strongarm 84WG	2	0.45 oz	0.024	12 H/ --	Provides general broadleaf weed control. Incorporate into top 1-3" of final seedbed. Good to excellent control of many species including bristly starbur, wild poinsettia, eclipta, and copperleaf. Should be tank-mixed with a grass herbicide. Poor control of sicklepod. Control of nutsedge has been variable and inconsistent. Can also be applied preemergence. Crop rotation restrictions: cotton-10 months; soybeans-0 months; wheat, barley-4 months; oats, rye-6 months; corn-18 months; tobacco, sorghum-18 months; other crops-30 months. Pre-slurry in water before adding to larger spray/mix tank.
<i>imazethapyr</i> Pursuit 2 AS 70 DG	2	4 oz 1.44 oz	0.063	4 H/ 85 D	Controls purple and yellow nutsedge, wild poinsettia, wild radish, pigweed, burgherkin, and several other annual species. Does not control Florida beggarweed or sicklepod. <u>Shallow</u> incorporation is preferred. May be tank-mixed with Dual, Prowl/Pendimax, or Sonalan. Incorporated treatments are more persistent than preemergence or postemergence applications and are more likely to result in carryover. Rotation intervals for various crops include the following: lima beans, southern peas, soybeans, peanuts, wheat, rye-4 months; field corn-8.5 months; barley, tobacco-9 months; bahiagrass, cabbage, canteloupe, cotton, cucumber, Irish potato, lettuce, oats, onion, sorghum, sunflower, sweet corn, sweet potato transplants, sweet pepper transplants, tomato transplants; and watermelon-18 months; canola-40 months.

PEANUT WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION/A	LBS ACTIVE INGREDIENT/A		
CHEMIGATION					
<i>metolachlor</i> Stalwart, Parallel PCS Me-Too-Lachlor	15	Refer to PPI section for rates			May be applied by injection through center pivot irrigation systems. Use at normal recommended rates. Apply after planting but before crop emergence. Requires proper system calibration and safety devices (check valves, cutoff switches, etc.) to provide effective weed control and prevent environmental contamination. Accurate herbicide application through chemigation may provide superior weed control compared to conventional ground applications. The generic formulations of metolachlor (Parallel PCS, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.
<i>S-metolachlor</i> Dual Magnum 7.62E Cinch 7.64EC	15	Refer to PPI section for rates			
<i>pendimethalin</i> Prowl/Pendimax3.3EC Prowl H ₂ O 3.8ACS	3	Refer to PPI section for rates			
PREEMERGENCE					
<i>imazethapyr</i> Pursuit 2.0 AS 70 DG	2	4 oz 1.44 oz	0.063	4 H/ 85 D	See comments for Pursuit PPI. Controls the same weeds as listed for Pursuit PPI but with greater dependency on rainfall or irrigation for activation.
<i>metolachlor</i> Stalwart, Parallel PCS, Me-Too-Lachlor	15	1-1.33 pt	1-1.33	24 H/ 90 D	Controls some annual grasses (not Texas panicum) and small-seeded broadleaf weeds. Provides some suppression of sicklepod and Florida beggarweed. Apply after planting and before crop and weeds emerge. If Dual is used as a PPI treatment, any additional application of Dual should be delayed until peanuts begin emerging (AC). Multiple applications--preplant incorporated followed by at-cracking treatments--improve control of sicklepod, Florida beggarweed, and yellow nutsedge. Preemergence treatments generally provide better broadleaf weed control/suppression. Up to 2 pt/A of any metolachlor formulation can be applied preemergence for the partial control of Florida beggarweed in the southeast Do not apply more than 2.66 pt/A/year of Stalwart/Parallel/Me-Too-Lachlor or 2.8 pt/A/year of Dual Magnum/Dual II Magnum/Cinch formulation. The generic formulations of metolachlor (Parallel, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.
<i>S-metolachlor</i> Dual Magnum 7.62EC Dual II Magnum 7.64EC Cinch 7.64EC		1-1.33 pt	0.96-1.27		
<i>diclosulam</i> Strongarm 84WG	2	0.45 oz	0.024	12 H/ --	Refer to PPI section.
<i>flumioxazin</i> Valor SX 51WG Outflank 51WG Panther 51WG Rowel 51WG	14	3 oz	0.096	12 H/ --	Apply immediately after planting but no later than 2 days after planting. Plant peanuts at least 1.5" deep. DO NOT irrigate when peanuts are cracking. Rainfall or irrigation at cracking will cause temporary crop injury that should not result in reduced yields if applied according to the label. Valor will provide good to excellent control of many broadleaf weeds including Florida beggarweed, Palmer amaranth, and tropic croton. Valor will not control annual/perennial grasses, sicklepod, nutsedge, and cocklebur. Valor can be tank-mixed with Prowl, Sonalan, Dual Magnum, or Warrant. Dual or Warrant tank-mixes with Valor would only be suggested when planting late in fields with a history of tropical spiderwort. Can also be used in strip-tillage peanut production systems in combination with glyphosate or paraquat to improve burndown control. Rotation restrictions include the following: cotton-2 months; field corn-1 month; soybeans-0 months; tobacco-2 months; wheat-2 months. Refer to current product label for additional rotational restrictions. Completely clean spray equipment THE SAME DAY OF USE as directed on the herbicide label!!!! Pre-slurry in water before adding to larger spray/mix tank. Panther 4SC is a liquid formulation of flumioxazin but has not yet been adequately tested by UGA.

PEANUT WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION/A	LBS ACTIVE INGREDIENT/A		
PREEMERGENCE					
<i>sulfentrazone + carfentrazone</i> Spartan Charge 3.5L	14 + 4	3-3.75 oz	0.074-0.092 + 0.008-0.01	12 H/ --	Will provide good to excellent residual control of pigweed. Can be tank-mixed with Prowl or Dual. Can be tank-mixed with glyphosate or paraquat pre-plant burndown in strip-tillage systems. Can be applied up to 3 days after planting. However, do not apply after peanut emergence, at cracking, or if seedling is close to the soil surface. Do not use on soils classified as sand, which have less than 1% OM. Do not irrigate when peanuts are cracking. Rotation Restrictions: canola-24 months; field corn-4 months; cotton-18 months; small grains-4 months; sorghum-10 months; soybeans-anytime; sunflowers-anytime; tobacco-anytime.
<i>acetochlor</i> Warrant 3ME	15	48 oz	1.125	12 H/ Forage-90 D	Can be applied PRE and/or EPOST (after crop emergence up through the R1 stage of growth. R1 ends when 50% of plants have a visible peg (R2)). Will provide good to excellent control of annual grasses (except Texas panicum), pigweed, and tropical spiderwort. Crop injury potential will increase if used in cold/wet soils. In wet years or environments, the length of residual control with Warrant may be reduced.
AT CRACKING OR EARLY POSTEMERGENCE					
<i>imazethapyr</i> Pursuit 2.0 AS 70 DG	2	4 oz 1.44 oz	0.063	4 H/ 95 D	See comments for Pursuit PPI and PRE. Provides effective control of nutsedge, wild poinsettia, wild radish, bristly starbur, prickly sida, and several other annual species. Weed size is especially critical for effective control of nutsedge, bristly starbur, and prickly sida. If weeds are emerged, surfactant or crop oil concentrate should be included. May be tank-mixed with paraquat or 2,4-DB for broader spectrum control of emerged weeds.
<i>metolachlor</i> Stalwart Parallel PCS Me-Too-Lachlor 8EC	15	1-1.33 pt	1-1.33	24 H/ 90 D	See comments for Dual PPI and PRE. Compared to PPI and PRE treatments, AC applications provide better control of non-emerged broadleaf weeds such as Florida beggarweed and sicklepod. May be tank-mixed with paraquat + Basagran, paraquat + Storm, or Cadre or Cobra treatments for improved contact activity and for suppression/control of problem broadleaf weeds and yellow nutsedge. Do not use Dual II Magnum/Cinch formulations after peanut emergence. Do apply more than 2.66 pt/A/year of Stalwart/Parallel/Me-Too-Lachlor or 2.8 pt/A/year of Dual Magnum. Research has shown that Dual will provide good to excellent residual control of tropical spiderwort if applied before weed emergence. The generic formulations of metolachlor (Parallel PCS, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials. Adjuvants are not needed when Dual is tank-mixed with POST treatments.
<i>S-metolachlor</i> Dual Magnum 7.62EC		1-1.33 pt	0.95-1.27		
<i>acetochlor</i> Warrant 3ME	15	48 oz/A	1.125	12 H/ Forage-90 D	Can be applied after emergence but before flowering. Refer to PRE comments. Can be tank-mixed with paraquat + Basagran or paraquat + Storm treatments or Cadre or Cobra. Total amount of Warrant that can be applied PRE + EPOST-6 pt/A/year. Use a NIS at 0.25% v/v when tank-mixed with POST herbicides. Warrant can be applied EPOST up through the R1 stage of growth.
<i>paraquat</i> Firestorm/Parazone/Helmquat 3 SL	22	5.4 oz	0.125	12 H/ --	Provides effective contact control of sicklepod, Florida beggarweed, Texas panicum, and many other problem weeds. When used alone, paraquat is not effective on smallflower morningglory, prickly sida, wild radish, or tropic croton. Apply anytime up to 14 days after ground crack . After in combination with Basagran or Storm 14 days after ground crack. Include NIS at 1 qt/100 gal spray solution with all paraquat treatments. Do not make more than 2 applications per season. Do not apply a total of more than 10.8 ozs/A/year (Firestorm/Parazone) or 16.0 ozs/A/year (Gramoxone Inteon). Peanut foliage injury is usually temporary. Conditions of high humidity, wet foliage, and/or wet soils result in greater foliage burn. Thrips injury retards crop recovery. Research indicates no adverse effects of adding chlorothalonil products with paraquat tank-mixtures where fungicide treatments are needed. The success of "at-crack" sprays can be greatly improved by 1) applying herbicides in a minimum of 15 GPA; 2) using flat fan nozzles; 3) decreasing ground speed; and 4) using lower spray pressures (30 PSI). Rain-free period for paraquat is 30 minutes.
Gramoxone Inteon/ Gramoxone SL 2 SL		8 oz			

PEANUT WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION/A	LBS ACTIVE INGREDIENT/A		
AT CRACKING OR EARLY POSTEMERGENCE					
<i>paraquat</i> Firestorm/Parazone/Helmquat 3 SL or Gramoxone Inteon/ Gramoxone SL 2 SL + <i>bentazon+acifluorfen</i> Storm 4EC	22 + 6 + 14	8 oz 12 oz + 1-1.5 pt	0.188 + 0.5 + 0.25	48 H/ 75 D	Provides effective, broad-spectrum weed control. Provides some suppression of yellow nutsedge. Addition of Dual or Frontier/Outlook improves contact activity and provides residual weed suppression/control, but could result in increased foliar peanut burn. Apply anytime up to 28 days after ground crack. Include NIS at 0.25% (1 qt/100 gal) with all paraquat treatments. The success of “at-crack” sprays can be greatly improved by 1) applying herbicides in a minimum of 15 GPA; 2) using flat fan nozzles; 3) decreasing ground speed; and 4) using lower spray pressures (30 PSI). Research indicates no adverse effects of adding chlorothalonil products with paraquat tank-mixtures where fungicide treatments are needed *Warrant, Dual Magnum or generic metolachlor can be used in combination with this treatment to provide residual control of pigweed and tropical spiderwort. NIS is not recommended if Dual Magnum or generic metolachlors are used with paraquat + Storm.
<i>paraquat</i> Firestorm/Parazone/Helmquat 3 SL or Gramoxone Inteon/ Gramoxone SL 2 SL + <i>bentazon</i> Basagran 4EC 5EC	22 + 6	8 oz 12 oz + 8-16 oz 6.4-12.8 oz	0.189 + 0.25 + 0.5	48 H/ Forage-50 D	Provides effective, broad-spectrum weed control. Provides some suppression of yellow nutsedge. Generally reduces peanut injury compared to other paraquat treatments. The lower rate of Basagran (0.5 pt) is usually sufficient to reduce peanut foliar burn and provide control of smallflower morningglory. The higher rate (1 pt) is necessary for control of weeds such as bristly starbur and prickly sida. Apply anytime up to 28 days after ground crack. Include NIS at 1 qt/100 gal spray solution with all paraquat treatments. The success of “at-crack” sprays can be greatly improved by 1) applying herbicides in a minimum of 15 GPA; 2) using flat fan nozzles; 3) decreasing ground speed; and 4) using lower spray pressures (30 PSI). Research indicates no adverse effects of adding chlorothalonil products with paraquat tank-mixtures where fungicide treatments are needed. *Warrant (48 oz/A) or , Dual Magnum or generic metolachlor (16 oz/A) can be used in combination with this treatment to provide residual control of pigweed and tropical spiderwort. NIS is not recommended if Dual Magnum or generic metolachlors are used with paraquat + Basagran.
<i>diclosulam</i> Strongarm 84WG	2	0.45 oz	0.024	12 H/ --	24(c) label for use in Georgia. The only weed on current 24(c) label is tropical spiderwort but Strongarm also has POST activity on annual morningglory, bristly starbur, common cocklebur, common ragweed, eclipta, and horseweed. Can be applied up until 30 days after planting. Use in combination with a NIS at 0.25% v/v (1 qt/100 gals). When applied postemergence in peanut, cotton rotation restriction is 18 months. Follow other rotation restrictions listed in PPI section. Label must be in the possession of user at the time of application.
POSTEMERGENCE					
<i>acifluorfen</i> Ultra Blazer 2L	14	0.5-1.5 pt	0.125-0.38	--/ 75 D	Especially useful for control of morningglories, tropic croton, wild radish, wild poinsettia, hophornbeam copperleaf, and spider flower. Adjust rate according to weed size and species as noted on the label. Use 1 pt/A or less for control of highly sensitive species such as hemp sesbania and showy crotalaria. Slight to moderate peanut foliage burn may result. Do not apply more than 2 pt/A per season as a postemergence treatment. Apply with nonionic surfactant at 1 qt/100 gal spray solution (0.25% v/v). May be tank-mixed with 2,4-DB (1 pt/A). The Blazer + 2,4-DB tank mixture is generally more injurious to peanuts than either product alone. May be tank-mixed with Basagran for improved control of broadleaf weeds such as cocklebur, and prickly sida. A pre-packaged mix of acifluorfen + bentazon is marketed as Storm. Ultra Blazer can be tank-mixed with Dual Magnum or Warrant + 2,4-DB. Rain-free period for Ultra Blazer is 4 hrs.

PEANUT WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION/A	LBS ACTIVE INGREDIENT/A		
POSTEMERGENCE					
<i>bentazon</i> Basagran 4EC 5EC	6	1.5-2 pt 1.2-1.6 pt	0.75-1	48 H/ Forage-50 D	Apply for postemergence control of yellow nutsedge, cocklebur, bristly starbur, smallflower morningglory, prickly sida, and certain other weeds. Treat when broadleaf weeds are small and actively growing. Adjust rate according to weed size as noted on label. Two applications may be required for control of yellow nutsedge. For yellow nutsedge, include crop oil concentrate at 1 qt/A. Do not foliarly apply sulfur 14 days before or after use of crop oil concentrate to minimize risk of peanut foliage burn. May be tank-mixed with 2,4-DB amine 2L (0.5 pt/A) for improved control of morningglories. Early-season applications of bentazon at high rates following in-furrow applications of Di-Syston may infrequently result in SEVERE peanut injury. Rain-free period for Basagran is 4 hours.
<i>bentazon</i> + <i>acifluorfen</i> Storm 4EC	6 + 14	1.5 pt	0.5 + 0.25	48 H/ 75 D	Controls morningglories, cocklebur, prickly sida, ragweed, eclipta, tropic croton, and several other broadleaf weeds with less injury than Blazer alone. Application timing is critical--weeds must be small. Include surfactant or crop oil concentrate. Can be mixed with 2,4-DB for control of larger weeds and for control of sicklepod. May be tank-mixed with paraquat. Rain-free period for Storm is 4 hours.
<i>2,4-DB</i> Butyrac 175 1.75 lb/gal Butyrac 200 2 lb/gal Butoxone 175 1.75 lb/gal Butoxone 200 2 lb/gal	4	14-18 oz 13-16 oz 16-28 oz 14-26 oz	0.19-0.25 0.20-0.25 0.22-0.38 0.22-0.40	48 H/ 30-45 D (Depends upon formulation)	Apply up to 2 applications per season as an over-the-top treatment for broadleaf weed control. Use rates and application timing varies by specific product label. For control of morningglory and citromelon, apply in the seedling stage. Cocklebur one foot or more in height can be controlled; however, earlier treatment is preferred. Also effective for control of escaped sicklepod. Do not apply if peanuts are under drought stress. Butyrac may be applied up to 12 weeks after planting. Research indicates no adverse effects of adding chlorothalonil products with 2,4-DB where fungicide treatments are needed. Rain-free period for 2,4-DB is 1 hour. Do not tank-mix with postemergence grass herbicides.
<i>imazethapyr</i> Pursuit 2 AS 70 DG	2	4 oz 1.44 oz	0.063	4 H/ 85 D	See comments for Pursuit PPI, PRE, and AC/EP. Generally should be used early postemergence-when weeds are extremely small. Controls wild radish, pigweeds, morningglories, cocklebur, and several other annual species. Compared to PPI, PRE, and AC/EP treatments, POST applications are less effective on nutsedge, wild poinsettia, and some other species. Applications should be made before nutsedge exceeds 3-4 inches and bristly starbur exceeds 2". May be tank-mixed with paraquat or 2,4-DB. Post control of escaped wild poinsettia is greatly enhanced in combination with paraquat. Rain-free period for Pursuit is 1 hour.
<i>imazapic</i> Cadre/Impose 2AS	2	4 oz	0.063	12 H/ 90 D	Provides excellent control of many broadleaf and grass weeds and both purple and yellow nutsedge. Apply as an early postemergence treatment when weeds are less than 2-3 inches in height. Under conditions of heavy weed pressure, applications of Cadre 10-14 days following an at-cracking treatment (paraquat combination) has resulted in superior weed control. Use with NIS (0.25% v/v) or COC (1 qt/A). <u>Do not tank-mix with postemergence grass herbicides.</u> Rotation restrictions include: wheat, rye-4 months; corn, snapbeans, southern peas, soybeans, tobacco-9 months; cotton, oats, sweet corn, grain sorghum-18 months; canola-40 months. See label for additional restrictions. Rain-free period for Cadre is 3 hours. Cadre can be tank-mixed with Dual Magnum or Warrant + 2,4-DB
<i>lactofen</i> Cobra 2EC	14	12.5 oz	0.195	12 H/ 45 D	Apply after peanuts reach 6 true leaf stage of growth. Use a crop oil concentrate at 1% v/v (1 gal/100 gals). Provides good control of pigweeds, morningglories, ragweed, copperleaf, wild poinsettia, and eclipta. Cobra can be tank-mixed with Basagran, Dual Magnum, Cadre, Pursuit, Select, Warrant and 2,4-DB. Rain-free period is 30 minutes.

PEANUT WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION/A	LBS ACTIVE INGREDIENT/A		
POSTEMERGENCE					
<i>sethoxydim</i> Poast 1.5EC Poast Plus 1EC	1	1-1.5 pt 1.5-2.25 pt	0.19-0.28	12 H/ 40 D	For control of annual and perennial grasses. Apply when annual grasses are small (1-6 inches) and actively growing. Under favorable conditions, large Texas panicum can be controlled. For perennial grass control, two applications are usually required for satisfactory control. Always apply with 1 qt/A crop oil concentrate. Tank-mixtures with other herbicides, such as 2,4-DB, may reduce grass control. Do not apply sulfur 14 days before or after application to minimize risk of peanut foliage burn. Reduced spray volumes (10 GPA) may improve grass control. Refer to Table 1 at the end of this chapter for more specific information about grass control. Rain-free period for Poast is 1 hour.
<i>clethodim</i> Select, Arrow, others 2EC Select Max / TapOut 0.97EC Section Three, Shadow 3EC	1	6-8 oz 12-16 oz 3.84-5.33	0.09-0.125	24 H/ 40 D	For control of annual and perennial grasses. Apply when grasses are small (<6 inches) and actively growing. Under favorable conditions, large Texas panicum and bermudagrass can be effectively controlled. Heavy bermudagrass pressure or larger Texas panicum will require a follow-up treatment. When tank-mixing with a broadleaf herbicide or controlling perennial grasses, increase rates (8-16 ozs/A-Select; 16-32 oz/A-Select Max/TapOut). Do not apply more than 21.33 oz/A/year (Section Three, Shadow), 32 oz/A/year (Select) or 64 oz/A/year (Select Max/TapOut). Always apply with a crop oil concentrate at 1% v/v (Select/Arrow). A NIS (0.25% v/v) can be used with Select Max/TapOut to reduce crop injury potential. May be tank-mixed with Basagran, Blazer, Storm, or Orthene. Do not tank-mix with chlorothalonil products or reduced grass control can occur. Refer to Table 1 at the end of this chapter for more specific information about grass control. Rain-free period is 1 hour.
<i>fluazifop-P</i> Fusilade DX 2EC	1	8-24 oz	0.125-0.375	12 H/ 40 D	For the control of annual and perennial grass weeds. Use rate depends upon weed and weed size. Refer to table at the end of this section for specific information about rates and timings. Do not apply more than 48 oz/A/season. Do not apply more than 24 oz/A/application. Maintain a minimum of 14 days between applications. Use a NIS at 0.25% v/v or COC at 1% v/v. Refer to Table 1 at the end of this chapter for more specific information about grass control. Rain-free period is 1 hour. Fusilade also has some activity on bristly starbur (i.e. goathead or Texas sandspur).
<i>chlorimuron</i> Classic 25DF	2	0.5 oz	0.008	--/ 45 D	Make one application per season as an over-the-top treatment for mid-season Florida beggarweed and bristly starbur control or suppression. Under favorable conditions—good soil moisture, moderate temperatures, and high relative humidity—other species such as cocklebur, ragweed, and sicklepod may be suppressed. Avoid applications during periods of drought/heat stress because of potential for poor weed control and crop injury. Applications of Classic may not provide acceptable control of Florida beggarweed that has escaped control or is re-growing after a previous application of Cadre. Include nonionic surfactant at 1 qt/100 gals spray solution with all Classic applications. Addition of ammonium sulfate (2 lb/A) or feed grade urea (2 gal/A) improves activity on bristly starbur. Classic can be applied from 60 days after peanut emergence to within 45 days of harvest. APPLICATIONS OF CLASSIC APPLIED FROM 60 DAYS AFTER CROPEMERGENCE TO 45 DAYS BEFORE HARVEST MAY CAUSE A SLIGHT INCREASE IN TSWV SYMPTOMS. Temporary yellowing of peanut foliage and reduction of canopy growth sometimes occur. Can be tank-mixed with Bravo or 2,4-DB. However, combinations of Classic + 2,4-DB result in significantly more foliar crop injury compared to Classic alone. Do not use on Spanish peanut. Do not tank-mix with elemental sulfur. Rain-free period for Classic is 1 hour. In recent weed-free trials conducted in Georgia, Classic has caused 7-11% yield reductions when applied to Georgia-06G and Tifguard. Significant yield losses have not occurred when Classic has been applied to Florida-07, Georgia Greener, and Georgia-07W. In 2013, GA-09B yields were reduced 5% when Classic was applied 74 DAE. Yields were not affected when applied to 60, 92, and 105 DAE.

PEANUT WEED CONTROL

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION/A	LBS ACTIVE INGREDIENT/A		
NON-SELECTIVE APPLICATOR (NSA)					
<i>paraquat</i> Gramoxone Inteon / Gramoxone SL 2SL	22	50:50 solution in water		24 H/ 30 D	Section 24C Special Local Need label: For the salvage control/suppression of Palmer amaranth and Florida beggarweed. To prevent seed production in Palmer amaranth, apply within 2 weeks of pollen shed. Tractors should be operated at speeds of 5 MPH or less. NSAs that have performed well (>85% control) in UGA tests include the following: GrassWorks Weed Wiper, Smucker's Top Crop Super Sponge, and LMC-Cross Wick-Bar. Do not apply more than 1 pt/A of Gramoxone. In order for NSAs to be effective, at least 60%-70% of the weed must be wicked/wiped. Additionally, this treatment may also be more effective on pigweed plants that are just starting to produce seed-heads. Rain-free time is 30 minutes. 24C Label must be in possession of user at the time of application.
HARVEST AID					
<i>carfentrazone</i> Aim 2EC	14	1-2 oz	0.156-0.031	12 H/ 7 D	Useful for the late-season dessication/defoliation of annual morningglories (<i>Ipomoea</i> spp.). Aim is less effective on smallflower morningglory. Use in combination with either a NIS (0.25% v/v) or COC (1% v/v). Aim may cause peanut leaf spotting or burning. Use at least 15 GPA for optimum results. Do not graze or feed peanut hay to livestock. Only 1 application per season is permitted. Rain-free period is 6-8 hours.
<i>pyraflufen</i> ET 0.208EC	14	1-2 oz	0.0016-0.0032	12 H/ 7 D	Useful for the late-season dessication/defoliation of annual morningglories (<i>Ipomoea</i> spp). Use in combination with a NIS at 0.25% v/v (1 qt/100 gals). Apply a minimum of 7 days before harvest. Use at least 15 GPA for optimum results. ET will cause peanut leaf speckling/burn. Rain-free period is 1 hour.

WEED RESPONSE TO BURNDOWN HERBICIDES USED IN PEANUT

Eric P. Prostko and A. Stanley Culpepper, Extension Agronomists – Weed Science

WEED SPECIES	Burndown Treatment ¹							
	2,4-D ³	glyphosate acid ²	glyphosate acid ² + 2,4-D ³	glyphosate acid ² + Valor	glyphosate acid ² + Aim or ET	paraquat	paraquat + 2,4-D	paraquat + Valor ⁴
GRASSES / SEDGES								
annual bluegrass	N	E	E	E	E	G-E	G-E	
bermudagrass	N	F	F	F	F	P	P	
crabgrass	N	E	G-E	E	E	G		
goosegrass	N	E	G-E	E	E	F-G		
Italian ryegrass	N	G-E	G	G	G	P-F	P-F	
johnsongrass	N	G-E	G	G-E	G-E	P		
little barley	N	E	E	E	E	G	G	
sandbur	N	E	G-E	E	E	G		
Texas panicum	N	E	G-E	E	E	G		
volunteer corn	N	E	E	E	E	F-G		
purple nutsedge	N	F-G	F-G	G	F-G	P-F		
yellow nutsedge	N	F	F	F	F	P-F		
BROADLEAVES								
bristly starbur	G	G-E	G-E	E	E	E		
buttercup	G	G-E	E	G-E	G-E	E		
Carolina geranium	F	P-F	G	G	F-G	G-E	G-E	
chickweed	P	E	E	E	E	E	E	
citronmelon	F	G-E	E	E	E	F		
cocklebur	E	E	E	E	E	G-E		
coffee senna	G	E	E	E	E	F		
corn spurry	P-F	G-E	G-E			F-G		
cowpea	G	E			E	E		
cudweed	P-F	G-E	G-E	E		F-G		
curly dock	P-F	F	F-G	F	F	P	P-F	
eveningprimrose	E	P-F	E	F-G	F	P-F	E	F-G

WEED RESPONSE TO BURNDOWN HERBICIDES USED IN PEANUT

WEED SPECIES	Burndown Treatment ¹							
	2,4-D ³	glyphosate acid ²	glyphosate acid ² + 2,4-D ³	glyphosate acid ² + Valor	glyphosate acid ² + Aim or ET	paraquat	paraquat + 2,4-D	paraquat + Valor ⁴
BROADLEAVES								
eclipta	P	F			G-E	F		G
Florida beggarweed	P-F	E	E	E	E	E		
Florida pusley	F	F	G	F-G	G	F		G
field pansy	P-F	F-G	F-G	G		G-E		
hemp sesbania	G-E	P-F	E		G-E	F		
henbit	P-F	F	G-E	E	E	G	G-E	
horsenettle	F	F			P-F	P-F		
Horseweed ALS-resistant	F-G	F-G	G-E	F-G	G	F	G	F
Glyphosate-resistant	F-G	F-G	G-E	F-G	G	F	G	F
	F-G	P	F-G	P	F	F	G	F
lambquarters	E	G	G		G-E	F-G		
morningglory, Ipomoea	G	F	E	E	E	F-G		
morningglory, smallflower	F	G	E	E	G-E	P		
Pennsylvania smartweed	F	G	G		G-E	P		
Pigweed ALS-resistant	G-E	G-E	E	E	E	G	G-E	G-E
Glyphosate-resistant	G-E	G-E	G-E	E	E	G	G-E	G-E
	G-E	P	F-G	P	F	G	G-E	G-E
prickly sida	F-G	F-G	G		F-G	P-F		
purslane	G-E	F-G	G-E	G	F-G	G		
ragweed	E	G	E		G-E	G		
redweed	F	G			G-E	F		
shepherdspurse	G	G			G	G	G-E	
sicklepod	F-G	G-E	E	E	G-E	E		
speedwell	P-F	G-E	G-E	E	E	F	G	
spurred anoda	F-G	G			G	F-G		
swinecress	F-G	F-G	G	F-G	F-G	P	P-F	
tropic croton	F	G-E	G-E	E	G-E	F		

WEED RESPONSE TO BURNDOWN HERBICIDES USED IN PEANUT

WEED SPECIES	Burndown Treatment ¹							
	2,4-D ³	glyphosate acid ²	glyphosate acid ² + 2,4-D ³	glyphosate acid ² + Valor	glyphosate acid ² + Aim or ET	paraquat	paraquat + 2,4-D	paraquat + Valor ⁴
BROADLEAVES								
tropical spiderwort	G-E	P	G-E	F	Aim = G-E ET = P-F	G	G-E	
velvetleaf	F-G	G			E	P		
vines (maypop, trumpet creeper, bigroot mg)	F	P-F			P-F	P		
Virginia pepperweed	G-E	G			G	P-F	G-E	
volunteer peanuts	P	F	F	F-G	F	P	P	F-G
wild lettuce	G	G	G-E	E	G-E	P		
wild poinsettia	F-G	G			G-E	G-E		
wild radish	G	F-G	E	G	G	F	F-G	G
COVER CROPS								
clover	F	F	F-G		F	F-G		
lupine	G	G	G		G	F-G		
small grains	N	E	G-E	E	E	G		G
vetch	G	F	G-E	F	F	F		

Key:
 E-90% or better control
 G-80% to 90% control
 F-60% to 80% control
 P-30% to 60% control
 N- < 30% control

¹Application rates per acre: 2,4-D, 1 pt; glyphosate acid, 0.75 lb a.e.; paraquat, 0.63 lb a.i.; Valor, 1 to 2.0 oz (Note: if 3 oz/A of Valor is used, burndown control may be better than indicated and residual control will be increased); Aim, 1-2 oz/A; ET, 0.5-2 oz/A.

²Mixing herbicides with glyphosate occasionally reduces grass control (including cover crops). This is more likely to occur with large weeds in dry conditions.

³Labels for 2,4-D are ambiguous concerning the waiting period between application and planting.

⁴Use a NIS (0.25% v/v) or COC (1% v/v) with this tank-mixture. A COC may be preferred if weeds are large

WEED RESPONSE TO HERBICIDES USED IN PEANUTS

Eric P. Prostko, Extension Agronomist - Weed Science

	I PPI/PRE ^{1,2}						PRE			POSTEMERGENCE	
	Prowl Pendimax Sonalan	Dual Magnum ³	Lasso Intrro	Propel Outlook	Pursuit	Strongarm	Warrant	Spartan Charge	Valor	Paraquat ⁴	Paraquat + Storm
PERENNIALS											
bermudagrass	P	P	P	P	P	P	P		P	P	P
johnsongrass-rhizome	P	P	P	P	P	P	P		P	P	P
nutsedge, purple	P	P	P	P	G	P-F	P		P	P-F	F
nutsedge, yellow	P	F-G	F	F	F-G	P-F	P-F		P	P-F	F-G
broadleaf signalgrass	G-E	F-G	P	F	P	P	F-G		P	G	G
crabgrass	E	E	E	E	F	P	E		P	F-G	F-G
crowfootgrass	E	E	E	E	P	P	E		P	G	G
fall panicum	G	G	G	G	P-F	P	G		P	G	G
goosegrass	E	E	E	E	F	P	E		P	F-G	F-G
johnsongrass-seedling	E	F	F	F	G	P	F		P	G	G
sandbur	E	F-G	F-G	F-G		P	F-G		P	F	F-G
Texas panicum	G-E	P-F	P	P	P-F	P-F	P-F		P	G-E	G-E
BROADLEAVES											
bristly starbur	P	P	F	P	F	E	P		F	P-F	F-G
burgherkin	P	P	P	P	E	G	P		G	F	G
carpetweed	G	P-F	P-F	G	F-G	G	P			F-G	G
citronmelon	P	P	P	P	P	G	P		G	F	G
cocklebur	P	P	P	P	G-E	G-E	P		P	G	G-E
coffee senna	P	P	P	P	F-G	P	P		P-F	F	E
copperleaf	P	P		F-G	P	G-E	P		G-E	P	G
cowpea	P	P	P	P	P	P	P		P-F	F-G	F

WEED RESPONSE TO HERBICIDES USED IN PEANUTS

	I PPI/PRE ^{1,2}						PRE			POSTEMERGENCE	
	Prowl Pendimax Sonalan	Dual Magnum ³	Lasso Intro	Propel Outlook	Pursuit	Strongarm	Warrant	Spartan Charge	Valor	Paraquat ⁴	Paraquat + Storm
BROADLEAVES											
crotalaria	P	P	P	P			P		G		F-G
croton, tropic	P	P	P-F	P	P	F-G	P		G	P	G
dayflower, Benghal tropical spiderwort	P	G-E	F	F	G	G	G-E		F	G	G
eclipta	P	P-F	P-F	P-F	P	G-E			G-E	P-F	F-G
Florida beggarweed	P	P-F	F	P-F	P	F-G	P-F		G-E	G-E	G-E
Florida pusley	E	G-E	G-E	G-E	G	G-E	G		G-E	P	P
groundcherry, cutleaf	P	G	G	G							
jimsonweed	P				G	G-E			G	P	F
hairy indigo	P	F				G			G	F	
hemp sesbania	P	P	P	P	P	P-F	P		G		G
horseweed							P		G-E	P	P
lambsquarters	E	F	F	G	F	G-E	F		G-E	F	F-G
morningglory spp.	P	P	P	P	G	F-G	P		F-G	P	F
cypressvine	P	P	P	P	G		P		G	F-G	F-G
entireleaf/ivyleaf	P	P	P	P	G	F-G	P		F-G	F	G
pitted	P	P	P	P	G	F-G	P		F	F	G
purple moonflower	P	P	P	P			P			F	G
red	P	P	P	P	G	F	P		G	F	G
smallflower	P	P	P	P	E	G	P		G-E	P	G-E
tall	P	P	P	P	G		P		F-G	F	G
Pigweeds	G	G	G	G	E	G		G-E	E	F	G-E
ALS-resistant	G	G	G	G	P	P		G-E	E	F	G-E

WEED RESPONSE TO HERBICIDES USED IN PEANUTS

	I PPI/PRE ^{1,2}						PRE			POSTEMERGENCE	
	Prowl Pendimax Sonalan	Dual Magnum ³	Lasso Intrro	Propel Outlook	Pursuit	Strongarm	Warrant	Spartan Charge	Valor	Paraquat ⁴	Paraquat + Storm
BROADLEAVES											
poorjoe											
prickly sida	P	F	F	F	G-E	F-G	F		G-E	F	G
primrose, cutleaf evening										P	G (+2,4DB)
purslane	G-E	G	G	G	G		G		G-E	G	G
ragweed	P	P	P	F-G	P	G-E			G-E	P-F	G
redweed	P					G			G-E	F	G
spurred anoda	P	P	P	P		F-G			F	P	G
sicklepod	P	P	F	P	P	P	P		P	G-E	G-E
smartweed	P				G	G			P-F	G-E	G
spider flower	P	P	P	P	G						
spurge spp.	P	P-F	P	P-F					G-E		
velvetleaf	P	P	P	P	P-F	G-E			F	F	F-G
wild poinsettia	P	P	P	P	E	G-E			F-G	F	G
wild radish	P	P	P	P	E					F	G

Abbreviations:

E-Excellent (> 90%)

G-Good (80-89%)

F-Fair (70-79%)

P-Poor (< 70%)

If no letter is given, response is unknown.

PPI=Preplant Incorporated, PRE=Preemergence.

¹ Ratings for Pursuit PPI and PRE are similar.

² Ratings for Dual, Lasso and Outlook/Propel PRE and AC are similar. See remarks for additional information.

³ The generic formulations of metolachlor (Parallel PCS, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.

⁴ Commercially available as Firestorm or Parazone or Gramoxone Inteon or Gramoxone SL.

WEED RESPONSE TO HERBICIDES USED IN PEANUTS

	POSTEMERGENCE												
	Strongarm**	Paraquat + Basagran	2,4-DB	Pursuit	Basagran	Ultra Blazer	Cobra	Storm	Cadre	Fusilade	Select	Poast	Classic
PERENNIALS													
bermudagrass	P	P	P	P	P	P	P	P	P	G	G	F-G	P
Johnsongrass- (rhizome)	P	P	P	P	P	P	P	P	F-G	G-E	G	F-G	P
nutsedge, purple		F	P	G	P	P	P	P	G-E	P	P	P	P
nutsedge, yellow		F-G	P	F-G	G	P	P-F	F	G-E	P	P	P	F-G
GRASSES													
broadleaf signalgrass	P	G	P	P	P	P	P-F	P	G	G	G-E	G-E	P
crabgrass	P	F-G	P	P-F	P	P	P-F	P	G	G	G-E	G-E	P
crowfootgrass	P	G	P	P-F	P	P	P	P	G	F-G	G	F-G	P
fall panicum	P	G	P	P	P	F	P	P	G	G-E	G-E	G-E	P
goosegrass	P	F-G	P	P	P	P	P	P	F	G	G	G	P
johnsongrass-seedling	P	G	P	F	P	P	P	P	F-G	G-E	G-E	G-E	P
sandbur	P	F-G	P		P	P	P-F	P	G	G	G	G	P
Texas panicum	P	G-E	P	P-F	P	P	P	P	F-G	G	G-E	G-E	P
BROADLEAVES													
bristly starbur	E	F	P-F	P-F	G	P-F	G	F-G	F	F	P	P	F
burgherkin		F	F	F	P	G	G	F	G-E	P	P	P	P
carpetweed		P	P	F-G	P	G-E	G-E	G	F-G	P	P	P	
citronmelon		F	G	P	P	F	G	F	G	P	P	P	P
cocklebur	E	G	E	E	E	G	G-E	E	E	P	P	P	F
coffee senna		E	F-G	F	G	P	P-F	F	G	P	P	P	P
copperleaf	P	P	P	P	P	G-E	G-E	F	P-F	P	P	P	P
cowpea		P-F	P-F	P	P	P-F	P-F	P-F	P-F	P	P	P	F
crotalaria					P	E	E	G-E		P	P	P	

WEED RESPONSE TO HERBICIDES USED IN PEANUTS

	POSTEMERGENCE												
	Strongarm**	Paraquat + Basagran	2,4-DB	Pursuit	Basagran	Ultra Blazer	Cobra	Storm	Cadre	Fusilade	Select	Poast	Classic
BROADLEAVES													
croton, tropic	P	P	P	P	P	E	E	G-E	P	P	P	P	P
dayflower, Benghal tropical spiderwort	G	G	P	F-G	G	P	P	P	F-G	P	P	P	F
eclipta	G-E	F	P	P	G	F-G	F-G	G	P-F	P	P	P	P
Florida beggarweed	P-F	G-E	P	P	P	P	P-F	P	F-G	P	P	P	F-G
Florida pusley		P	P	P	P	P	F-G	P	P	P	P	P	P
groundcherry, cutleaf		F-G			P	G	G	F-G		P	P	P	
jimsonweed		E	P	F-G	E	E	E	G	E	P	P	P	
hairy indigo			F	P	P	G	G	F	F	P	P	P	F-G
hemp sesbania				P	P	E	E	G-E	P	P	P	P	F-G
horseweed ALS-resistant	G P	P	P	P	P	P	P	P	P	P	P	P	F P
lambsquarters		F	F	P	F	P-F	P-F	F	P-F	P	P	P	P
morningglory spp.	G-E	F-G	F-G	G	F	G-E	G-E	G	G	P	P	P	
cypressvine		G-E	F	G	G	G	G-E	G	G	P	P	P	
entireleaf/ivyleaf	G-E		G	F-G	P	G	F-G	F	G	P	P	P	
pitted	G-E		F-G	G	P	G-E	G	F-G	G	P	P	P	
purple moonflower	F-G		F-G	P	P	G-E	G-E	G	F	P	P	P	P
red			G		F-G	G-E	G-E	G-E		P	P	P	
smallflower	G-E	G-E	F	E	E	G-E	G-E	G-E	E	P	P	P	
tall			G		P	G	G	F-G	G	P	P	P	
Pigweeds ALS-resistant	P P	F-G F-G	F F	E P	P P	G-E G-E	G-E G-E	G G	E P	P P	P P	P P	F P

WEED RESPONSE TO HERBICIDES USED IN PEANUTS

	POSTEMERGENCE												
	Strongarm**	Paraquat + Basagran	2,4-DB	Pursuit	Basagran	Ultra Blazer	Cobra	Storm	Cadre	Fusilade	Select	Poast	Classic
BROADLEAVES													
poorjoe			F			G	G			P			
prickly sida		G	P	P-F	G	P	G	G	G	P	P	P	P
primrose, cutleaf evening	P	F (+2,4-DB)	F	P	P	P	P	P	P	P	P	P	P
purslane		G	G	P-F	G	E	E	G-E	P-F	P	P	P	
ragweed	E	F	F	P	F	E	E	G	F	P	P	P	P-F
redweed		G	P	P	G	P	F	G	G	P	P	P	P
spurred anoda		F-G	P		G	P	P	F	G	P	P	P	
sicklepod	P	G	F-G	P	P	P	P-F	P	G-E	P	P	P	P-F
smartweed		G	P	G-E	G-E	G-E	G-E	G-E	F-G	P	P	P	P
spider flower				F-G		G	G	F	F-G	P	P	P	F
spurge spp.			P	P	P	F	F	F		P	P	P	P
velvetleaf		G	P	P-F	G	P-F	G	F-G		P	P	P	
wild poinsettia	P-F	G-E	P	P-F	P	G-E	G-E	G	E	P	P	P	P
wild radish	G-E	F	P	G-E	P-F	E	E	G	E	P	P	P	P

<p>Abbreviations: E-Excellent (> 90%) G-Good (80-89%) F-Fair (70-79%) P-Poor (<70%)</p>	<p>If no symbol is given, response is unknown. ⁴Palmer amaranth control may be less than indicated. **24(c) label for use in Georgia only for tropical spiderwort.</p>
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TABLE 1. SUMMARY OF PEANUT GRASS HERBICIDES

	HERBICIDE					
	Fusilade DX	Poast	Poast Plus	Select/Arrow/Others (2 lb ai/gal)	Select Max/TapOut (0.97 lb ai/gal)	Section Three Shadow (3 lb ai/gal)
Maximum Rate/A/ Season	48 oz	2.5 pt	3.75 pt	32 oz	64 oz	21.33 oz
Maximum Rate/A/ Application	24 oz	1.5 pt	1.5 pt	16 oz	32 oz	10.67 oz
broadleaf signalgrass	12 oz (2-4")	1 pt (up to 8")	1.5 pt (up to 8")	6-8 oz (2-6")	9-16 oz (2-6")	3.33 oz
crabgrass	12 oz (1-2")	1 pt (up to 6")	1.5 pt (up to 6")	6-8 oz (2-6")	9-16 oz (2-6")	3.33 oz (1-4")
crowfootgrass	NL*	NL	NL	6-8 oz (2-6")	9-16 oz (2-6")	NL
field sandbur	12 oz (2-4")	1.25 pt (up to 3')	1.875 pt (up to 3")	6-8 oz (2-6")	9-16 oz (2-6")	NL
goosegrass	8 oz (2-4")	1 pt (up to 6")	1.5 pt (up to 6")	6-8 oz	9-16 oz (2-6")	NL
Texas panicum	12 oz (2-8")	1 pt (up to 8")	1.5 pt (up to 8")	6-8 oz (2-6")	9-16 oz (2-6")	3.33 oz (1-4")
rhizome johnsgrass	12-24 oz (1 st) (8-18") 8-24 oz (2 nd) (6-12")	1.5 pt (1 st) (up to 25") 1 pt (2 nd) (up to 12")	2.25 pt (1 st) (up to 25") 1.5 pt (2 nd) (up to 12")	8-16 oz (1 st) (12-24") 6-8 oz (2 nd) (6-18")	12-32 oz (1 st) (12-24") 9-24 oz (2 nd) (6-18")	5.33-10.67 oz (1 st) (12-24") 4-5.33 oz (2 nd) (6-18")
bermudagrass	12-24 oz (1 st) (4-8" runners) 8-24 oz (2 nd) (4-8" runners)	1.5 pt (1 st) (up to 6" stolon) 1 pt (2 nd) (up to 4" stolon)	2.25 pt (1 st) (up to 6" stolon) 1.5 pt (2 nd) (up to 4" stolon)	8-16 oz (1 st) (3-6" runners) 8-16 oz (2 nd) (3-6" runners)	12-32 oz (1 st) (3-6" runners) 12-32 oz (2 nd) (3-6" runners)	5.33-10.67 oz (1 st) (up to 6" runners) 5.33-10.67 oz (up to 6" runners)

*NL= crowfootgrass was not listed on the product label.

SUGGESTED HERBICIDE PROGRAMS FOR THE CONTROL OF TROPICAL SPIDERWORT (BENGHAL DAYFLOWER) IN PEANUT:

Program 1

a) **PRE Immediately After Planting:** Valor at 3 oz/A + Dual Magnum or generic metolachlor (Stalwart, Parallel PCS, Me-Too-Lachlor) at 1 pt/A or Warrant at 3 pt/A **and**

b) **POST when spiderwort is 1-2" tall:** Cadre/Impose 2L at 4 oz/A or Strongarm at 0.45 oz/A + Dual Magnum or generic metolachlor (Stalwart, Parallel PCS, Me-Too-Lachlor) at 1pt/A Warrant at 3 pt/A.

Program 2

a) **AT-CRACK (before 28 days after peanut cracking):** Apply Gramoxone Inteon/Gramoxone SLat 12 oz/A or Firestorm/Parazone/Helmquat at 8 oz/A + Storm at 16 oz/A + Dual Magnum or generic metolachlor (Stalwart, Parallel PCS, Me-Too-Lachlor) at 1 pt/A or Warrant at 3 pt/A **and**

b) **POST (2-3 weeks after at-crack spray):** Apply Cadre/Impose 2L at 4 oz/A or Strongarm at 0.45 oz/A + Dual Magnum or generic metolachlor (Stalwart, Parallel PCS, Me-Too-Lachlor) at 1 pt/A or Warrant at 3 pt/A.

**When using Dual Magnum or generic metolachlor POST in combination with Cadre/Impose, Gramoxone/Firestorm, or Strongarm, additional spray adjuvants (NIS, COC) are not necessary. The maximum amount/A/year of Dual Magnum that can be applied is 2.8 pt/A. The maximum amount/A/year of Stalwart, Parallel PCS, or Me-To-Lachlor that can be applied is 2.66 pt/A. The maximum amount of Warrant that can be applied PRE + POST is 6 pt/A/year. When Warrant is applied POST, a NIS (0.25% v/v) is needed.*

TABLE 2. SUGGESTED HERBICIDE PROGRAMS FOR MANAGING ALS – RESISTANT PALMER AMARANTH IN PEANUT¹

PREPLANT INCORPORATED	PREEMERGENCE²	CRACKING OR EARLY POSTEMERGENCE³ (PALMER < 3 IN.)	POSTEMERGENCE⁴ (PALMER < 3 IN.)
Prowl ⁵ or Sonalan	Valor ⁹ or Spartan Charge ^{6,7}		Cobra ⁷ or Ultra Blazer ⁷ + Dual Magnum ⁸ or Warrant ⁸ + 2,4-DB
Prowl ⁵ or Sonalan		Gramoxone SL or Firestorm or Parazone or Helmquat + Storm + Warrant ⁸ or Dual Magnum ⁸	Cobra ⁷ or Ultra Blazer ⁷ + Dual Magnum ⁸ or Warrant ⁸ + 2,4-DB

¹ALS-resistant Palmer amaranth is a very serious concern. An aggressive management program is necessary to slow spread of the resistant biotypes and to reduce selection pressure in areas currently not infested with resistant biotypes. A combination of soil residual and postemergence herbicides will be required for optimum control.

²Strongarm is not included in this table because it is an ALS-inhibiting herbicide. However, it can be used for the control of other broadleaf weeds.

³Apply cracking or early postemergence treatment only if weeds have emerged.

⁴Cadre or Pursuit may be tank-mixed with Cobra or Ultra Blazer if needed for control of other weed species. Cadre and Pursuit are ALS- inhibitors. Because of concerns with weed resistance to ALS-inhibitors, a mixture of Cobra or Ultra Blazer with Cadre or Pursuit would be preferred over Cadre or Pursuit alone. When using Cadre or Pursuit, follow all labeled crop rotation restrictions.

⁵Generic brands of Prowl (pendimethalin) are available and perform similarly. Prowl or Sonalan can be applied preemergence if 0.5-0.75” of water can be applied within 48 hours of application. They can be tank-mixed with Valor or Spartan Charge in this situation.

⁶If Valor or Spartan Charge is properly activated with 0.5-0.75” of rainfall or irrigation within 7 days of application, it is unlikely that an “at-cracking” treatment will be required. However, if control with Valor or Spartan Charge is unacceptable, an “at-cracking” treatment of Gramoxone SL or Firestorm or Parazone or Helmquat + Storm + Dual Magnum or Warrant should be applied.

⁷Valor, Cobra, Spartan Charge, Storm, and Ultra Blazer have the same mode of action (PPO inhibitor). Consequently, no more than 2 applications of these herbicides should be used in a season.

⁸Generic brands of metolachlor are available (Stalwart, Parallel PCS, Me-Too-Lachlor). However, these generic brands have not provided the same length of residual control as Dual Magnum (*S*-metolachlor) in some UGA field trials. When tank-mixing paraquat, Cobra or Ultra Blazer with Dual Magnum/generics, additional spray adjuvants (NIS, COC) are *not* recommended and will likely increase peanut injury. When using Warrant with POST application, add NIS (0.25% v/v).

⁹Generic brands of Valor 51WG (flumioxazin) are also available including Outflank, Panther, and Rowel. Panther SC is a liquid formulation of flumioxazin but this formulation has not yet been adequately tested by UGA weed scientists.

SPECIAL NOTE: Dual Magnum and Warrant are in the same herbicide family and have the same mode of action (inhibit very long chain fatty acids). Multiple applications (> 2) of these herbicides in a single year should be avoided to prevent or delay the evolution of resistance. These herbicides have no postemergence activity.

SOYBEAN: SOYBEAN INSECT CONTROL

Phillip Roberts, Extension Entomologist, Mike Toews, Research Entomologist, and David Buntin, Research Entomologist

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Bean Leaf Beetle	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.8-3.8 oz	0.018-0.025	12 H/ 21 D	Bean leaf beetles are foliage feeders and damage the plant by chewing holes in the leaves and occasionally feeding on stems and pods. Defoliation Threshold: Treat when 30 percent foliage loss has occurred and beetles are present prior to bloom or when 15 percent foliage loss has occurred and beetles are present after bloom. Pod Feeding Threshold: Treat if 50 percent of the plants have pod feeding prior to R6.
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC	3A	2.1-6.4 oz 2.1-6.4 oz	0.033-0.1 0.033-0.1	12 H/ 18 D	
	<i>carbaryl</i> Sevin 80S Sevin 4F	1A	0.625-1.25 lb 1-2 pt	0.5-1 0.5-1	12 H/ 21 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.8 oz	0.0125-0.022	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	0.77-1.28 oz 0.77-1.28 oz	0.0075-0.0125 0.0075-0.0125	24 H/ 45 D	
	<i>lambda-cyhalothrin</i> Karate Zeon 2.08 Silencer 1	3A	0.96-1.6 oz 1.92-3.2 oz	0.015-0.025 0.015-0.025	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Max .8EC	3A	2.8-4 oz	0.0175-0.025	12 H/ 21 D	
Beet Armyworm	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-20 oz	0.047-0.067	4 H/ 1 day	Defoliation Threshold: Treat when 30 percent foliage loss has occurred and larvae a 1/2" or longer are present prior to bloom or when 15% foliage loss has occurred and larvae a 1/2" or longer are present after bloom. Beet armyworm infestations sometimes occur on seedling soybeans, especially on ultra-late planted soybeans.
	<i>flubendiamide</i> Belt 4SC	28	2-3 oz	0.063-0.094	12 H/ 14 D	
	<i>indoxacarb</i> Steward 1.25 EC	22	5.6-11.3 oz	0.055-0.1	12 H/ 21 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	4-8 oz	0.06-0.12	4 H/ 14 D	
	<i>novaluron</i> Diamond 0.83 EC	15	6-12 oz	0.039-0.077	12 H/ 28 D	
	<i>spinosad</i> Blackhawk	5	1.7-2.2 oz	0.038-0.049	4 H/ 28 D	
Blister Beetles	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.8-3.8 oz	0.018-0.025	12 H/ 21 D	Blister beetles are rarely a problem in soybeans, however, large numbers can cause extensive defoliation. Blister beetles may congregate in isolated areas of fields. Defoliation Threshold: Treat when 30% foliage loss has occurred and beetles are present prior to bloom or when 15% foliage loss has occurred and beetles are present after bloom.
	<i>carbaryl</i> Sevin 80S Sevin 4F	1A	0.625-1.25 lb 1-2 pt	0.5-1 0.5-1	12 H/ 21 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.8 oz	0.0125-0.022	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	1.28-1.54 1.28-1.54	0.0125-0.015 0.0125-0.015	24 H/ 45 D	

SOYBEAN INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Blister Beetles (continued)	<i>lambda-cyhalothrin</i> Karate Zeon 2.08 Silencer 1	3A	1.6-1.92 oz 3.2-3.84 oz	0.025-0.03 0.025-0.03	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Max .8EC	3A	2.8-4oz	0.0175-0.025	12 H/ 21 D	
Corn Earworm	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.8-3.8 oz	0.018-0.025	12 H/ 21 D	<p>Corn earworm infestations are rare in Georgia soybeans and typically occur in more northern areas of the state. Corn earworms may feed on the foliage or more importantly may damage developing pods.</p> <p>Defoliation Threshold: Treat when 30% foliage loss has occurred and larvae a 1/2" or longer are present prior to bloom or when 15% foliage loss has occurred and larvae a 1/2" or longer are present after bloom.</p> <p>Sweep Net Threshold: 5 larvae/25 sweeps.</p> <p>Drop Cloth Threshold: 2 larvae/1 ft of row.</p>
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC	3A	2.1-6.4 oz 2.1-6.4 oz	0.033-0.10 0.033-0.10	12 H/ 18 D	
	<i>carbaryl</i> Sevin 80S Sevin 4F	1A	0.625-1.875 lb 1-3 pt	0.5-1.5 0.5-1.5	12 H/ 21 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.8 oz	0.0125-0.022	12 H/ 21 D	
	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-20 oz	0.047-0.067	4 H/ 1 D	
	<i>flubendiamide</i> Belt 4SC	28	2-3 oz	0.063-0.094	12 H/ 14 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	0.77-1.28 0.77-1.28	0.0075-0.0125 0.0075-0.0125	24 H/ 45 D	
	<i>lambda-cyhalothrin</i> Karate Zeon 2.08 Silencer 1	3A	0.96-1.6 oz 1.92-3.2 oz	0.015-0.025 0.015-0.025	24 H/ 30 D	
	<i>esfenvalerate</i> Asana XL .66EC	3A	5.8-9.6 oz	0.03-0.05	12 H/ 21 D	
	<i>indoxacarb</i> Steward 1.25 EC	22	5.6-11.3 oz	0.055-0.1	12 H/ 21 D	
	<i>methomyl</i> Lannate 24LV	1A	0.75-1.5 pt	0.225-0.45	48 H/ 14 D	
	<i>spinosad</i> Blackhawk	5	1.7-2.2 oz	0.038-0.049	4 H/ 28 D	
	<i>zeta-cypermethrin</i> Mustang Max .8EC	3A	2.8-4 oz	0.0175-0.025	12 H/ 21 D	
Cutworms	<i>alpha-cypermethrin</i> Fastac 0.83	3A	1.3-3.8 oz	0.018-0.025	12 H/ 21 D	Treat when 10% of stand is lost and larvae are present.
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC	3A	2.1-6.4 oz 2.1-6.4 oz	0.033-0.10 0.033-0.10	12 H/ 18 D	
	<i>chlorpyrifos</i> Lorsban 4E	1B	2 pt	1	24 H/ 28 D	

SOYBEAN INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Cutworms (continued)	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	0.8-1.6 oz	0.0065-0.0125	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	0.77-1.28 oz 0.77-1.28 oz	0.0075-0.0125 0.0075-0.0125	24 H/ 45 D	
	<i>lambda-cyhalothrin</i> Karate Zeon 2.08 Silencer 1	3A	0.96-1.6 oz 1.92-3.2 oz	0.015-0.025 0.015-0.025	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Max .8EC	3A	1.28-4 oz	0.008-0.025	12 H/ 21 D	
Fall Armyworm	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-20 oz	0.047-0.067	4 H/ 1 day	Defoliation Threshold: Treat when 30% foliage loss has occurred and larvae a 1/2" or longer are present prior to bloom or when 15% foliage loss has occurred and larvae a 1/2" or longer are present after bloom. Fall armyworm may sometimes feed on pods. If pod feeding is observed treat when populations reach 2 larvae/1 ft of row.
	<i>flubendiamide</i> Belt 4SC	28	2-3 oz	0.063-0.094	12 H/ 14 D	
	<i>indoxacarb</i> Steward 1.25EC	22	5.6-11.3 oz	0.055-0.1	12 H/ 21 D	
	<i>methomyl</i> Lannate 2.4LV	1A	1.5 pt	0.45	48 H/ 14 D	
	novaluron Diamond 0.83 EC	15	6-12 oz	0.039-0.077	12 H/ 28 D	
	<i>spinosad</i> Blackhawk	5	1.7-2.2 oz	0.039-0.049	4 H/ 28 D	
Grasshoppers	<i>alpha-cypermethrin</i> Fastac 0.83	3A	3.2-3.8 oz	0.02-0.025	12 H/ 21 D	Grasshoppers are primarily foliage feeders but may also feed on pods. In reduced tillage fields, immature grasshoppers may emerge from egg pods oviposited in the soil the previous fall. Adult grasshoppers migrating into soybeans initially build on field edges. Immature (wingless) grasshoppers are easier to control than adults. Defoliation Threshold: Treat when 30% foliage loss has occurred and larvae a 1/2" or longer are present prior to bloom or when 15% foliage loss has occurred and larvae a 1/2" or longer are present after bloom.
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC	3A	2.1-6.4 oz 2.1-6.4 oz	0.033-0.1 0.033-0.1	12 H/ 18 D	
	<i>acephate</i> Orthene 97	1B	0.5 lb	0.48	24 H/ 14 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	2-2.8 oz	0.0155-0.022	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	1.28-1.54 oz 1.28-1.54 oz	0.0125-0.015 0.0125-0.015	24 H/ 45 D	
	<i>lambda-cyhalothrin</i> Karate Zeon 2.08 Silencer 1	3A	1.6-1.92 oz 3.2-3.84 oz	0.025-0.03 0.025-0.03	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Max .8EC	3A	3.2-4 oz	0.02-0.025	12 H/ 21 D	

SOYBEAN INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Green Cloverworm	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.8-3.8 oz	0.018-0.025	12 H/ 21 D	Green cloverworm is a foliage feeder that has 3 pairs of abdominal prolegs; larvae become very active when proded. Green cloverworm is attacked by numerous beneficial organisms and rarely requires insecticidal control. Defoliation Threshold: Treat when 30% foliage loss has occurred and larvae a 1/2" or longer are present prior to bloom or when 15% foliage loss has occurred and larvae a 1/2" or longer are present after bloom. Sweep Net Threshold: 38 larvae/25 sweeps. Drop Cloth Threshold: 8 larvae/1 ft of row.
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	0.8-1.6 oz	0.0065-0.0125	12 H/ 21 D	
	<i>carbaryl</i> Sevin 80S Sevin 4F	1A	0.625-1.25 lb 1-2 pt	0.5-1 0.5-1	12 H/ 21 D	
	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-20 oz	0.047-0.067	4 H/ 1 day	
	<i>fluebendiamide</i> Belt 4SC	28	2-3 oz	0.063-0.094	12 H/ 14 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	0.77-1.28 oz 0.77-1.28 oz	0.0075-0.0125 0.0075-0.0125	24 H/ 45 D	
	<i>lambda-cyhalothrin</i> Karate Zeon 2.08 Silencer 1	3A	0.96-1.6 oz 1.92-3.2 oz	0.015-0.025 0.015-0.025	24 H/ 30 D	
	<i>diflubenzuron</i> Dimilin 2L	15	2-4 oz	0.03-0.06	12 H/ 21 D	
	<i>esfenvalerate</i> Asana XL .66EC	3A	2.9-5.8 oz	0.015-0.03	12 H/ 21 D	
	<i>indoxacarb</i> Steward 1.25EC	22	5.6-11.3 oz	0.055-0.1	12 H/ 21 D	
	<i>methomyl</i> Lannate 2.4LV	1A	0.4-0.75 pt	0.12-0.225	48 H/ 14 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	4-8 oz	0.06-0.12	4 H/ 14 D	
	<i>novaluron</i> Diamond 0.83 EC	15	6-10 oz	0.039-0.064	12 H/ 28 D	
	<i>spinosad</i> Blackhawk	5	1.1-2.2 oz	0.025-0.049	4 H/ 28 D	
	<i>zeta-cypermethrin</i> Mustang Max .8EC	3A	2.8-4 oz	0.0175-0.025	12 H/ 21 D	
Japanese Beetle	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.8-3.8 oz	0.018-0.025	12 H/ 21 D	Japanese beetle is a foliage feeder and is most often observed infesting soybean in northern areas of Georgia. Defoliation Threshold: Treat when 30% foliage loss has occurred and larvae a 1/2" or longer are present prior to bloom or when 15% foliage loss has occurred and larvae a 1/2" or longer are present after bloom.
	<i>carbaryl</i> Sevin 80S Sevin 4F	1A	0.625-1.25 lb 1-2 pt	0.5-1 0.5-1	12 H/ 21 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.8 oz	0.0125-0.022	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	1.28-1.54 oz 1.28-1.54 oz	0.0125-0.015 0.0125-0.015	24 H/ 45 D	

SOYBEAN INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Japanese Beetle (continued)	<i>lambda-cyhalothrin</i> Karate Zeon 2.08 Silencer 1	3A	1.6-1.92 oz 3.2-3.84 oz	0.025-0.03 0.025-0.03	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Max .8EC	3A	2.8-4 oz	0.0175-0.025	12 H/ 21 D	
Kudzu Bug	<i>acephate</i> Orthene 97	1B	0.75-1 lb	0.5-0.97	24 H/ 14 D	Kudzu bugs have sucking mouthparts and feed on the main stem and petioles. Current recommendations include interrupting the development of each generation of kudzu bug by applying an insecticide to target the immature stage of the insect.
	<i>alpha-cypermethrin</i> Fastac 0.83	3A	3.2-3.8 oz	0.02-0.025	12 H/ 21 D	
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC	3A	5.12-6.4 oz 6.4 oz	0.08-0.1 0.1	12 H/ 18 D	Kudzu bug infestations are generally higher on early planted soybeans.
	<i>clothianidin</i> Belay 2.13	4A	3-4 oz	0.05-0.067	12 H/ 21 D	Sweep Net Threshold: 1 immature kudzu bug/sweep. Samples should be taken from all areas of the field, including edges and the middle, taking care not to bias sampling along border rows where populations build initially.
	<i>gamma-cyhalothrin</i> Declare 1.25	3A	1.28-1.54 oz	0.0125-0.015	24 H/ 45 D	Visual Inspection Threshold: As an alternative to sweep-net sampling, visual inspections of insect density lower in the canopy will suffice. If immature kudzu bugs are easily and repeatedly found on leaf petioles and/or main stems, treatment is likely warranted.
	<i>lambda-cyhalothrin</i> Karate Zeon 2.08	3A	1.92 oz	0.03	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Max .8 EC	3A	4 oz	0.025	12 H/ 21 D	
Lesser Cornstalk Borer	<i>chlorpyrifos</i> Lorsban 15G	1B	8 oz/1,000 ft of row	1	24 H/ 28 D	Treat when 10 percent of seedlings are infested with larvae. The risk of lesser cornstalk borer is greatest during hot dry periods. Infestations are more common in conventionally tilled sandy soils. The risk of lesser cornstalk borer is also high when previous crop residues are burned prior to planting. See label for details on application.
	Lorsban 4E		2 pt	1		
Loopers, Soybean	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-20 oz	0.047-0.067	4 H/ 1 D	Soybean looper is a foliage feeder that has 2 pairs of abdominal prolegs. Soybean loopers are highly resistant to pyrethroid insecticides and should not be used for control.
	<i>flubendiamide</i> Belt 4SC	28	2-3 oz	0.063-0.094	12 H/ 14 D	
	<i>indoxacarb</i> Steward 1.25 EC	22	5.6-11.3 oz	0.055-0.1	12 H/ 21 D	Defoliation Threshold: Treat when 30% foliage loss has occurred and larvae a 1/2" or longer are present prior to bloom or when 15% foliage loss has occurred and larvae a 1/2" or longer are present after bloom.
	<i>methoxyfenozide</i> Intrepid 2F	18	4-8 oz	0.06-0.12	4 H/ 14 D	Sweep Net Threshold: 19 larvae/25 sweeps.
	<i>spinosad</i> Blackhawk	5	1.1-2.2 oz	0.025-0.049	4 H/ 28 D	Drop Cloth Threshold: 8 larvae/1 ft of row.
Mites	<i>bifenthrin</i> Brigade 2EC Discipline 2EC	3A	5.12-6.4 oz 5.12-6.4 oz	0.08-0.1 0.08-0.1	12 H/ 18 D	Mites are an occasional problem in Georgia soybeans. The presence of mites should be confirmed with a hand lens on damaged leaves prior to treating. Treat if infestations become general over the entire field and leaf discoloration is becoming evident. Spot treatment of infested areas is also an option.
	<i>dimethoate</i> Dimethoate 4EC	1B	1 pt	0.5	48 H/ 21 D	

SOYBEAN INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Stink Bugs	<i>acephate</i> Orthene 97	1B	0.5-1 lb	0.5-0.97	24 H/ 14 D	<p>Stink bugs damage developing seeds with their sucking mouthparts. Southern green, green, and brown stink bugs are the most common species observed in soybean.</p> <p>Bloom to Mid Pod-Fill (R1-R4): Sweep Net Threshold: 3 stink bugs/25 sweeps. Drop Cloth Threshold: 0.33 stink bugs/1 ft of row.</p> <p>After Mid Pod-Fill (R5-R6.5 + 7 days): Sweep Net Threshold: 9 stink bugs/25 sweeps. Drop Cloth Threshold: 1 stink bug/1 ft of row.</p> <p>*If soybeans are being grown for seed, 1 stink bug/6 ft of row will justify control measures.</p> <p>Diamond is an insect-growth regulator and will not control adults.</p>
	<i>alpha-cypermethrin</i> Fastac 0.83	3A	3.2-3.8 oz	0.02-0.025	12 H/ 21 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.8 oz	0.0125-0.022	12 H/ 21 D	
	<i>bifenthrin</i> Brigade 2EC Discipline 2EC	3A	2.1-6.4 oz 2.1-6.4 oz	0.033-0.1 0.033-0.1	12 H/ 18 D	
	<i>clothianidin</i> Belay 2.13	4A	3-6 oz	0.05-0.1	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	1.28-1.54 oz 1.28-1.54 oz	0.0125-0.015 0.0125-0.015	24 H/ 45 D	
	<i>lambda-cyhalothrin</i> Karate Zeon 2.08 Silencer 1	3A	1.6-1.92 oz 3.2-3.84 oz	0.025-0.03 0.025-0.03	24 H/ 30 D	
	<i>novaluron</i> Diamond 0.83 EC	15	6-12 oz	0.039-0.077	12 H/ 28 D	
	<i>zeta-cypermethrin</i> Mustang Max .8EC	3A	3.2-4 oz	0.02-0.025	12 H/ 21 D	
Sugarcane Beetles	The treatments for lesser cornstalk borer give helpful control.					Sugarcane beetles are a rare and sporadic pest of soybeans in Georgia.
Three-cornered Alfalfa Hopper	<i>acephate</i> Orthene 97	1B	0.75-1 lb	0.73-0.97	24 H/ 14 D	<p>Three-cornered alfalfa hoppers feed on the main stem above the soil surface in seedling soybeans. Soybeans are most susceptible to main stem girdling when plants are less than 12" in height. Girdling of the main stem may cause plants to lodge. Damaged plants may also lodge in the future as a result of damage during the seedling stage.</p> <p>Threshold (seedling soybeans): treat soybeans less than 12" in height when 10% of the plants are infested with nymphs and/or adults or stand is being reduced below recommended plant population and bugs are present.</p> <p>Both adults and nymphs may also feed on the petioles of leaves, blooms, and pods of reproductive soybeans.</p> <p>Threshold (reproductive soybeans): Sweep Net Threshold: 50 bugs/25 sweeps. Drop Cloth Threshold: 6 bugs/1 ft of row.</p>
	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.8-3.8 oz	0.018-0.025	12 H/ 21 D	
	<i>carbaryl</i> Sevin 80S Sevin 4F	1A	1.25 lb 0.2 pt	1 1	12 H/ 21 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.8 oz	0.0125-0.022	12 H/ 21 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	0.77-1.28 oz 0.77-1.28 oz	0.0075-0.0125 0.0075-0.0125	24 H/ 45 D	
	<i>lambda-cyhalothrin</i> KarateZeon 2.08 Silencer 1	3A	0.96-1.6 oz 1.92-3.2 oz	0.015-0.025 0.015-0.025	24 H/ 30 D	
	<i>zeta-cypermethrin</i> Mustang Max .8E	3A	2.8-4 oz	0.0175-0.025	12 H/ 21 D	

SOYBEAN INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Velvetbean Caterpillar	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.8-3.8 oz	0.018-0.025	12 H/ 21 D	Velvetbean caterpillar is a foliage feeder which that has 4 pairs of abdominal prolegs; larvae become very active when prodded. Velvetbean caterpillar is a voracious feeder and generally occurs during late season. Defoliation Threshold: Treat when 30% foliage loss has occurred and larvae a 1/2" or longer are present prior to bloom or when 15% foliage loss has occurred and larvae a 1/2" or longer are present after bloom. Sweep Net Threshold: 38 larvae/25 sweeps. Drop Cloth Threshold: 8 larvae/1 ft of row. Preventive applications of Dimilin should be made at the late R2 or R3 growth stage. R3 is defined as beginning pod, 3/16" pod at 1 of the 4 uppermost nodes on the main stem with a fully developed trifoliolate.
	<i>carbaryl</i> Sevin 80S Sevin 4F	1A	0.625-1.25 lb 1-2 pt	0.5-1 0.5-1	12 H/ 21 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1	3A	1.6-2.8 oz	0.0125-0.022	12 H/ 21 D	
	<i>chlorantraniliprole</i> Prevathon 0.43	28	14-20 oz	0.047-0.067	4 H/ 1 D	
	<i>flubendiamide</i> Belt 4SC	28	2-3 oz	0.063-0.094	12 H/ 14 D	
	<i>gamma-cyhalothrin</i> Prolex 1.25 Declare 1.25	3A	0.77-1.28 oz 0.77-1.28 oz	0.0075-0.0125 0.0075-0.0125	24 H/ 45 D	
	<i>lambda-cyhalothrin</i> Karate Zeon 2.08 Silencer 1	3A	0.96-1.6 oz 1.92-3.2 oz	0.015-0.025 0.015-0.025	24 H/ 30 D	
	<i>diflubenzuron</i> Dimilin 2L	15	2-4 oz	0.03-0.06	12 H/ 21 D	
	<i>esfenvalerate</i> Asana XL .66EC	3A	2.9-5.8 oz	0.015-0.03	12 H/ 21 D	
	<i>methomyl</i> Lannate 2.4LV	1A	0.4-0.75 pt	0.12-0.225	48 H/ 14 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	4-8 oz	0.06-0.12	4 H/ 14 D	
	<i>novaluron</i> Diamond 0.83 EC	15	6-10 oz	0.039-0.064	12 H/ 28 D	
	<i>spinosad</i> Blackhawk	5	1.1-2.2 oz	0.025-0.049	4 H/ 28 D	
<i>zeta-cypermethrin</i> Mustang Max .8EC	3A	2.8-4 oz	0.0175-0.025	12 H/ 21 D		

Premixed or Co-Packaged Insecticide Products:

Products listed below are available as premixes or co-packages of 2 insecticidal active ingredients. When using premixed or co-packaged products, be sure the use of all active ingredients is necessary. Unnecessary applications or use of reduced rates of an active ingredient may lead to or intensify insecticide resistance.

<i>bifenthrin, imidacloprid</i> (Brigadier)	<i>zeta-cypermethrin, bifenthrin</i> (Hero)
<i>zeta-cypermethrin, chlorpyrifos</i> (Stallion)	<i>chlorpyrifos, lambda-cyhalothrin</i> (Cobalt Advanced)
imidacloprid, cyfluthrin (Leverage)	<i>methoxyfenozide, spinetoram</i> (Intrepid Edge)
<i>lambda-cyhalothrin, thiomethoxam</i> (Endigo)	<i>zeta-cypermethrin, chlorpyrifos</i> (Stallion)
<i>spinosad, gamma-cyhalothrin</i> (Consero)	<i>chlorpyrifos, bifenthrin</i> (Tundra Supreme)

SOYBEAN INSECT CONTROL

Conserve Natural Enemies: Reserve broad spectrum insecticides for late season use. Broad spectrum insecticides disrupt beneficial insects and spiders which suppress insect pest populations.

Insect Control Termination: Generally insect control can be terminated for foliage-feeding caterpillars, kudzu bugs, and stink bugs at R6 + 7 days (R6.5). The R6 growth stage is defined as: full seed, pod contains a green seed that fills the pod cavity at one of the four uppermost nodes on the main stem with a fully developed trifoliolate leaf. R7 is defined as beginning maturity, one normal pod on the main stem that has reached mature pod color, normally brown or tan depending on variety. When terminating insect controls, insect populations should be below threshold levels.

SWEEP NET: If using a 15" diameter sweep net, take several 25-sweep samples in each field, the following treatment threshold levels can be used:

<u>Pests</u>	<u>Average # Per 25 Sweeps</u>
Kudzu Bugs (immatures)	25
Corn Earworms	5
Green Cloverworms	38
Soybean Loopers	19
Stink Bugs	
(bloom to mid-pod)	3
(Mid-pod to maturity)	9
Three-cornered Alfalfa Hopper	50
Velvetbean Caterpillar	38

GROUND CLOTH: If using a ground cloth, make several 3-ft examinations for each 20 acres being surveyed.

<u>Pests</u>	<u>Average # Per Row Foot</u>
Corn Earworms	2
Green Cloverworms	8
Soybean Loopers	8
Stink Bugs	
(bloom to mid-pod)	0.33
(Mid-pod to maturity)	1
Three-cornered Alfalfa Hopper	6
Velvetbean Caterpillar	8

INSECT PEST RESPONSE TO INSECTICIDES USED IN SOYBEAN

Insecticide	Bean Leaf Beetle	Beet Armyworm	Blister Beetles	Corn Earworm	Cutworms	Fall Armyworm	Grasshopper	Green Cloverworm	Japanese Beetle	Kudzu Bug	Lesser Cornstalk Borer	Soybean Loopers	Spider Mites	Stink Bugs (Southern Green)	Stink Bugs (Brown)	Three-cornered Alfalfa Hopper	Velvetbean Caterpillar	Predators	Parasites	Chemical Class (MOA)	REI (Hours)*
<i>acephate</i> Orthene 97	3	5	4	4	2	4	2	4	-	2	-	4	5	2	2	2	3	H	H	1B	24
<i>alpha-cypermethrin</i> Fastac 0.83	2	4	2	1	2	3	2	1	2	2	-	4	5	1	3	2	1	E	E	3A	12
<i>beta-cyfluthrin</i> Baythroid XL 1	2	4	2	1	2	3	2	1	2	3	-	4	5	1	3	2	1	H	M	3A	12
<i>bifenthrin</i> Brigade 2, Discipline 2, Fanfare 2	2	4	2	1	2	3	2	1	2	1	-	4	2	1	2	2	1	H	M	3A	12
<i>carbaryl</i> Sevin 80S, Sevin 4F	2	4	3	3	4	3	3	2	2	2	-	5	5	4	4	3	2	E	E	1A	12
<i>chlorantraniliprole</i> Prevathon 0.43	5	1	5	1	3	1	3	1	-	5	-	1	5	5	5	5	1	E	E	28	4
<i>chlorpyrifos</i> Lorsban 4, Lorsban 15G	3	3	4	4	1	3	3	3	-	3	2	4	4	4	4	4	3	H	H	1B	24
<i>clothianidin</i> Belay 2.13	2	5	3	5	5	5	5	5	-	2	-	5	5	2	3	3	5	E	E	4A	12
<i>diflubenzuron</i> Dimilin 2L	5	4	5	5	5	4	3	1	-	5	-	4	5	5	5	5	1	E	E	15	12
<i>dimethoate</i> Dimethoate 4	3	5	3	5	5	4	4	4	-	4	-	5	3	4	4	3	4	M	H	1B	48
<i>esfenvalerate</i> Asana XL 0.66	2	4	3	1	2	3	2	1	2	3	-	4	5	2	4	2	1	H	M	3A	12
<i>flubendiamide</i> Belt 4 SC	5	1	5	1	3	1	-	1	-	5	-	1	5	5	5	5	1	E	E	28	12
<i>gamma-cyhalothrin</i> Declare 1.25, Prolex 1.25	2	4	2	1	2	3	2	1	2	2	-	4	5	1	3	2	1	H	M	3A	24
<i>indoxacarb</i> Steward 1.25	5	1	5	1	3	1	5	1	-	5	-	1	5	4	4	5	3	M	E	22	12

*Read and follow label directions.
1=Very Effective; 5=Not Effective; E=Easy; M=Moderate; H=Hard

Table continues on next page.

INSECT PEST RESPONSE TO INSECTICIDES USED IN SOYBEAN (continued)

Insecticide	Bean Leaf Beetle	Beet Armyworm	Blister Beetles	Corn Earworm	Cutworms	Fall Armyworm	Grasshopper	Green Cloverworm	Japanese Beetle	Kudzu Bug	Lesser Cornstalk Borer	Soybean Loopers	Spider Mites	Stink Bugs (Southern Green)	Stink Bugs (Brown)	Three-cornered Alfalfa Hopper	Velvetbean Caterpillar	Predators	Parasites	Chemical Class (MOA)	REI (Hours)*
<i>lambda-cyhalothrin</i> Karate Z 2.08, Karate 1, Silencer 1	2	4	2	1	2	3	2	1	2	1	-	4	5	1	3	2	1	H	M	3A	24
<i>methomyl</i> Lannate LV 2.4	3	3	4	2	4	2	4	1	-	-	-	3	5	3	3	3	1	H	M	1A	48
<i>methoxyfenozide</i> Intrepid 2F	5	1	5	5	4	3	5	1	-	5	-	2	5	5	5	5	1	E	E	18	4
<i>novaluron</i> Diamond 0.83EC	-	2	-	4	5	1	3	1	-	-	-	3	5	3	3	-	1	M	E	15	12
<i>spinosad</i> Tracer 4	5	2	5	1	3	2	5	1	-	5	-	2	5	5	5	5	1	E	M	5	4
<i>zeta-cypermethrin</i> Mustang Max 0.8	2	4	2	1	2	3	2	1	2	2	-	4	5	1	3	2	1	H	M	3A	12

*Read and follow label directions.
1=Very Effective; 5=Not Effective; E=Easy; M=Moderate; H=Hard

SOYBEAN DISEASE CONTROL

Bob Kemeraït, Extension Plant Pathologist

DISEASE	CHEMICAL	MOA	RATE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Foliar Diseases	Alto		2.75-5.5 fl oz. For control of soybean rust, use 2.75-4 fl oz/A. For other foliar diseases use 4-5.5 fl oz/A.	12 H/ 30 D	<p>Foliar Diseases: The presence of Asian soybean rust in Georgia has greatly affected disease control recommendations and fungicides are now considered an important tool, not only for the management of Asian soybean rust, but also in some instances for diseases such as anthracnose and perhaps Phomopsis pod and stem blight. Before deciding to apply a fungicide, a grower should consider the current yield potential in the field and the potential for further disease spread.</p> <p>Asian soybean rust can develop very rapidly in a field when enough spores are present and environmental conditions are favorable. Once a soybean crop reaches reproductive growth stages, growers should be prepared to treat with fungicides as soon as the disease is likely to be present in the area.</p> <p>Higher rates of a product provide greater residual activity and may reduce the need for later sprays to manage rust.</p>
	<i>benzovindiflupyr</i> (solatenol) + <i>azoxystrobin</i> + <i>propiconazole</i> Trivapro A + B	7 + 3 + 11	Trivapro A (solatenol) 4 fl oz/A Trivapro B 10.5 fl oz/A		For management of soybean rust and other foliar diseases. Trivapro A: Maximum total rate/season 14 fl oz/A. Trivapro B: Apply up until growth stage R6
	Bravo Ultrex		0.9-2.2 lb/A for management of foliar diseases including rust.	12 H/ 42 D	
	Bravo Weather Stik		1-2.25 pt/A for management of foliar disease including suppression of rust.	12 H/ 42 D	
	Domark 230 ME		4-5 fl oz for management of foliar disease including soybean rust.	12 H/ Do not apply after R5 growth stage.	
	Echo 90DF		0.875-2 lb/A for management of foliar disease including rust.	12 H/ 42 D	
	Echo 720		1-2.25 pt/A for management of foliar disease including rust.	12 H/ 42 D	
	Equus 720		1-2.25 pts/A for management of foliar diseases including rust.	12 H/ 42 D	
	Equus DF		0.9-2.2 lb/A for management of foliar diseases including rust.	12 H/ --	
	Evito T		4-6 fl oz/A for management of soybean rust and other foliar diseases.	12 H/ 30 D (seed)	
	<i>fluoxastrobin</i> Evito		2-5.7 fl oz/A for management of soybean rust and other foliar diseases.	12 H/ 30 D	
	<i>flutriafol</i> + <i>fluoxastrobin</i> Fortix		5-6 fl oz/A for management of soybean rust and other foliar diseases and for suppression of southern blight.	12 H/ 30 D (seed)	Maximum of 2 applications per season no later than growth stage R5 (beginning seed). Do not apply Fortix within 21 days of harvest for dry beans or 30 days before harvest for seed.
<i>flutriafol</i> Topguard		7-14 for management of soybean rust and other foliar diseases.	12 H/ 21 D		

SOYBEAN DISEASE CONTROL

DISEASE	CHEMICAL	MOA	RATE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Foliar Diseases (continued)	Headline		6-12 fl oz for management of foliar disease including Asian soybean rust.	12 H/ 21 D	Although "Headline SBR" is no longer available commercially, growers can tank-mix 3.1 fl oz tebuconazole with 4.7 fl oz Headline to create a similar product.
	<i>picoxystrobi</i> Approach		6-12 fl oz/A for management of soybean rust and other foliar diseases.	12 H/ 14 D	There should be no more than two sequential applications of Approach before shifting to a fungicide with a different mode of action. The 6-12 fl oz/A rate should initially be applied prior to disease development. Do not apply Approach within 14 days of grain harvest.
	<i>picoxystrobin+cyproconazole</i> Approach Prima		5-6.8 fl oz/A fl oz/A for management of soybean rust and other foliar diseases.	12 H/ 30 D	There should be no more than two sequential applications of Approach Prima before shifting to a fungicide with a different mode of action. The 5-6.8 fl oz/A rate should initially be applied prior to disease development. Do not apply Approach Prima within 30 days of grain harvest .
	Priaxor		4-8 fl oz for management of foliar diseases of soybean; no more than 2 applications in a season.	12 H/ 21 D	
	<i>propiconazole</i> Tilt Bumper		4-6 fl oz for management of soybean rust and other foliar diseases.	12 H/ apply up to R6 growth stage	
	Quadris 2.08F		6.2-15.4 fl oz/A (to include frog eye leaf spot and soybean rust)	4 H/ 14 D	
	Quadris Top		8-14 fl oz for management of foliar diseases of soybean.	12 H/ 14 D	
	Quadris Xtra		4-6.8 fl oz for management of soybean rust; 5-6.8 fl oz for management of other foliar diseases.	12 H/ 30 D	
	Quilt		14-20 fl oz for management of foliar diseases to include Asian soybean rust.	12 H/ 21 D	
	Stratego		10 fl oz/A for management of soybean rust and other foliar diseases.	12 H/ 21 D	
	Stratego YLD		4-4.65 fl oz for management of soybean rust and other foliar diseases.	12 H/ 21 D	
	<i>tebuconazole</i>		3-4 fl oz for management of foliar disease including soybean rust.	12 H/ 12 D	
	<i>tetraconazole + azoxystrobin</i> Affiance	3 + 11	10-14 fl oz/A		
	<i>tebuconazole + azoxystrobin</i> Custodia	3 + 11	8.6 fl oz/A		
	Topsin-M 4.5 FL		10-20 fl oz/A (controls frog eye leaf spot and other foliar diseases but NOT soybean rust).	24 H/ 21 D	
Topsin-M 70WP		0.5-1 lb/A (controls frog eye leaf spot and other foliar diseases but NOT soybean rust).	24 H/ 21 D		

SOYBEAN SEED TREATMENT

Bob Kemerait, Extension Plant Pathologist

CHEMICAL	RATE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
<i>apron + terrachlor + vitavax</i> Prevail	4 oz/bu		Apply fungicide first; then apply inoculant immediately before planting. Best results are obtained by using commercially treated seed or treating seed using a mechanical seed treater. Otherwise, mix seed and chemical seed treatment thoroughly in a wash tub for good coverage. Hopper box treatment is not desirable. Seed treatments listed here with inoculants have not been evaluated under our growing conditions.
<i>carboxin + captan</i> Vitavax-Captan HBM Enhance	3 oz/bu	12 H/ --	
<i>carboxin + thiram</i> Vitavax 200	2 fl oz/bu or 4 fl oz/100 lb	12 H/ --	
<i>carboxin + thiram + molybdenum</i> Vitavax-M	6 fl oz/bu or 12 fl oz/100 lb		
<i>captan + carboxin</i> TCI Captan-Vitavax	3 oz/bu		
<i>captan + carboxin + molybdenum</i> Vitavax/Moly	3 oz/bu		
<i>captan + molybdenum</i> Capt'n Moly	3.8 oz/bu		
Dynasty	0.153-0.459 fl oz/CWT	4 H/ --	
<i>metalaxyl + ipconazole + clothianidin</i> Inovate	4.74 fl oz/CWT	24 H/ --	
<i>thiram</i> 42-S Thiram	2 fl oz/bu		
<i>thiram + molybdenum</i> Moly-T Protreat L Protreat TM	3.8 oz/bu 5 fl oz/bu 2 oz/bu		
Trilex 2000	1 fl oz/CWT		

SOYBEAN NEMATODE TREATMENT

Bob Kemeraït, Extension Plant Pathologist

CHEMICAL	RATE /ACRE (36" ROW BASIS)		OZ/1000 FT. OF ROW ANY ROW SPACING	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	ACTIVE INGREDIENT			
Preplant Injected Telone II	3 gal			5 D post application/ --	Inject 12" below the soil surface. Wait 2 weeks between application and planting when using Telone II.
AVICTA Complete Beans				48 H/ --	AVICTA Complete Beans is a new seed-treatment product that includes Avicta 500FS for management of nematodes. See label for further details.
Vydate C-LV	17-34 fl oz	7.1-14.3 fl oz	1.17-2.34 fl oz	48 H/ --	Apply in furrow in 7-10" band (incorporated 2-4") in 10-20 gal/water/A.

Nematode-resistant varieties are available and can usually be grown without a nematicide. Some data suggests that nematicides may increase the yield of resistant varieties when nematode pressure is high.

NEMATICIDE	RELATIVE EFFECTIVENESS RATING
Telone II	excellent
Vydate	poor-fair

SOYBEAN WEED CONTROL

Eric P. Prostko, Extension Agronomist – Weed Science

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Minimum till, strip-till, and no-till Burndown Options	<i>glyphosate</i> Various trade names 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9	16-128 oz 13-103 oz 12-96 oz 11.7-92 oz 11-85 oz 10-77 oz	0.38-3.0 ae	4 H/ 7 D	Controls most emerged annual grass and broadleaf weeds. Glyphosate rates vary according to weed species, weed size and spray volume. Refer to the individual product labels for additional information. Use of tank-mixes with glyphosate for bermudagrass or johnsongrass control in minimum tillage systems is not recommended. The higher rates are suggested for johnsongrass and bermudagrass control. The use of ammonium sulfate (AMS) is only recommended where hard water (Ca, Na, Mg, K) is a concern. Additional spray adjuvants are not required in loaded formulations.
	<i>paraquat</i> Gramoxone SL 2 lb/gal Firestorm/Parazone 3 lb/gal	22	30-60 oz 20-40 oz	0.47-0.94	24 H/ --	Apply during or after planting, but before crop emerges to kill emerged annual grasses and weeds. Add a nonionic surfactant at 0.25% v/v. (1 qt per 100 gal spray). Apply in a minimum of 15 GPA. Refer to label for specific cautions and restrictions. Numerous tank-mixes are allowed. Rain-free period is 30 minutes.
	<i>glufosinate</i> Liberty 280 2.34SL Cheetah Kong Interline	10	29-36 oz	0.53-0.66	12 H/ --	Apply during or after planting, but before crop emerges to kill emerged annual grasses and weeds. Liberty will not provide adequate burndown control of small grains. Very effective for burndown control of volunteer peanuts. Can be tank-mixed with glyphosate or 2,4-D. Rain-free period is 4 hours. Generic formulations of glufosinate should be used with caution because limited data has been collected by UGA.
	<i>carfentrazone</i> Aim 2EC	14	0.5-1 oz	0.008-0.016	12 H/ V10	Tank-mix with glyphosate or glufosinate for the improved control of large morningglories. Can be applied up to 24 hours after soybean planting. Rain-free period is 6-8 hours.
	<i>pyraflufen</i> ET 0.208EC	9	0.5-2.0 oz	0.0008-0.003	12 H/ 70 D	Tank-mix with glyphosate or glufosinate for the improved control of large morningglories. Soybeans can be planted immediately. Rain-free period is 1 hour.
	<i>thifensulfuron</i> + <i>tribenuron</i> (FirstShot SG) 5SG	2	0.5-0.8 oz	0.008-0.013 + 0.008-0.013	12 H/ --	Can be tank-mixed with glyphosate, paraquat, glufosinate, and 2,4-D ester. Soybean can be planted in 7-14 days after treatment depending upon soil type (14 days for sands, loamy sands, sandy loams). Use a NIS (0.25% v/v) or COC (1% v/v). Rain-free period is NL.
	<i>2,4-D amine</i> Various trade names 3.8 lb/gal	4	16 oz	0.475	48 H/ --	Very effective for cutleaf evening-primrose control. Can be tank-mixed with glyphosate, glufosinate, or paraquat to provide broad-spectrum burndown control. Soybeans can be planted in 15 days (amine) after application.
	<i>dicamba</i> Clarity, Sterling, Vision, others 4 lb/gal	4	4-16 oz	0.125-0.50	24 H/ --	Can be tank-mixed with glyphosate, paraquat, or glufosinate to improve the control of broadleaf weeds such as horseweed. Soybeans can be planted in 14 days (≤ 8 oz/A) or 28 days (> 8 oz/A) if 1" of rainfall or irrigation has occurred since application Rain-free period is 4 hours.

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Preplant incorporated or Preemergence	<i>pendimethalin</i> Prowl/Pendimax 3.33EC	3	1.2-2.4 pt	0.5-1	24 H/ 85 D	For annual grasses and small seeded broadleaf weed control. Soil incorporate 2" deep within 7 days of application. Mechanical incorporation is not required if rain of 0.5" or more occurs within 7 days of application.
	Prowl H ₂ O 3.8ASC		1.5-2.1 pt	0.71-1		
	<i>trifluralin</i> Treflan, others 4 lb/gal	3	1-2 pt	0.5-1	12 H/ --	For annual grasses and small-seeded broadleaf weed control. Soil incorporate 2-3 inches deep within 24 hours of application. Treflan should be applied within 4 weeks of planting. Rates should be adjusted for soil type. Refer to specific herbicide label for use information.
	<i>metribuzin</i> Metri, Metribuzin, Tricor 75DF 4F	5	5.3-8 oz 8-12 oz	0.25-0.38	12 H/ 70 D	Incorporation should be shallow (1-2") to prevent placement of herbicide in soybean seed zone. Do not use on sands! Do not use on loamy sands or sandy loams if OM is <1%. Use the low rate on coarse soils. Do not apply to sensitive soybean varieties. Refer to soybean seed label for information on sensitivity to metribuzin. Do not apply with soil applied organic phosphate pesticides such as Di-Syston, Thimet, OR Lorsban, as soybean injury may occur regardless of soybean variety. Can be tank-mixed with Treflan or Prowl for broader spectrum weed control. A split treatment of 1/2-2/3 the normal rate of Metribuzin incorporated followed by the remaining 1/2-1/3 rate after planting may be used. This split treatment may lessen the injury potential compared to a full rate incorporated and may increase consistency of control over that of a preemergence treatment. Do not use increased rates when splitting the application. Refer to the end of this section for an up-to-date list of soybean varieties that have exhibited acceptable tolerance to metribuzin in UGA tests.
	<i>metribuzin</i> + <i>chlorimuron</i> Canopy, Cloak 75DG	5 + 2	6-10 oz	0.24-0.40 + 0.04-0.07	12 H/ --	Canopy may be soil incorporated or applied preemergence for control of several broadleaf weeds. The rate of application varies with soil type. Not recommended for use on sands and any other coarse soil types with <1% OM. Incorporation should be 1-2" deep. Canopy may be tank-mixed with Prowl or Treflan for broader spectrum weed control. Follow label directions for the use rates. Refer to Remarks and Precautions discussion of metribuzin for sensitive soybean varieties and potential herbicide-insecticide interactions. Soybean injury expressed as stunting has been observed. Refer to the end of this section for an up-to-date list of soybean varieties that have exhibited acceptable tolerance to metribuzin in UGA tests. Canopy use rates for soils with 0.5-3% organic matter are: loamy sand, sandy loam-6 oz/A; loam, silt loam, silt, sandy clay loam-8 oz/A; silty clay loam, clay loam, clay-10 oz/A. Rotation restrictions: soybeans-0 months; barley, wheat, rye-4 months; field corn-9-10 months; cotton, tobacco, sorghum-10 months; peanuts-8 months; canola, onions-18 months.
<i>metribuzin</i> + <i>S-metolachlor</i> Boundary 6.5 lb/gal	5 + 15	1.2-2.1 pt	0.19-0.33 + 0.94-1.64	12 H/ --	Incorporate uniformly within top 2" of soil. Not recommended for use on sands or any other coarse soil types with < 1% OM. Follow rate restrictions for soil type, pH, varieties, etc., listed under remarks and precautions for metribuzin. Refer to the end of this section for an up-to-date list of soybean varieties that have exhibited acceptable tolerance to metribuzin in UGA tests. Rotation restrictions: soybeans-0 months; barley, wheat-4 months; corn, cotton-12 months; canola, peanut, sorghum, tobacco, tomato-12 months; onions-18 months.	

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Preplant incorporated or Preemergence (continued)	<i>imazethapyr</i> Pursuit 2 lb/gal 70DG	2	0.25 pt 1.44 oz	0.063	4 H/ 85 D	Controls several annual broadleaf weeds and suppresses nutsedge. May be tank-mixed with Prowl or trifluralin for improved annual grass control. Incorporate to a depth of 1-2". Pursuit should only be applied 1 time per year to soybeans. Do not apply Classic, Canopy, Scepter, Scepter O.T., or use Pursuit either preemergence or postemergence on fields previously treated with Pursuit. Refer to the label for rotation restrictions.
	<i>flumetsulam</i> Python 80WDG	2	0.9-1 oz	0.045-0.05	12 H/ --	Controls a wide range of broadleaf weeds. Incorporate 2 to 3 inches deep. Tank-mix with herbicides such as Treflan or Prowl for the control of annual grasses. Crop rotational restrictions are: corn-0 months; small grains-4 months; tobacco-9 months; cotton-18 months; onions, canola-26 months.
	<i>sulfentrazone</i> + <i>metribuzin</i> Authority MTZ 45DG	14 + 5	12-14 oz	0.135-0.156 + 0.20-0.24	12 H/ --	General broadleaf weed control with minimal control of annual grasses. Follow same precautions as for other metribuzin herbicides discussed above. Do not use on sands or any other coarse soils with less than 1% OM. Do not use on soils with a soil pH > 7.5. Do not incorporate deeper than 2". Refer to the end of this section for an up-to-date list of soybean varieties that have exhibited acceptable tolerance to metribuzin in UGA tests. Rotational crop restrictions: barley, wheat-4 months; cotton-18 months; peanut-12 months; field corn-4 months; sorghum, tobacco-12 months. Sulfentrazone is also available in other premixes: Authority Assist (sulfentrazone + imazethapyr); Authority Elite (sulfentrazone + s-metolachlor); Authority First (sulfentrazone + chloransulam) Authority XL (sulfentrazone + chlorimuron); Spartan Advance (sulfentrazone + glyphosate); and Spartan Charge (sulfentrazone + carfentrazone).
	<i>sulfentrazone</i> + <i>chlorimuron</i> Authority XL 70DG	14 + 2	3-6 oz	0.117-0.233 + 0.015-0.029	12 H/ --	Do not use on soils classified as sands. Provides residual control of several broadleaf weed species including pigweed, morningglory, and prickly sida. Do not incorporate deeper than 2" . Can be tank-mixed with Prowl or Treflan to improve the control of annual grasses. Crop rotation restrictions (soil pH <6.8): canola-36 months; cotton-12-18 months*; soybeans-anytime; small grains-4 months; sorghum-10 months; tobacco-10 months; field corn-10 months; peanuts-anytime. *Some UGA research suggests that the cotton rotation restriction should be 18 months. Crop injury can be minimized (not eliminated) by planting an STS/SRS soybean variety.
	<i>ethalfuralin</i> Sonalan HFP 3EC	3	1.5-2 pt	0.56-0.75	24 H/ --	Uniformly incorporate into top 2-3" of soil within 48 hours of application. Do not plant soybeans deeper than 2". Can also be applied PRE after planting and incorporated with 0.5-1" of rainfall or irrigation within 48 hours after application.

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Preemergence	<i>linuron</i> Lorox 50DF Linex 4L	7	1-2 lb 1-2 pt	0.50-1	24 H/ --	Provides good control of Florida beggarweed, common ragweed, and pigweed. Do not use on sands or loamy sands and/or soils with less than 1% OM. <u>Sicklepod will not be controlled effectively with Lorox or Linex.</u> Linuron may be tank-mixed with Lasso, Dual, or Prowl. Plant soybeans at least 1.5" deep to reduce injury.
	<i>metolachlor</i> Stalwart, Parallel PCS, Me-Too-Lachlor	15	1-1.33 pt	1-1.33	24 H/ 90 D	Can be applied PPI, PRE or POST. *The generic formulations of metolachlor (Parallel PCS, Stalwart, Me-Too-Lachlor) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials. Dual Magnum can also be applied postemergence in soybeans. The total Dual Magnum rate applied PPI, PRE, or POST during any one crop should not exceed 2.6 pt/A.
	<i>S-metolachlor</i> Dual Magnum 7.62E		1-1.33 pt	0.95-1.27		
	<i>flumioxazin</i> 51WDG Valor Panther Rowel Outflank	14	2-3 oz	0.064-0.096	12 H/ --	Provides good to excellent control of many annual broadleaf weeds. Will not control grass weeds, nutsedges, cocklebur, and sicklepod. Apply as a preemergence treatment only. Do not apply to emerging soybeans. Should be tank-mixed with Command or Prowl/Pendimax. Do not use in the same field with Axiom, Domain, Intro/Micro-Tech, Dual, or Frontier/Outlook or severe injury can occur. Can also be tank-mixed with glyphosate for use as a preplant burndown in reduced tillage production systems. Refer to label for specific rotation restrictions. Panther SC is a liquid formulation of flumioxazin but has not yet been adequately tested by UGA.
	<i>pyroxasulfone</i> Zidua 85WG	15	1.5-2 oz	0.089-0.106	12 H/ --	Zidua may be applied PPI, PRE, or early post-emergence (V1-V3) for the residual control of certain annual grasses and Palmer amaranth. DO NOT APPLY BETWEEN EMERGENCE THRU UNIFOLIOLATE STAGE. On lighter soils, soil applications of Zidua may cause temporary soybean stunting. POST applications may cause stunting and leaf burn. Pre-slurry in water before adding to larger spray tank. Crop rotation restrictions for Zidua are as follows: corn-0 months, cotton-4 months; peanut-4 months; soybean-0 months; wheat-4 months; tobacco-18 months; canola-18 months.
<i>pyroxasulfone</i> + <i>flumioxazin</i> Fierce 76WG	15 + 14	3 oz/A	0.080 + 0.063	12 H/ --	Apply preemergence within 3 days of soybean planting. Do not tank-mix with Intro, Micro-Tech, Dual Magnum, or Outlook. Will provide residual control of annual broadleaf weeds and certain grasses. May cause early season stunting. Crop rotation restrictions: cotton-45 days (conventional, 30 days (reduced tillage); field corn-7 days (reduced/ minimum/no-till), 30 days (conventional till); soybean-0 months; wheat-30 days; peanut-4 months; other crops-18 months.	

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Preemergence (continued)	<i>flumioxazin</i> + <i>chlorimuron</i> + <i>thifensulfuron</i> Envive 41.3DG	14 + 2 + 2	2.5-4 oz	0.046-0.073 + 0.014 -0.023 + 0.0045-0.007	12 H/ --	A three-way mixture of Valor + Classic + Harmony GT. Do not tank-mix with Boundary, Micro-Tech, Intro, Dual, Outlook or Warrant within 14 days of planting soybeans unless soybeans are planted under no-till or minimum tillage conditions on wheat stubble or no-till field corn stubble. Can be tank-mixed with Prowl to improve grass control. Do not use on soil types with less than 0.5% OM. USE LOW RATE ON COARSE SOILS. Do not irrigate when soybeans are cracking. Crop injury may occur on poorly drained soils under cool, wet conditions. Excessive rainfall following soybean emergence may also result in temporary crop injury. Cool, cloudy, wet weather may also cause soybean stunting. Crop injury can be minimized (not eliminated) by planting an STS/SRS soybean variety. Rotation restrictions: soybeans-anytime; small grains-4 months; peanut-8 months; field corn-10 months; cotton-10 months; sorghum-12 months.
	<i>acetochlor</i> Warrant 3ME	15	40-48 oz	0.94-1.125	12 H/ --	Will provide control of certain annual grasses and small-seeded broadleaf weeds including Palmer amaranth. May be applied preplant, at-planting, preemergence or early -POST (R2). Mechanical incorporation is not recommended. If PRE and POST applications of Warrant are made, do not exceed 4 qt/A/season of Warrant. Warrant is also labeled for center-pivot applications. For the following soil types, do not apply Warrant within 50 feet of any well where the depth to groundwater is 30 feet or less: sands <3% OM; loamy sands < 2% OM; sandy loams <1% OM. These restrictions do not apply for areas more than 50 feet from a well or if groundwater is more than 30 feet below land surface.
	<i>s-metolachlor</i> + <i>metribuzin</i> + <i>fomesafen</i> Intimidator 4.81EC	15 + 5 + 14	1.9-2.4 pt	0.81-1.02 + 0.18-0.23 + 0.16-0.20	24 H/ 90 D	Apply PRE for the control of certain annual broadleaf and grass weeds, including Palmer amaranth. Can also be applied PPI. Plant soybeans at least 1.5" deep. Only for use on metribuzin-tolerant soybean varieties. Refer to the end of this section for an up-to-date list of soybean varieties that have exhibited acceptable tolerance to metribuzin in UGA field tests. Do not use on sand, sandy loam, or loamy sand soils with < 1% OM. Crop rotation restrictions: cotton-12 months; field corn-10 months; sorghum-12 month; soybeans-anytime; peanut-18 months; wheat-4.5 months.
	<i>pyroxasulfone</i> + <i>fluthiacet</i> Anthem 2.15SE	15 + 14	5-6.5 oz	0.08-0.11 + 0.002-0.003	12 H/ --	Can be applied PRE or early postemergence. Provides residual control of certain annual grasses and broadleaf weeds. On coarse textured soils, use the 5 oz/A rate. No more than 6.8 oz/A/year can be applied on coarse soils. POST applications will cause leaf burn/speckling. Rotation restrictions: corn and soybean = 0 months; cotton, peanut, and wheat = 4 months. Rain-free period is 1 hour.

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Postemergence	Application of postemergence herbicide treatments to moisture stressed weeds will usually result in poor control.					
	<i>bentazon</i> Basagran, Depend, Leader, Broadloom 4 lb/gal	6	1.5-2 pt	0.75-1	48 H/ --	Apply to soybeans at the second or third trifoliolate (V2 or V3) leaf stage, but before weeds exceed 2-4" in height (14-21 days after planting). A non-phytotoxic oil concentrate (1 qt/A) should be added depending on the weed species as specified on the label. Basagran can be tank-mixed with Blazer. Rain-free period is 4 hours. Soybeans are tolerant of Basagran at all stages of growth.
	<i>acifluorfen</i> Ultra Blazer 2 lb/gal	14	1.5 pt	0.38	48 H/ 50 D	Blazer requires a nonionic surfactant (1 qt/100 gals.) to be added to the spray tank when used alone and when tank-mixed with Basagran. Apply to soybeans at the second or third trifoliolate (V2 or V3) leaf-stage, but before weeds have more than 4 to 6 true leaves (14-21 days after planting). Control of larger weeds may be poor. Ultra Blazer can be tank-mixed with Classic, or Basagran. Rain-free period is 4 hours.
	<i>lactofen</i> Cobra 2 lb/gal	14	12.5 oz	0.20	12 H/ 45 D	Apply to soybeans in the first or second trifoliolate leaf stage if weeds are in the 2-6 leaf stage. Add a crop oil concentrate at 0.25% to 1% v/v depending upon humidity (refer to label). With aerial applications, the use of 1 qt/A of crop oil concentrate is required. Do not apply Cobra when crop or weeds are under stress of drought. Crop injury expressed as leaf burn and/or suppression may occur. This injury is usually temporary but may cause lasting effects to late planted (after July 1) soybeans especially if the application is followed by a period of drought stress. Cobra can be tank-mixed with Basagran and Classic. Rain-free period is 30 minutes. Do not apply Cobra after growth stage R6 (full seed).
	<i>fomesafen</i> Reflex/Dawn/TopGun 2 lb/gal	14	1.5 pt	0.38	24 H/ 45 D	Apply when soybeans have reached at least the V1 stage of growth. Apply Reflex when weeds are small and not stressed from dry weather. Application should be made when weeds have 1-4 true leaves (14-21 days after planting). Add a nonionic surfactant (0.25 % v/v) or crop oil concentrate (1.0% v/v) to the spray mixture. Can be tank-mixed with glufosinate or certain formulations of glyphosate. However, avoid tank-mixing Reflex with potassium salt formulations of glyphosate (Credit Extreme, Roundup Original MAX, Roundup WeatherMAX, Roundup PowerMAX, Touchdown HiTech, Touchdown Total, Touchdown CT2, Traxion). Rain-free period is 1 hour. Rotational crop restrictions: cotton, soybean-0 months; small grains-4 months; field corn, peanuts-10 months; tobacco, sorghum-10 months. Reflex can also be applied PRE but POST applications are preferred.
	<i>imazethapyr</i> Pursuit 2 lb/gal 70 DG	2	4 oz 1.44 oz	0.063	4 H/ 85 D	Pursuit may be applied anytime after soybean emergence until R1 stage but before weeds exceed 3 inches. Add 0.25% v/v NIS After application wait at least 10 days before cultivation. Do not apply Pursuit if Canopy, Scepter or Pursuit was used as a preplant incorporated or preemergence treatment. Refer to the label for rotational restriction. Rain-free period is 1 hour.
	<i>bentazon</i> + <i>acifluorfen</i> Storm 4 lb/ga	6 + 14	1.5 pt	0.5 + 0.25	48 H/ 50 D	Apply to soybeans at the first or second trifoliolate leaf but before weeds exceed the 4 true-leaf stage. A crop oil concentrate or surfactant should be used at the rate of 1-2 pt/A. Any crop injury should be temporary. Rain-free period is 4 hours.

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Postemergence (continued)	<i>cloransulam</i> FirstRate, Amplify 84WD	2	0.3-0.6 oz	0.016-0.032	12 H/ Forage/Hay = 25D Grain = 70D	Controls a wide range of annual broadleaf weeds (except prickly and arrowleaf sida, common lambsquarters, black nightshade, and pigweeds). May be applied from soybean emergence up to R2 (an open bloom at one of the 2 uppermost nodes). Add either 0.25% v/v nonionic surfactant or 1% v/v crop oil concentrate to the spray mix. May be tank-mixed with Blazer, Basagran, Cobra, Reflex, Pursuit, glyphosate, or postemergence grass herbicides. Maximum total in-crop use rate/year = 1.05 oz/A . Rotational crop restrictions: soybean = 0 months; wheat = 3 months; field corn, cotton, peanut, sorghum, oats = 9 months. Rain-free period is 2 hours.
	<i>chlorimuron</i> Classic 25DF	2	0.5-0.66 oz	0.008-0.01	12 H/ 60 D	Apply over-the-top after soybeans have their first trifoliolate leaf (V1). The addition of a nonionic surfactant at 0.25% by volume is required. Crop oil concentrate may be substituted for nonionic surfactant, but may increase soybean injury. Control of sicklepod is consistently better if chlorimuron is used following a preplant incorporated or preemergence treatment of metribuzin. Do not apply when soybeans or weeds are under temperature or drought stress. Refer to rotational crop restrictions shown on the label. Refer to label for information on sprayer cleanout procedures following use. Classic can be tank-mixed with glyphosate for improved control of morningglories and other broadleaf weeds in Roundup Ready soybeans only . When tank-mixed with glyphosate, apply Classic at 0.25-0.33 oz/A. Rain-free period is 1 hour.
	<i>thifensulfuron</i> Harmony SG 50SG	2	1/8 oz	0.004	4 H/ 60 D	Salvage treatment for the control of Palmer amaranth (pigweed) that is NOT ALS-resistant . Can be applied any time after the first trifoliolate leaf has expanded but no later than 60 days before harvest. Use in combination with NIS (0.25% v/v) or COC (1% v/v) and nitrogen (32-0-0/28-0-0 at 1 qt/A or AMS at 3 lb/A). Can be tank-mixed with glyphosate for use in RR soybeans. Rotational crop restrictions: wheat, barley, oats, triticale, soybeans, field corn-anytime; all other crops-45 days. Rain-free period is 3 hours. Do not tank-mix with Classic. Harmony GT will cause soybean injury in the form of leaf and terminal burn. DO NOT USE HARMONY EXTRA ON SOYBEANS! <i>*Higher rates of Harmony SG (0.50 oz/A) can be used on STS/SR soybean varieties. A list of STS/SR soybean varieties is provided at the end of this section.</i> <i>**Harmony will not control ALS-resistant Palmer amaranth.</i>
	<i>flumiclorac</i> Resource 0.86 EC	14	4 oz	0.027	4 H/ 14 D	Tank-mix with glyphosate for improved control of tall, ivyleaf, and entireleaf morningglory in Roundup Ready soybeans only. Must be applied with a NIS (0.25% v/v) or COC (1 pt/A) and spray grade ammonium sulfate (2.5 lbs/A). Rain-free period is 2 hours.

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Postemergence (continued)	<i>glyphosate</i> Various trade names 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9		0.56-1.50 ae	4 H/ 14 D	Apply glyphosate over-the-top of improved soybean varieties that are designated as soybeans with the Roundup Ready™ gene. Severe injury or death of soybeans will result if any soybean varieties not designated as having the Roundup Ready™ gene are sprayed with glyphosate. Controls a wide range of grass and broadleaf weeds. May be applied from the cracking stage through the R2 (full- flowering) stage of soybeans. Use the low rate on weeds up to 3” tall. Higher rates are needed as weeds increase in size. For morningglories, applications should be made when morningglories are less than 3”s tall. Sequential treatments may be applied provided that the maximum postemergence (from cracking through flowering) total use rate does not exceed 2.25 lb ae/A. (ex. 2.25 lb ae/A = 2 qt/A of Roundup PowerMax or 3 qt/A of Glyfos). There are no crop rotational restrictions for glyphosate. Not all formulations are labeled for use on RR soybeans. Refer to specific product label. The use of ammonium sulfate (AMS) is only recommended where hard water (Ca, Na, Mg, K) is a concern. Additional spray adjuvants are not required in loaded formulations.
	<i>imazethapyr</i> + <i>glyphosate</i> Extreme 2.17 lb/gal	2 + 9		0.063 + 0.75	48 H/ 85 D	Apply Extreme only to Roundup Ready soybeans. Add a nonionic surfactant at a rate of 1 pt/100 gallons and spray grade ammonium sulfate (2.5 lb/A) or liquid N (1-2 qts/A). Apply before weeds exceed 8”. Applications should be made before bloom. Only 1 application/year is permitted. Cotton rotation is 18 months. Refer to label for additional rotation intervals. Also sold as Tackle 4.128SL (Tackle use rate- 2 pt/A = 0.032 lb ai/A imazethapyr + 1 lb ai/A of glyphosate). Very effective for the control of tropical spiderwort if applied early. Rain-free period is 1 hour.
	<i>S-metolachlor</i> + <i>glyphosate</i> Sequence 5.25 lb/gal	15 + 9		1.13 -1.31 + 0.84-0.98	24 H/ 90 D	Apply Sequence only to Roundup Ready soybeans. Most effective when applied from cracking up through the 3 rd trifoliolate leaf stage. Very effective for the control of tropical spiderwort if applied early.
	<i>quizalofop</i> Assure II, Targa 0.88 lb/gal	1		5 -12 oz	12 H/ 80 D	Apply to annual and perennial grasses at recommended rate and stage of growth (until R3-R4 stage of growth). Use in combination with a COC (1% v/v) or NIS (0.25% v/v). The maximum amount that can be used in a single season is 18 oz/A. Tank-mixtures with broadleaf herbicides may reduce grass control. Rain-free period is 1 hour.
	<i>sethoxydim</i> Poast 1.5 lb/gal Poast Plus 1 lb/gal	1		1-1.5 pt 1.5-2.25 pt	12 H/ 75 D	Apply with a crop oil concentrate (1 qt/A) over the top of annual grasses and crop. Refer to label for suggested stage of application. Many tank-mixes will reduce the activity of Poast. Apply with a crop oil concentrate for control of rhizome johnsongrass when 15-20 inches tall. If regrowth occurs or new plants emerge, a second application of 1.5 pts/A may be used at the 6-10 inch stage. Do not apply more than 7.5 pts/A/year. Rain-free period is 1 hour.

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Postemergence (continued)	<i>fluzifop-P</i> Fusilade DX 2 lb/gal	1	12 oz	0.19	12 H/ 60 D	Apply with a crop oil concentrate (0.5-1.0% v/v) or nonionic surfactant (0.25-0.5% on a volume basis) over the top of annual grasses and crop prior to soybean bloom stage. Refer to label for suggested stage of application and specific rates. Many tank-mixes will reduce the activity of Fusilade. Apply to johnsongrass before the boot stage of growth at 8-18" high. If regrowth occurs or new plants emerge, apply a second application of 8 fl oz when the johnsongrass is 6-12" tall. Do not apply more than 32 oz/A/year. Rain-free period is 1 hour.
	<i>clethodim</i> Select, Arrow, others 2EC Select Max /TapOut, others 0.97EC	1	6-8 oz 12 -16 oz	0.09-0.125	24 H/ 60 D	Apply to annual grasses at recommended stage of growth. A crop oil concentrate at 1% v/v should be added to the spray mix (Select/Arrow). A NIS (0.25% v/v) can be used with Select Max to reduce crop injury. Do not graze or feed treated soybean forage or hay to livestock. Higher rates and split applications may be needed for optimum perennial grass control (rhizome johnsongrass and bermudagrass). Do not exceed 32 oz/A/year for Select or 64 oz/A/year for Select Max/TapOut. Rain-free period is 1 hour.
	<i>S-metolachlor</i> + <i>fomesafen</i> Prefix 5.29EC	15 + 14	2-2.33 pt	1.095-1.26 + 0.24-0.28	24 H/ 90 D	Apply when soybeans are in at least the V1 stage of growth. Can be tank-mixed with glyphosate for use on RR soybeans. Use a NIS at 0.25% v/v (1 qt/100 gals) when applying alone or in combination with glyphosate products that do not contain a built-in adjuvant. Do not exceed 3 pt/A of Prefix/A/season. Do not use Prefix postemergence if a soil-applied application of S-metolachlor containing products was used. Rain-free period is 1 hour. Prefix can also be applied PPI or PRE but POST applications are preferred. Statement is a generic formulation of metolachlor + fomesafen. However, this formulation is only labeled for PPI or PRE use in soybean.
	<i>pyraflufen</i> ET 0.208EC	14	0.5-0.75 oz	0.0008-0.0016	12 H/ 70 D	Can be applied over-the-top of soybeans up to V6 stage of growth. Can be tank-mixed with glyphosate for use in RR soybeans to improve the control of annual morningglories and certain other broadleaf weeds less than 4" tall . Additions of ET to glyphosate will increase soybean leaf burn but this symptom is usually temporary. Rain-free period is 1 hour. Do not use a COC adjuvant.
	<i>fluthiacet-methyl</i> Cadet 0.91L	149	0.4-0.6 oz	0.0028-0.0042	12 H/ 60 D	Tank-mix with glyphosate (RR soybeans) or glufosinate (LL soybeans) to improve the control of annual morningglory and pigweed. Additions of Cadet to glyphosate or glufosinate will increase soybean leaf injury. Soybean leaf injury will also be increased if applied to wet crop foliage (dew, rain, irrigation). Cadet can be applied from soybean emergence until R2 (full flowering). Rain-free period is 4 hours.
	<i>fomesafen</i> + <i>glyphosate</i> Flexstar GT 3.5 2.82SL	14 + 9	3.5-5.3	0.25-0.37 + 0.99-1.50	24 H/ 45 D	Only for use on RR soybean varieties. Use in combination with a NIS (0.25% v/v) or COC (1% v/v). Rotational crop restrictions: cotton, soybean-0 months; small grains-4 months; field corn, peanuts-10 months; tobacco, sorghum-10 months. Rain-free period is 1 hour.

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS										
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT												
Postemergence (continued)	<i>glufosinate</i> Liberty 280 2.34SL Cheetah Kong Interline	10	22-36 oz	0.19-0.28	12 H/ 70 D	<p>Only for use on Liberty-Link® soybean varieties. The use of Liberty on other varieties will result in severe injury or crop death. Liberty can be applied from soybean emergence (VE) up to but not including the beginning bloom stage of growth (R1). Up to 2 applications of Liberty can be applied per season. Do not apply more than 36 oz/A in a single application. Do not apply more than 65 oz/A/year on soybeans. If Liberty is used in a burndown prior to planting, only 1 in-crop application at 22-29 oz/A can be used. Optimum time of application for Liberty is between 9 am–6 pm. Avoid tank-mixes with grass herbicides such as Assure, Fusilade, Poast, and Select. If desired, a residual herbicide such as Dual Magnum or Warrant or Reflex can be tank-mixed with Liberty. However, tank-mixes with residual herbicides will increase crop injury. Liberty should be applied in a minimum of 15 GPA using flat fan nozzle tips or other nozzle tips that produce medium size spray droplets (300-400 microns). Rain-free period is 4 hours.</p> <p><i>* Do not rely exclusively on Liberty. The use of a soil residual herbicide at planting and/or postemergence is <u>mandatory</u> for optimum weed control in the Liberty-Link soybean system and to help delay the development of herbicide resistance.</i></p> <p>Generic formulations of glufosinate should be used with caution because limited data has been collected by UGA. Cheetah Max is a combination of glufosinate + fomesafen</p>										
	<i>acetochlor + fomesafen</i> Warrant Ultra 3.45SC	15 + 14	48-50 oz/A	1.06-1.10 + 0.236-0.244	24 H/ 45 D	Can be applied POST up until R2 (full bloom—an open flower at one of the 2 uppermost nodes) stage of soybean growth (wait until at least V1 stage). Apply with NIS at 0.25% v/v (1 qt/100 gal). Crop rotation restrictions: soybean-0 months; cotton-1 month; wheat-4 months; field corn/grain sorghum/peanut-10 months. Can also be applied PRE. Only 1 application/year can be made. Tank-mix with glyphosate for use in RR soybeans.										
Postemergence Directed	<i>metribuzin</i> Metribuzin, Tricor 75DF 4F	5	5.3-10.7 oz 8-16 oz	0.25-0.50	12 H/ 70 D	<p>Do not apply until soybeans have reached the following minimum heights:</p> <table border="0"> <thead> <tr> <th style="text-align: left;"><u>Herbicide</u></th> <th style="text-align: left;"><u>Minimum Soybean Height Prior to Directed Spraying</u></th> </tr> </thead> <tbody> <tr> <td>metribuzin</td> <td>8-12"</td> </tr> <tr> <td>metribuzin + 2,4-DB</td> <td>8-12"</td> </tr> <tr> <td>paraquat</td> <td>8"</td> </tr> <tr> <td>2,4-DB</td> <td>8"</td> </tr> </tbody> </table> <p>Rates should be adjusted to band width.</p> <p>At the early growth stages, do not spray unless the soybean stand is uniform in height as slow emerging soybeans will be killed. Crop oil concentrate or nonionic surfactant should also be added to spray. If weeds exceed 4" in height, the tank-mix of 2,4-DB with metribuzin will improve weed control. When using paraquat adjust equipment to spray no higher than 3" of the soybean plant. Paraquat can also be applied in a hooded or shielded sprayer.</p> <p>**DO NOT apply metribuzin post-directed to sensitive soybean varieties.</p>	<u>Herbicide</u>	<u>Minimum Soybean Height Prior to Directed Spraying</u>	metribuzin	8-12"	metribuzin + 2,4-DB	8-12"	paraquat	8"	2,4-DB	8"
	<u>Herbicide</u>	<u>Minimum Soybean Height Prior to Directed Spraying</u>														
	metribuzin	8-12"														
	metribuzin + 2,4-DB	8-12"														
paraquat	8"															
2,4-DB	8"															
<i>paraquat</i> Gramoxone SL 2 lb/gal	22	16-32 oz	0.25-0.50	24 H/ Forage = 46 D												
Firestorm/Parazone/ Helmquat 3 lb/gal		5.3 fl oz	0.124													
<i>2,4-DB</i> Butyrac 200 2L Butyrac 175 1.75L Butoxone 1.75L	4	0.7-0.9 pt 0.8-1.0 pt 1 pt	0.18-0.22 0.18-0.22 0.22	48 H/ 60 D												

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
Postemergence Directed (continued)	<i>carfentrazone</i> Aim 2EC	14	0.5-1.5 oz	0.008-0.025	12 H/ V10	For the control of tropical spiderwort, annual morningglory, and pigweed. Apply as post-directed treatment with spray directed toward base of plant and avoid contact with soybean foliage. Use a NIS at 0.25% v/v (1 qt/100 gal). Do not feed treated soybean forage or hay to livestock.
Rope Wick	<i>glyphosate</i> Various trade names	9	1 gal/2 gal of water		4 H/ 7 D	Use in wiper applicators at a ratio of 1 gallon of glyphosate to 2 gallons of water (33% solution). For best results: 1. Mount equipment on front of tractor. 2. Maintain wick saturation. 3. Operate equipment at 2-3 mph, slower on dense weed clumps. 4. Avoid wiping weeds when wet or drought stressed. 5. Make a second application in the opposite direction. Not all formulations of glyphosate may be labeled for this use. Refer to specific product label.
Postemergence Shielded or Hooded Sprayers	<i>glyphosate</i> various trade names 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9	16-48 oz 13-39 oz 12-36 oz 11.7-35 oz 11-32 oz 10-29 oz	0.38-1.13 ae	4 H/ 7 D	Do not apply until soybeans have reached the effective “chemical cultivation” treatment for emerged weeds in row middles. Hood or shield height must be adjusted so that glyphosate does not contact soybean green stems or foliage. Apply in a spray volume of 3-10 GPA. Not all formulations of glyphosate are labeled for this use. Refer to specific product label.
	<i>paraquat</i> Gramoxone SL 2 lb/gal	22	16-32 oz	0.25-0.50	24 H/ Forage = 46 D	Do not apply until soybeans have reached the following minimum height of 8”. Rates should be adjusted to band width. At the early growth stages, do not spray unless the soybean stand is uniform in height as slow emerging soybeans will be killed. Crop oil concentrate or nonionic surfactant should also be added to spray. If weeds exceed 4 inches in height, the tank-mix of 2,4-DB with metribuzin will improve weed control. When using paraquat adjust equipment to spray no higher than 3” of the soybean plant.
HARVEST AIDS						
Harvest Aid	<i>glyphosate</i> Various trade names 3 lb ae/gal 3.73 lb ae/gal 4 lb ae/gal 4.17 lb ae/gal 4.50 lb ae/gal 5 lb ae/gal	9	32-64 oz 26-52 oz 24-48 oz 23-46 oz 21-42 oz 19-38 oz	0.75-1.5 ae	4 H/ 7 D	Apply after soybean pods have lost all green color. Application is usually timed 14-21 days before harvest. May be aerially applied. This treatment is not recommended for conventional soybeans grown for seed purposes. Not all formulations of glyphosate are labeled for this use. Refer to specific product label.

SOYBEAN WEED CONTROL

STAGE OF APPLICATION	HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT		
HARVEST AIDS						
Harvest Aid (continued)	<i>paraquat</i> Gramoxone Inteon/ Gramoxone SL 2 lb/gal Firestorm/Parazone/ Helmquat 3 lb/gal	22	16 oz 10.7 oz	0.25	24 H/ 15 D	<p>Indeterminate Varieties: Apply when at least 65% of the seed pods have reached a mature brown color or when seed moisture is 30% or less.</p> <p>Determinant Varieties: Apply when soybeans are fully mature (full pod development, 50% leaf drop, and the remaining leaves are yellow).</p> <p>Mature cocklebur and drought stressed weeds are not adequately controlled by this treatment. Do not apply to immature soybeans. Add a nonionic surfactant at 0.25% v/v. May be ground or aerially applied.</p>
	<i>carfentrazone</i> Aim 2EC	14	1.5 oz	0.023	12 H/ 3 D	For the pre-harvest desiccation of pigweeds and annual morningglories (<i>Ipomoea</i> species). Can be applied by ground or air. Use with a crop oil concentrate at 1% v/v. Can be tank-mixed with glyphosate to improve the spectrum of control.
	<i>saflufenacil</i> Sharpen 2.85SC	14	1-2 oz	0.02-0.04	12 H/ 3 D	<p>Apply when soybeans have reached physiological maturity at least 3 days before harvest. Could take up to 10 days for optimum desiccation. Use a MSO at 1% v/v (must contain at least 60% MSO). Do not apply to soybeans grown for seed production.</p> <p>Indeterminate Varieties: > 65% brown pods and > 70% leaf drop or when seed moisture is 30% or less.</p> <p>Determinate Varieties: soybeans are fully developed, > 50% leaf drop, remaining leaves are yellowing.</p> <p>Crop Rotation Restrictions: corn/sorghum/small grains-0 months; soybeans-1 month; cotton-1.5-3 months; peanuts-4-5 months</p> <p>Rain-Free Period is 1 hour</p>
Center Pivot Irrigation Application	<i>metolachlor</i> Stalwart, Parallel PCS, Me-Too-Lachlor	15	16 oz	1	24 H/ 90 D	Herbicides should be applied only through center pivot systems that water uniformly. Apply in 1/4-1/2" of irrigation water/A. Equipment must have appropriate check valves or other suitable devices in the system to ensure that the herbicide solution cannot siphon back into water supply. Refer to labels for more specific information regarding center-pivot applications.
	<i>S-metolachlor</i> Dual Magnum 7.62EC		16 oz	0.97		
	<i>metribuzin</i> Metri, Metribuzin, Tricor 75DF 4F	5	5.3-8 oz 8-12 oz	0.25-0.38	12 H/ 70 D	

SOYBEAN WEED RESPONSE TO HERBICIDES

Eric P. Prostko, Extension Agronomist – Weed Science

	Prowl Pendimax	Scepter	Treflan	Squadron	Sonalan	Metribuzin	Pursuit	Canopy	Authority MTZ	Authority XL
PREPLANT INCORPORATED										
PERENNIAL WEEDS										
bermudagrass	P	P	P	P	P	P	P	P	P	P
johnsongrass (rhizome)	P	P	P	P	P	P	P	P	P	P
yellow nutsedge	P	F-G	P	F-G	P	P	F-G	F	F-G	G
purple nutsedge	P	P-F	P	P-F	P	P	G	P	F-G	G
ANNUAL GRASSES										
broadleaf signalgrass	G	P-F	G	G	G	P-F	P		P	P
crabgrass	E	F	E	E	E	G	P	G	P	F
crowfootgrass	E		E	G		G	P	G		
fall panicum	E	P	E	G	E	P	P		P	F
goosegrass	E	F	E	G	E	G	P	G	P	
johnsongrass (seedling)	E	F	E	E	E	P	P	P	P	F
sandbur	E		E	G		P	P			
Texas panicum	G-E	F	G-E	G-E	G-E	P	P			F
BROADLEAF WEEDS										
bristly starbur	P	F	P	F	P	G	F	G		G
burcucumber	P	F-G	P	F-G	P	P	P	F		
citronmelon	P	P	P	P	P	F	P-F			
cocklebur	P	G	P	G	P	F	F-G	G-E	P-F	G
coffee senna	P	F	P	F	P	G	F-G	G		E
common ragweed	P	G	P	G	P	G	P	G	F	P-F
copperleaf	P	P	P	P	P	G-E		G-E		
cowpea	P	P	P	P	P	F	P	F		
crotalaria	P		P		P	G		F		
Florida beggarweed	P	P-F	P	P	P	E	P	E		E
Florida pusley	E	E	E	E	E	E	E	E		E
hemp sesbania	P	P	P	P	P	G-E	P	G-E	P	F-G
horseweed						G		G	G	
ALS-resistant						G		F	G	
glyphosate-resistant						G		G	G	
jimsonweed	P	G	P	G	P	G	G	G	F	F-G
lambsquarters	G-E	G	G-E	G-E	E	G-E	F	G-E	G-E	G-E

E=Excellent (>90%)

G=Good (80-89%)

F=Fair (70-79%)

P=Poor (<70%)

If no symbol is given, weed response is unknown.

SOYBEAN WEED RESPONSE TO HERBICIDES

	Prowl Pendimax	Scepter	Treflan	Squadron	Sonalan	Metribuzin	Pursuit	Canopy	Authority MTZ	Authority XL
PREPLANT INCORPORATED										
cypressvine	P	F	P	F	P	F-G	G	F-G		E
entireleaf	P	F	P	G	P	P-F	G	G	G-E	E
ivyleaf	P	F	P	G	P	P-F	G	G	G-E	E
pitted	P	G	P	G	P	F-G	G	G	G-E	F-G
red	P	F	P	G	P	F	G			
smallflower	P	G	P	G	P	G	E	G		E
tall	P	F	P	G	P	P-F	G	F-G		E
Pennsylvania smartweed	P	G	P	G	P	G		G	G-E	E
pigweeds	G	E	G	E	G-E	G-E	E	E	G-E	E
ALS-resistant	G	P	G	G	G	G-E	P	G-E	G-E	E
glyphosate-resistant	G	E	G	E	G	G-E	E	E	G-E	E
prickly sida	P	F	P	F-G	P	G-E	G-E	G-E	G	F-G
purslane	E		E	E	E	G-E		E		G-E
redweed	P	P-F	P	F	P					F
sicklepod	P	F-G	P	F	P	F-G	P	G		P
tropic croton	P		P	P	P	G	P	G		E
tropical spiderwort	P					G	F-G	G	F	G
velvetleaf	P	P-F	P	P-F	P	G-E	G	G	P	
wild poinsettia	P	G	P	G	P	G	E	G	F	P-F

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If no symbol is given, weed response is unknown.

SOYBEAN WEED RESPONSE TO HERBICIDES

	Python	Prowl Pendimax	Zidua Anthem	Dual Magnum ¹	Command	Warrant	Pursuit	Linex Lorox	Metribuzin
	PPI/PRE	PREEMERGENCE							
PERENNIAL WEEDS									
bermudagrass	P	P		P	P	P	P	P	P
johnsongrass (rhizome)	P	P		P	P	P	P	P	P
yellow nutsedge	P	P	P	F-G	P	F	F-G	P	P
purple nutsedge	P	P	P	P	P	P	G	P	P
ANNUAL GRASSES									
broadleaf signalgrass		G	F-G	F-G	E	F-G	P		P
crabgrass	P	G-E	G-E	G-E	E	G-E	P	G	G
crowfootgrass	P	G-E	G-E	G-E	G	G-E	P	G	G
fall panicum	P	G	G-E	G-E	G	G-E	P	G	P
goosegrass	P	G	G-E	G-E	G	G-E	P	G	G
johnsongrass (seedling)	P	G			F		P		P
sandbur	P	G	G-E	G-E	F	G-E	P	G	
Texas panicum	P	G	F	P-F	F-G	P-F	P		P
BROADLEAF WEEDS									
bristly starbur	E	P		P		F	F	F	G
burcucumber	P	P		P	P	P	P	P	P
citronmelon		P		P	P	P			F
cocklebur	E	P	P	P	P	P	F-G	P	F
coffee senna	F	P		P	F	P-F	P		G
common ragweed	G	P		P	F-G	P	P	G	G
copperleaf	F	P		P		P	P	P	G-E
cowpea	P	P		P	P	P	P	P	F
crotalaria		P							F
Florida beggarweed	F-G	P		P-F	F-G	F	P	G	E
Florida pusley	G	G		G	F-G	G	E	G	G
hemp sesbania		P		P		P	P		G-E
horseweed	G								G
ALS-resistant	P								G
Glyphosate-resistant	G								G
jimsonweed	P	P		P	F-G	P	G		G
lambsquarters	E	G		F	G-E	F	P-F	G-E	G

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 G=Good (80-89%)
 F=Fair (70-79%)
 P=Poor (<70%)
 If no symbol is given, weed response is unknown.

¹The generic formulations of metolachlor (**Parallel PCS, Stalwart, Me-Too-Lachlor**) have not provided the same length of residual control of certain weeds as similar rates of Dual Magnum formulations in some UGA field trials.

SOYBEAN WEED RESPONSE TO HERBICIDES

	Python	Prowl Pendimax	Zidua Anthem	Dual Magnum ¹	Command	Warrant	Pursuit	Linex Lorox	Metribuzin
	PPI/PRE	PREEMERGENCE							
morningglories									
cypressvine	F-G	P					G		F-G
entireleaf	F-G	P		P	P	P	G	G	P-F
ivyleaf	F-G	P		P	P	P	G	G	P-F
pitted	F-G	P		P	P	P	G	G	F-G
purple	P	P		P	P	P	P		P
red	F-G	P		P	P		G		F
smallflower	G-E	P		P-F	G	P	E	G	G
tall	F-G	P		P	P	P	G	G	P-F
Pennsylvania smartweed		P		P	G	P			G
pigweeds	E	G	G-E	G-E	P	G-E	E	G	G-E
ALS-resistant	P	G	G-E	G-E	P	G-E	P	G	G-E
glyphosate-resistant	E	G	G-E	G-E	P	G-E	E	G	G-E
prickly sida	E	P		F	G	G	G-E		G
purslane		E		G	G	G		G	G-E
redweed	G	P							
sicklepod	F-G	P		P	P	P	P	P	F-G
tropic croton		P		P	G	P	P		G
tropical spiderwort		P	G	G	F		F-G		F-G
velvetleaf	E	P		P	E	P	G		G
wild poinsettia	G	P		P	P	P	G-E		G

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SOYBEAN WEED RESPONSE TO HERBICIDES

	Fierce	Valor	Valor XLT Envive	Reflex Dawn	Prefix Statement	Assure II	Poast	Fusilade DX	Ultra Blazer	Basagran
	PREEMERGENCE					POSTEMERGENCE				
PERENNIAL WEEDS										
bermudagrass	P	P	P			G-E	F	G-E	P	P
johnsongrass (rhizome)	P	P	P			E	G	E	P	P
yellow nutsedge	P	P	F-G	G-E	G-E	P	P	P	P	G*
purple nutsedge	P	P	P-F			P	P	P	P	P
ANNUAL GRASSES										
broadleaf signalgrass	F-G	P	P	F-G	F-G	G	E	E	P	P
crabgrass	G-E	P	P	F-G	E	F-G	G	F	P	P
crowfootgrass	G-E	P	P		G	G	F-G	F	P	P
fall panicum	G-E	P	P		G	G	G	G	P	P
goosegrass	G-E	P	P		E	F-G	F-G	F-G	P	P
johnsongrass (seedling)		P	P			E	G-E	G-E	P	P
sandbur	G-E	P	P		G		G	G	P	P
Texas panicum	F	P	P	F	F	F-G	E	G-E	P	P
bristly starbur	F	F	F-G	G		P	P	F-G	F	E
burcucumber	P	P	P-F			P	P	P	F	P
citronmelon	G	G	G			P	P	P	G-E	P
cocklebur	P	P	F-G	G	G	P	P	P	G	E
coffee senna	P-F	P-F	F-G	P	P	P	P	P	P-F	G
common ragweed	G	G-E	G-E	G	G	P	P	P	E	G
copperleaf	G-E	G-E	G-E			P	P	P	G-E	P
cowpea	P	P	P			P	P	P	F	P
crotalaria	G	G	G			P	P	P	E	P
Florida beggarweed	G-E	G-E	G-E	P	P-F	P	P	P	P-F	P
Florida pusley	G	G-E	G-E	P	G	P	P	P	E	P
hemp sesbania	G	G	G-E	P	P	P	P	P	E	P
horseweed	G	G	G			P	P	P		
ALS-resistant	G	G	G			P	P	P		
glyphosate-resistant	G	G	G			P	P	P		
jimsonweed	G	G	G			P	P	P	E	E
lambsquarters	G	G-E	G-E			P	P	P	F	F

E=Excellent (>90%)

G=Good (80-89%)

F=Fair (70-79%)

P=Poor (<70%)

If no symbol is given, weed response is unknown.

SOYBEAN WEED RESPONSE TO HERBICIDES

	Fierce	Valor	Valor XLT Envive	Reflex Dawn	Prefix Statement	Assure II	Poast	Fusilade DX	Ultra Blazer	Basagran
	PREEMERGENCE					POSTEMERGENCE				
morningglories										
cypressvine	F	G	G	F	F	P	P	P	G-E	G-E
entireleaf	F	F-G	F-G	F	F	P	P	P	G	P
ivyleaf	F	F-G	F-G	F	F	P	P	P	G	P
pitted	F	F	F-G	F	F	P	P	P	G-E	F
purple				F	F	P	P	P	G-E	P
red	F	G	G	F	F	P	P	P	G-E	F-G
smallflower	F	G-E	G-E	G-E	G-E	P	P	P	G-E	G-E
tall	F	F-G	F-G	F	F	P	P	P	G	F
Pennsylvania smartweed	P-F	P-F	F			P	P	P	G	G-E
pigweeds	E	E	E	E	E	P	P	P	G-E	P
ALS-resistant	E	E	E	E	E	P	P	P	G-E	P
glyphosate-resistant	E	E	E	E	E	P	P	P	G-E	P
prickly sida	G-E	G-E	G-E			P	P	P	P	G
purslane	G-E	G-E	G-E	G	G	P	P	P	E	G
redweed	G-E	G-E	G-E			P	P	P		G-E
sicklepod	P	P	F			P	P	P	P-F	P
tropic croton	G	G	G	F-G	F-G	P	P	P	E	P
tropical spiderwort	F-G	P-F	F	P	G-E	P	P	P	P	F
velevetleaf	G	G-E	G-E			P	P	P	F	G-E
wild poinsettia	F-G	F-G	F-G	G-E	G-E	P	P	P	G	P

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P=Poor (<70%)

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*Assumes 2 applications.

SOYBEAN WEED RESPONSE TO HERBICIDES

	Storm	2,4-DB	Scepter	Classic	Reflex Dawn	Cobra	Select Arrow	Liberty Cheetah Kong Interline	Glyphosate
POSTEMERGENCE									
PERENNIAL WEEDS									
bermudagrass	P	P	P	P	P	P	G-E	P	P-F
johnsongrass (rhizome)	P	P	P	P	P	P	E	P-F	G-E
yellow nutsedge	P	P	P-F	G	F	P-F	P	P	F
purple nutsedge	P	P	P	P-F	P	P	P	P	F-G
ANNUAL GRASSES									
broadleaf signalgrass	P	P	P	P	P	P-F	E	G	E
crabgrass	P	P	P	P	P	P-F	G	F-G	E
crowfootgrass	P	P	P	P	P	P	G	G	E
fall panicum	P	P	P	P	P	P	G	G	E
goosegrass	P	P	P	P	P	P	F-G	P	E
johnsongrass (seedling)	P	P	F	P	P	P	E	G	E
sandbur	P	P	P	P	P	P-F	G		E
Texas panicum	P	P	P	P	P	P	G-E	G	E
BROADLEAF WEEDS									
bristly starbur	G			G		G	P	G-E	G
burcucumber	P-F	P	P	G	F	F	P		E
citronmelon	G	P				G	P	G	G
cocklebur	G-E	G-E	E	E	F-G	G-E	P	E	E
coffee senna	G	F	F	P	P	P-F	P		G
common ragweed	G-E	P	F-G	G	G-E	E	P	G	G
copperleaf	G	P	P	P	G-E	G-E	P		P-F
cowpea	P-F	P-F	P	G	F	P-F	P		F-G
crotalaria	E				G-E	E	P		G
Florida beggarweed	P	P	P	E	P	P-F	P	G-E	G
Florida pusley	E		F	F	G	F-G	P	P-F	P-F
hemp sesbania	E	P	P	E	G	E	P	G-E	F
horseweed				F-G				G	F-G
ALS-resistant				P				G	F-G
glyphosate-resistant				F-G				G	P
jimsonweed	E	G	P	G-E	G	E	P	G	G
lambsquarters	G		F	P	P-F	P-F	P	E	G

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 G=Good (80-89%)
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 P=Poor (<70%)
 If no symbol is given, weed response is unknown.

SOYBEAN WEED RESPONSE TO HERBICIDES

	Storm	2,4-DB	Scepter	Classic	Reflex Dawn	Cobra	Select Arrow	Liberty Cheetah Kong Interline	Glyphosate
	POSTEMERGENCE								
morningglories									
cypressvine	G-E	F	F	P	G-E	G-E	P	G-E	F
entireleaf	F-G	G	P	F-G	F	F-G	P	G-E	F
ivyleaf	F-G	G	P	F-G	F	F-G	P	G-E	F
pitted	G	G	F	G	G	G	P	G-E	P-F
purple	G	G	P	P	G-E	F-G	P	G	P-F
red	G	G-E	F-G	G-E	G-E	G-E	P	G-E	F
smallflower	G-E	G	F	G-E	G	G-E	P	G-E	F
tall	G	G-E	P-F	P-F	G	G	P	G-E	F
Pennsylvania smartweed	G-E	P	F	G	G	G-E	P	G-E	G
pigweeds	G-E	F	E	F	G-E	G-E	P	F-G	G-E
ALS-resistant	G-E	F	P	P	G-E	G-E	P	F-G	G-E
glyphosate-resistant	G-E	F	E	F	G-E	G-E	P	F-G	P
prickly sida	G	P	P	P	P	G	P	P-F	P-F
purslane	G	G				E	P	G	G
redweed	G-E			F		F	P		G
sicklepod	P	F	F	F-G	P	P-F	P	G	E
tropic croton	G-E	P		P		E	P	G	G
tropical spiderwort	F			F			P	P-F	F
velevetleaf	F-G	P	P	G-E	F	F	P	E	G
wild poinsettia	F-G	P	F	F	F-G	G-E	P		G

E=Excellent (>90%)

G=Good (80-89%)

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If no symbol is given, weed response is unknown.

SOYBEAN WEED RESPONSE TO HERBICIDES

	FirstRate Amplify	Pursuit	Harmony GT XP or SG	Warrant Ultra	2,4-DB	Paraquat	Metribuzin	Metribuzin + 2,4-DB
	POSTEMERGENCE				POST-DIRECTED			
PERENNIAL WEEDS								
bermudagrass	P	P	P	P	p	P	P	P
johnsongrass (rhizome)	P	P	P	P	P	P	P	P
yellow nutsedge	P-F	F-G	P	P	P	P-F		P-F
purple nutsedge	P-F	G	P	P	P	P-F		
ANNUAL GRASSES								
broadleaf signalgrass	P	G	P	P	P	G		G
crabgrass	P	F	P	P	P	F	E	G-E
crowfootgrass	P	F	P	P	P	G	E	G-E
fall panicum	P	F	P	P	P	G	G	G
goosegrass	P	F	P	P	P	G	E	G-E
johnsongrass (seedling)	P	F-G	P	P	P	G	G	G
sandbur	P		P	P	P	G	E	G
Texas panicum	P	P	P	P	P	G	F	F-G
BROADLEAF WEEDS								
bristly starbur	E	F			G	G	G	E
burcucumber	F	P	P-F	F	P	G		
citronmelon		P			F	F	G	G-E
cocklebur	E	G-E	F	F-G	E	G	E	E
coffee senna		F		P	F-G			G-E
common ragweed	E	P		G-E	G	G	G	E
copperleaf	P	P		G-E	P			G-E
cowpea	P	P		F	P-F	G		G
crotalaria		P		G-E		G	E	E
Florida beggarweed	F-G	P		P	P	G	E	E
Florida pusley	F	P		F-G		F-G	G	G
hemp sesbania	P	P		G	P	P		G
horseweed	G							
ALS-resistant	P							
glyphosate-resistant	G							
jimsonweed	P	F	F	G	G	G	E	G
lambquarters	P	P	G-E	P-F	G	F-G	E	E

E=Excellent (>90%)
 G=Good (80-89%)
 F=Fair (70-79%)
 P=Poor (<70%)
 If no symbol is given, weed response is unknown.

SOYBEAN WEED RESPONSE TO HERBICIDES

	FirstRate Amplify	Pursuit	Harmony GT XP or SG	Warrant Ultra	2,4-DB	Paraquat	Metribuzin	Metribuzin + 2,4-DB
	POSTEMERGENCE				POST-DIRECTED			
morningglories								
cypressvine	G	G		G-E	F	F	E	E
entireleaf	G	G		F	G	F-G	F	E
ivyleaf	G	G		F	G	F-G	F	E
pitted	G	G		G	G	F-G	G-E	G-E
purple	P-F	P		G-E	G			G-E
red	G	G		G-E	G-E	F-G	G-E	E
smallflower	G	G		G	G	F-G	G-E	E
tall	G	G		G	G-E	F-G	F	G
Pennsylvania smartweed		F-G	G-E	G	P	P-F		F-G
pigweeds	P	E	G-E	G-E	F	F-G	G-E	G-E
ALS-resistant	P	P	P	G-E	F	F-G	G-E	G-E
glyphosate-resistant	P	E	G-E	G-E	F	F-G	G-E	G-E
prickly sida	P	P			P	P-F	E	G-E
purslane					G	G	G	G
redweed		F			P			
sicklepod	F	P		P	G	G	E	G-E
tropic croton	F	P			P	G	G	G
tropical spiderwort	F					G-E		
velvetleaf	G	G			P			F
wild poinsettia	G	P-F		F	P	F-G	P-F	F

E=Excellent (>90%)

G=Good (80-89%)

F=Fair (70-79%)

P=Poor (<70%)

If no symbol is given, weed response is unknown.

**WEED AND COVER CROP RESPONSE TO BURNDOWN HERBICIDES USED IN CONSERVATION TILLAGE
SOYBEAN PRODUCTIONS SYSTEMS IN GEORGIA**

WEED	Glyphosate	Glyphosate + 2,4-D amine	Glyphosate + Clarity	Glyphosate + Aim or ET	Glyphosate + FirstShot	Paraquat	Paraquat + 2,4-D	Paraquat + Metribuzin	Glufosinate
Carolina geranium	P	F-G	G	F-G	G-E	G-E	G-E	G-E	G-E
chickweed	E	E	E	E	E	E	E	G-E	G-E
corn spurry	G-E	G-E	G-E			F-G			
crimson clover	P-F	F	F-G	F		G	G-E	G	
cutleaf evening primrose	P-F	E	G	F	F	F	E	G	G-E (mature plant)
henbit	G	E	E	E	G-E	G	E	G	G-E
horseweed	F-G	G-E	E	G	G-E	F	G	G	G-E
glyphosate-resistant	P	F-G	E	P	P			G	
red sorrel	E	E	E			E	E	E	P-F
ryegrass**	G	G	G	G	G	P-F	P-F	P-F	P
small grains	E	E	E	E	E	F-G	F-G	F-G	P-F
swinecress	F-G	G	F-G	F-G	G	P-F	F-G		G-E
volunteer peanut	F	F	G	F	F	P	P-F	F	G-E
wild radish	F-G	G-E	G-E	G	G-E	F	G-E	F	G-E (mature plant)
Soybean plant-back restriction	0 days	15 days	14-28 days 1" rainfall or irrigation	0 days	7-14 days	0 days	7-15 days	0 days	0 days

PREPACKAGED TANK-MIXES FOR SOYBEANS			
[See manufacturer's label for specific rates and application uses.]			
PRODUCT NAME	ACTIVE INGREDIENTS (LBS AI/GAL OR % AI)	PRODUCT NAME	ACTIVE INGREDIENTS (LBS AI/GAL OR % AI)
Anthem	pyroxasulfone (2.087) + fluthiacet (0.063)	Anthem Maxx	pyroxasulfone (4.174) + fluthiacet (0.126)
Authority Assist	sulfentrazone (3.33) + imazethapyr (0.67)	Authority Elite	sulfentrazone (0.7) + s-metolachlor (6.3)
Authority First	sulfentrazone (62.1%) + chloransulam (7.9%)	Authority MTZ	Sulfentrazone (18%) + metribuzin (27%)
Authority XL	sulfentrazone (62%) + chlorimuron (8%)	Axiom	flufenacet (54.4%) + metribuzin (13.6%)
Backdraft	imazaquin (0.25) + glyphosate (1.25)	Boundary	metribuzin (1.25) + S-metolachlor (5.25)
Broadstrike + Treflan	flumetsulam (0.25) + trifluralin (3.4)	Canopy	chlorimuron (10.7 %) + metribuzin (64.3 %)
Canopy EX	chlorimuron (22.7%) + tribenuron (6.8%)	Canopy XL	sulfentrazone (46.9%) + chlorimuron (9.4%)
Cheetah Max	glufosinate (2.0) + fomesafen (1.0)		
Commence	clomazone (2.25) + trifluralin (3.0)	Concert	chlorimuron (12.5%) + thifensulfuron (12.5%)
Detail	imazaquin (0.5) + dimethenamid (3.6)	Domain	flufenacet (24%) + metribuzin (36%)
Enlite	chlorimuron (2.85%) + flumioxazin (36.21%) + thifensulfuron (8.8%)	Envive	chlorimuron (9.2%) + flumioxazin (29.2%) + thifensulfuron (2.9%)
Extreme	imazethapyr (0.17) + glyphosate (2.0)	Fierce	flumioxazin (33.5%) + pyroxasulfone (42.5%)
Flexstar GT 3.5	fomesafen (0.56) + glyphosate (2.26)	Freedom	alachlor (2.67) + trifluralin (0.33)
Fusion	fluazifop (2.0) + fenoxaprop (0.56)	Galaxy	bentazon (3.0) + acifluorfen (0.67)
Gangster	flumioxazin (51%) + cloransulam (84%)	Gauntlet	sulfentrazone (75%) + cloransulam-methyl (84%)
Prefix	fomesafen (0.95) + S-metolachlor (4.34)	Passport	trifluralin (2.4) + imazethapyr (0.2)
Pursuit Plus	imazethapyr (0.2) + pendimethalin (2.7)	Reliance STS	thifensulfuron (9%) + chlorimuron (16%)
Sequence	glyphosate (2.25) + S-metolachlor (3.0)	Sonic	sulfentrazone (62.1%) + chloransulam (7.9%)
Spartan Advance	sulfentrazone (0.56) + glyphosate (4.04)	Spartan Charge	sulfentrazone (3.15) + carfentrazone (0.35)
Squadron	imazaquin (0.33) + pendimethalin (2.0)	Steel	pendimethalin (2.25) + imazethapyr (0.17) + imazaquin (0.17)
Stellar	lactofen (2.4) + flumiclorac (0.7)	Storm	bentazon (2.67) + acifluorfen (1.33)
Synchrony XP	chlorimuron (21.5%) + thifensulfuron (6.9%)	Tackle	imazethapyr (0.128) + glyphosate (4.0)
Typhoon	fluazifop (0.47) + fomesafen (0.94)	Valor XLT	flumioxazin (30%) + chlorimuron (10.3%)
Warrant Ultra	acetochlor (2.82) + fomesafen (0.63)		

SOYBEAN PRE-MIXTURES AND EQUIVALENT RATES

PRE-MIXTURE	RATE/A	EQUIVALENT RATES/A
Authority MTZ 45DG	14 oz	Spartan 4L at 5.04 oz Metribuzin 75DG at 5.04 oz
Boundary 6.5EC	1.5 pt	Dual Magnum 7.62EC at 16.5 oz Metribuzin75DF at 4.9 oz
Canopy 75DG	6 oz	Metribuzin 75DG at 5.1 oz Classic 25DG at 2.6 oz
Envive 41.3DG	2.5 oz	Valor 51WG at 1.44 oz Classic 25DG at 0.90 oz Harmony 75DG at 0.14 oz
Flexstar GT 3.5 2.82 SL	3.5 pt	Touchdown Total 4.17SL at 30.4 oz Reflex 2SL at 15.7 oz
Prefix 5.29SL	2.33 pt	Dual Magnum 7.62EC at 21.2 oz Reflex 2SL at 17.7 oz
Sequence 5.25SL	3 pt	Dual Magnum 7.62EC at 18.9 oz Touchdown Total 4.17SL at 25.9 oz
Warrant Ultra 3.45SC	48 oz	Warrant 3ME at 45.1 oz Reflex 2SL at 15.1 oz

RR CORN CONTROL IN RR SOYBEANS

HERBICIDE*	CORN SIZE (IN)	RATE/A (OZ)
Arrow/Select	4-12 12-24	4-6 6-8
Assure II/Targa	1-12 12-18 18-30	1-12 12-18 18-30
Fusilade	12-24	6-8
Poast	1-12 12-20	12 16
Poast Plus	1-12 12-20	18 24
SelectMax/TapOut	4-12 12-18 18-24	8-12 10-14 12-16

*In RR soybean production systems, these grass herbicides can be tank-mixed with glyphosate.

HERBICIDE PROGRAMS FOR MANAGING VOLUNTEER RR COTTON IN RR SOYBEANS¹

PREEMERGENCE	POSTEMERGENCE ²
Canopy / Cloak 75DG (6-8 oz/A ³) or Metribuzin, 75DF (5.3-8 oz/A ³)	glyphosate + Resource (4 oz/A), or Reflex (16-24 oz/A), or Classic (0.5 oz/A)

¹A combination of preemergence and postemergence herbicides is needed to provide optimum control.

²Postemergence applications should be made when cotton is 6" or less.

³Rate depends on soil type. Refer to label.

HERBICIDE SUGGESTIONS FOR HORSEWEED (MARESTAIL) CONTROL IN SOYBEANS*

TIME OF APPLICATION	TREATMENT	COMMENTS
Preplant Burndown	Liberty 280 2.34SL at 29-36 oz/A**	Use at least 15 GPA and flat fan nozzle tips or other nozzle tips that produce medium size spray droplets (300-400 microns). Apply between 9:00 am and 6:00 pm. Temperatures less than 75°F will reduce control. Labeled for 6-12" horseweed plants.
	Roundup PowerMax 5.5 SL at 22-43 oz/A + Clarity 4SL at 8 oz/A	Soybeans can be planted in 14 days if 1" of rainfall or irrigation has occurred since application.
	Roundup PowerMax 5.5SL at 22-43 oz/A + 2,4-D amine 3.8SL at 1.5-2 pt/A	Soybeans can be planted 30 days after application.
	Gramoxone Inteon / Gramoxone SL 2SL at 48 oz/A + Metribuzin/Tricor 75DF at 4 oz/A + NIS at 0.25% v/v	Apply to 6" or smaller horseweed plants. Use at least 15 GPA and flat fan nozzle tips. Plant a metribuzin-tolerant soybean variety.
Residual Control	Valor SX 51WG at 2-2.5 oz/A	Excellent residual control but no postemergence activity
	Python 80WG at 1 oz/A	Will not control ALS-resistant populations.
Postemergence (in-crop)	Firstrate 84DG at 0.3 oz/A + NIS at 0.25% v/v	Apply to horseweed plants that are 6" tall or less. Can also be tank-mixed with glyphosate in RR soybeans. Will not control ALS-resistant populations.
	Liberty 2.34 SL at 22-29 oz/A**	For use in LL soybeans only. Apply in at least 15 GPA with flat fan nozzle tips or other nozzle tips that produce medium size spray droplets (300-400 microns). Apply between 9:00 am and 6:00 pm for optimum activity. Labeled for use on 6-12" tall horseweed plants.

*Tillage is also a very effective method for controlling horseweed.

**Generic formulations of glufosinate are also available including Cheetah, Kong, and Interline. Cheetah Max is a combination of glufosinate + fomesafen. Generic formulations of glufosinate should be used with caution because limited data has been collected by UGA.

HERBICIDE PROGRAMS FOR MANAGING GLYPHOSATE/ALS-RESISTANT PALMER AMARANTH AND DELAYING PPO/VLCFA RESISTANCE IN SOYBEANS.¹

SOYBEAN VARIETY	PROGRAM	PREEMERGENCE ²	POSTEMERGENCE ^{3,4}
Roundup Ready	1	TriCor/Metribuzin; or Canopy/Cloak ⁵ ; or Authority MTZ ^{7,12}	glyphosate + Reflex ⁷ ; or glyphosate + Prefix ^{7,8} ; or Flexstar GT ^{7,10} or glyphosate + Warrant Ultra ¹⁷
	2	Boundary ⁶	glyphosate + Reflex ⁷ ; or Flexstar GT ^{7,10}
	3	Prowl; or Dual Magnum ¹⁴ ; or Warrant ¹⁴ ; or Zidua ¹⁴ ; or Anthem ^{14,16}	glyphosate + Reflex ⁷ ; or Flexstar GT ^{7,10}
	4	Valor; or Envive ^{7,11} ; Authority XL ^{7,13} ; or Fierce ^{7,15}	glyphosate + Warrant ¹⁴ ; or glyphosate + Dual Magnum ¹⁴ ; or glyphosate + Zidua ¹⁴ ; or Sequence ⁹
Liberty-Link	1	Prowl; or Dual Magnum ¹⁴ ; or Warrant ¹⁴ ; or Zidua ¹⁴ ; or Anthem ^{14,16}	Liberty ¹⁸ + Reflex ⁷
	2	Valor; or Envive ^{7,11} ; or Authority XL ^{7,13} or Fierce ^{7,15}	Liberty ¹⁸ + Dual Magnum ¹⁵ or Warrant ¹⁵ ; or Zidua ¹⁵ ; or Anthem ^{15,17}
Conventional	1	TriCor/Metribuzin; or Canopy/Cloak ⁵ ; or Authority MTZ ^{7,12} (include Prowl for grass control)	Reflex ⁷ ; or Ultra Blazer ⁷ + Dual Magnum ¹⁴ or Warrant ¹⁴ ; or Cobra ⁷ + Dual Magnum ¹⁴ or Warrant ¹⁴ ; or Prefix ^{7,8} or Warrant Ultra ¹⁷
	2	Boundary ⁶	Reflex ⁷
	3	Prowl; or Dual Magnum ¹⁴ ; or Warrant ¹⁴ ; or Zidua ¹⁴ ; or Anthem ^{14,16}	Reflex ⁷

¹Glyphosate- and ALS-resistant Palmer amaranth are very serious concerns. An aggressive management program is necessary to slow spread of resistant biotypes and to reduce selection pressure in areas currently not infested with resistant biotypes.

²Generic brands of Prowl (pendimethalin) are available and perform similarly. When using Authority MTZ, Boundary, TriCor/Metribuzin or Canopy, follow label for appropriate rates, soil pH restrictions, and soybean variety tolerance. Dryland growers should consider mechanically incorporating Authority MTZ, Metribuzin, Canopy, Boundary, and Prowl. If mechanically incorporating herbicides, Trefflan can be used instead of Prowl if preferred. If Envive or Authority XL are used, consider planting an STS/ST soybean variety to help minimize potential early-season Classic injury caused by cool, wet weather.

³**Postemergence applications MUST be made before the largest Palmer amaranth plant in the field exceeds 2-3" in height. If a preemergence herbicide is used but not moisture activated, this could occur as early as 10-14 days after planting depending on the time of year. Palmer amaranth plants can grow from 1-3" per day.** When applied in combination with glyphosate, use either 16-24 oz/A of Reflex, 24 oz/A of Ultra Blazer, or 12.5 oz/A of Cobra.

⁴If residual herbicides are activated by a timely rainfall or irrigation event, a second post-emergence application may not be needed. The total amounts of these herbicides that can be applied per acre per year are as follows: Cobra – 25 oz/A; Reflex – 24 oz/A; and Ultra Blazer – 32 oz/A. Reflex may be preferred because of residual control of Palmer amaranth. On Roundup Ready soybean, glyphosate can be included in the second application if needed for the control of other weeds.

⁵Canopy/Cloak is a pre-mixture of metribuzin + chlorimuron (Classic).

⁶Boundary is a pre-mixture of metribuzin and S-metolachlor (Dual Magnum).

⁷Authority MTZ, Authority XL, Cobra, Envive, Flexstar GT, Prefix, Reflex, Ultra Blazer, Valor, Valor XLT, and Fierce have the same mode of action (PPO inhibitor). More than 1 application of these herbicides in a single season should be avoided if at all possible to prevent/delay the development of PPO resistance.

⁸Prefix is a pre-mixture of fomesafen (Reflex) and S-metolachlor (Dual Magnum).

⁹Sequence is a pre-mixture of glyphosate and S-metolachlor (Dual Magnum). **Sequence will not control emerged glyphosate resistant pigweed.**

¹⁰Flexstar GT is a pre-mixture of fomesafen (Reflex) and glyphosate (Touchdown).

¹¹Envive is a pre-mixture of chlorimuron (Classic), flumioxazin (Valor) and thifensulfuron (Harmony).

¹²Authority MTZ is a pre-mixture of sulfentrazone (Spartan) and metribuzin.

¹³Authority XL is a pre-mixture of sulfentrazone (Spartan) and chlorimuron (Classic).

¹⁴Dual Magnum and Warrant are members of the same herbicide family (chloroacetamide) and have the same mode of action (inhibit very long chain fatty acids). Multiple applications (>2) of these herbicides in a single year should be avoided to prevent or delay the evolution of resistance. Anthem and Zidua are not in the same herbicide family as Dual or Warrant but do have the same mode of action. Generally, these herbicides have no postemergence activity (except Anthem).

¹⁵Fierce is a pre-mixture of flumioxazin (Valor) and pyroxasulfone (Zidua).

¹⁶Anthem is a pre-mixture of pyroxasulfone (Zidua) + fluthiacet (Cadet).

¹⁷Warrant Ultra is a pre-mixture of acetochlor (Warrant) and fomesafen (Reflex).

¹⁸Generic formulations of glufosinate are also available including Cheetah, Kong, and Interline. Cheetah Max is a combination of glufosinate + fomesafen. Generic formulations of glufosinate should be used with caution because limited data has been collected by UGA.

SOYBEAN VARIETY TOLERANCE TO METRIBUZIN HERBICIDES

Soybean varieties that have exhibited acceptable tolerance to metribuzin herbicides (Boundary, Canopy, TriCor) in UGA tests conducted in 2008-2014 include the following:

Group IV: Asgrow 4903 RR/STS, Southern States RT4808

Group V: Asgrow 5905RR, AGS 568RR, Delta Pineland DP5634, Pioneer 95Y20, Pioneer 95Y40, Pioneer 95Y50, Pioneer 95Y70, Southern States RT5951NRR, Southern States RT5960NRR, Pioneer 95Y61, Pioneer 95Y71, Pioneer 95Y80, Pioneer P54T94R

Group VI: Asgrow 6301RR, Delta Pineland DP6568, Pioneer 96M60, Southern States RT 6451NRR, Vigoro V61N9, Northrup King NK-67R6

Group VII: AGS 758RR, Asgrow 7501RR, Asgrow H7242, Benning, Northrup King NKS 76L9, Northrup King NK-74M3, Northrup King NK-77T7, Northrup King NK-78G6, Pioneer 97M50, Southern States RT7270NRR, USG 7732nRR, Vigoro V74N9, Woodruff

Group VIII: Northrup King NKS 80P2, Prichard RR

*** Soybean varieties not included in this list have not been adequately evaluated by UGA.*

*** Rates tested in these studies include the following: Boundary 6.5EC at 24 oz/A; Canopy 75DG at 6 oz/A; Tricor/Metribuzin 75DG at 5.3 oz/A.*

*** Metribuzin herbicides are NOT recommended for use on sands or other coarse soils with less than 1% OM.*

****METRIBUZIN HERBICIDE SHOULD NOT BE USED ON THE FOLLOWING SOYBEAN VARIETIES: AGS LL591L, Southern States LL511N and LL595N; AG6730; AG6130*

SULFONYL-UREA TOLERANT (STS)/SULFONYL-UREA READY (SR) SOYBEAN VARIETIES

Asgrow: AG4135-GENRR2Y/SR; AG4232-GENRR2Y/SR; AG4531-GENRR2Y/SR; AG4533-GENRR2Y/SR; AG4632-GENRR2Y/SR; AG4730-GENRR2Y/SR; AG4831-GENRR2Y/SR; AG4835-GENRR2Y/SR; AG4934-GENRR2Y/SR; AG5233-GENRR2Y/SR; AG5335-GENRR2Y/SR; AG5533-GENRR2Y/SR; AG5632-GENRR2Y/SR; AG5732-GENRR2Y/SR; AG5935- GENRR2Y/SR

Northrup King: NKS45-R7 (GENRR2/STS); NKS46-Q6 (GENRR2/STS); NKS48-P4(GENRR2/STS); NKS54-V4(RR/STS)

Pioneer: 95M60 (RR/STS); 95Y70 (RR/STS)

Southern States: SS4215NS-R2; SS4714NS-R2; SS4725NS-R2; SS4915NS-R2; SS5200-STS (CONVENTIONAL); SS5216NS-R2; SS5914NS – LL/STS; LL6314S – LL/STS; SS7215NS-R2

SUGARCANE WEED CONTROL

Eric P. Prostko, Extension Agronomist – Weed Science

HERBICIDE	MOA	BROADCAST RATE/ACRE		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PREEMERGENCE					
<i>pendimethalin</i> Prowl/Pendimax 3.3EC Prowl H ₂ O 3.8 ACS	3	4.8 pt 4.2 pt	2	24 H/ 90 D	For annual grasses and small-seeded broadleaf weeds. Apply to loosened beds and incorporate into top 1-2" of soil within 7 days after application with rainfall, irrigation, or mechanical methods.
<i>trifluralin</i> Treflan, Trilin, others 4EC	3	2 pt	1	12 H/ --	For annual grasses and small-seeded broadleaf weeds. Apply in the fall on firmly packed beds immediately after planting or in the spring before and/or just after cane emerges. Incorporate 2-3" but be careful not to damage seed pieces or emerging shoots.
<i>atrazine</i> AAtrex, Atrazine 80W AAtrex Nine-O 90W AAtrex, Atrazine 4L	5	2.5 lb 2.2 lb 2 qt	2	12 H/ --	For broadleaf weeds. Apply at planting time or ratooning, but before sugarcane emerges. One additional application may be made over the top of the sugarcane as it emerges. Two additional directed spray applications may be made after emergence. Do not apply after canopy closure or more than 4 lb ai/A atrazine in 1 year.
POSTEMERGENCE					
<i>2,4-D</i> various brand names 3.8 lb/gal	4	32 oz	0.95	48 H/ Crop Maturity	For broadleaf weeds. Apply after cane emergence through lay-by. Only 1 POST application can be made per crop cycle.
<i>dicamba</i> Banvel/Clarity/Sterling/Vision 4 lb/gal	4	8-32 oz	0.25-1	24 H/ 87 D	For annual and perennial broadleaf weeds. Can be applied any time after weed emergence but before the close-in stage of sugarcane. When possible, apply as a directed spray beneath the sugarcane canopy especially when used at higher rates (32 oz/A).

(Weed Response— Refer to weed response table for corn or soybeans.)

SUNFLOWER: *SUNFLOWER INSECT CONTROL*

David Buntin, Research/Extension Entomologist

PEST	INSECTICIDE	MOA	FORMULATION AMOUNT PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Soil Insects: wireworms, seedcorn maggot, sunflower beetle	<i>imidacloprid</i> Gaucho 600, Attendant 600, Acceleron, others	4C	0.25-0.50 mg ai/seed		12 H/ --	Available as commercial seed treatment with various fungicides. May also provide control of flea beetles on seedling plants.
	<i>thiamethoxam</i> Cruiser 5FS	4C	0.25 mg ai/seed	--	12 H/ --	
Sunflower moth	<i>alpha-cypermethrin</i> Fastac 0.83	3A	2.2-3.8 fl oz	0.012-0.025	12 H/ 30 D	<p>WHEN TO TREAT FOR SUNFLOWER INSECTS</p> <p>SUNFLOWER MOTH: Treat when 20% of heads are blooming and moths (silver-gray, narrow bodied, about 1/4" long) and small larvae are present on the heads. Larvae are 5/8-3/4" long when mature, with yellowish green sides and have 5 brown to black longitudinal stripes down the back. Make 2 additional applications at 5-day intervals if moths and larvae continue to be found.</p> <p>NOTE: Some products listed may be toxic to pollinating bees. When applying insecticides during flowering, apply very early in the day or late in the day when bees are less active. Notify beekeepers with hives near the field(s) to be treated. Review the product label for any additional pollinator protection precautions</p>
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3A	2-2.8 fl oz	0.0155-0.022	12 H/ 30 D	
	<i>chlorpyrifos</i> Lorsban, Chlorpyrifos, Nufos, other brands 4E	1B	1-1.5 pt	0.5-0.75	24 H/ 42 D	
	<i>cyfluthrin</i> Tombstone 2	3A	2-2.8 fl oz	0.031-0.044	12 H/ 30 D	
	<i>deltamethrin</i> Delta Gold 1.5EC	3A	1-1.5 fl oz	0.012-0.018	12 H/ 21 D	
	<i>esfenvalerate</i> Asana XL 0.66EC Adjourn 0.66EC		5.8-9.6 fl oz 5.8-9.6 fl oz	0.03-0.05 0.03-0.05	12 H/ 28 D	
	<i>flubendiamide</i> Belt 4	28	2-3 fl oz	0.625-0.094	12 H/ 14 D	
	<i>gamma cyhalothrin</i> Declare 1.25 Proaxis 0.5	3A	1.02-1.54 fl oz 2.56-3.84 fl oz	0.01-0.015 0.01-0.015	24 H/ 45 D	
	<i>lambda cyhalothrin</i> Karate Zeon 2.08 Warrior Silencer Lambda others 1	3A	1.28-1.92 fl oz 2.56-3.84 fl oz	0.02-0.03 0.02-0.03	24 H/ 45 D	
	<i>zeta-cypermethrin</i> Mustang Maxx 0.8 Respect 0.8	3A	2.24-4 fl oz	0.014-0.025	12 H/ 30 D	

SUNFLOWER INSECT CONTROL

PEST	INSECTICIDE	MOA	FORMULATION AMOUNT PER ACRE	LB ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Sunflower seed weevil (adult)	Apply esfenvalerate, beta-cyfluthrin, cyfluthrin, deltamethrin, chlorpyrifos, lambda/gamma cyhalothrin, or zeta-cypermethrin products at the rates listed for sunflower moth.					Control directed at adults before eggs are laid in seed. Consider treatment if 15-20 adults occur per head at about 85% bloom.
Sunflower stem weevil (adult)	Apply esfenvalerate, beta-cyfluthrin, deltamethrin, chlorpyrifos, lambda/gamma cyhalothrin, or zeta-cypermethrin products at the rates listed for sunflower moth.					Adult weevils feed on leaves and lay eggs in stem. Larvae feed inside stem and sometimes kill stem above infestation. Direct sprays at adult weevils when there is 1 adult per plant. Check plants from seedling to 6-8 leaf stage. Larvae inside stems cannot be controlled.
Corn earworm	The materials listed for sunflower moth will give helpful control. Use highest labeled rate					CORN EARWORM, FALLARMYWORM: Control these at any time when more than 1/head is found while seeds are small and developing. In late season when seeds are maturing, it probably takes 2 or more of these insects per head before control is needed.
Fall armyworm	Chlorpyrifos as listed for sunflower moth will give helpful control.					
Grasshoppers	Apply esfenvalerate, beta-cyfluthrin, deltamethrin, chlorpyrifos, lambda/gamma cyhalothrin, or zeta-cypermethrin products at the rates listed for sunflower moth.					Treat if defoliation exceeds 15% and grasshoppers are numerous. May occur mostly on the field edge.
Stink bugs, leaffooted bugs	Apply gamma cyhalothrin or lambda cyhalothrin products as listed for sunflower moth.					STINK BUGS, LEAFFOOTED BUGS: Control these at any time when more than 1/head is found while seeds are small and developing. In late season when seeds are maturing, it probably takes 2 or more of these insects per head before control is needed.
Premixed or Co-Packed Insecticides: Products listed are available as premixes or co-packages of 2 insecticide active ingredients. User should check mixture labels for active ingredient, specific use rates, target pests, and precautions.						
BRAND NAME (ACTIVE INGREDIENTS)				RANGE OF FORMULATION RATES		
Besiege (lambda cyhalothrin, chloantraniliprole)				5-10 fl oz/A		
Cobalt Advanced (chlorpyrifos, gamma-cyhalothrin)				6-38 fl oz/A		
Stallion (chlorpyrifos, zeta-cypermethrin)				3.75-11.75 fl oz/A		

SUNFLOWER WEED CONTROL

Eric P. Prostko, Extension Agronomist – Weed Science

		BROADCAST RATE/ACRE			
HERBICIDE	MOA	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
PREPLANT SOIL INCORPORATED					
<i>ethalfuralin</i> Sonalan 3EC	3	1.5-2 pt	0.6-0.75	24 H/ NL	For annual grass and small seeded broadleaf weed control. Soil incorporate 2-3" deep within 48 hours of application.
<i>pendimethalin</i> Prowl/Pendimax 3.3EC	3	1.2-2.4 pt	0.5-1	24 H/ NL	For annual grass and small seeded broadleaf weed control. Soil incorporate 2" deep within 7 days of application. Can also be applied preemergence after planting but before crop/weed emergence.
Prowl H ₂ O 3.8ACS		1.5 pt	0.71		
<i>S-metolachlor</i> Dual Magnum, Brawl, others	15	1-1.33 pt	0.96-1.27	24 H/ NL	For annual grass and small seeded broadleaf control. Soil incorporate into top 2" of soil. Can also be applied preemergence after planting but before crop/weed emergence.
<i>trifluralin</i> Treflan, Trilin, etc. 4EC	3	1-1.5 pt	0.5-0.75	--	For annual grass and small seeded broadleaf weed control. Soil incorporate 2-3" deep within 24 hours of application.
PREEMERGENCE					
<i>sulfentrazone + carfentrazone</i> Spartan Charge 3.5L	14 + 4	3.75-5 oz	0.092-0.123 + 0.010-0.014	12 H/ NL	Will provide control of pigweed, morningglory, prickly sida, and several other small-seeded broadleaf weeds. Can be tank-mixed with Prowl or Dual. Can be applied until 3 days after planting. However, do not apply after sunflower emergence, at cracking, or if emerging seedling is close to the soil surface. Do not use on soils classified as sand, which have less than 1% OM. Rotation Restrictions: canola-24 months; field corn-4 months; cotton-18 months; peanuts-anytime; small grains-4 months; sorghum-10 months; soybeans-anytime; tobacco-anytime.
<i>sulfentrazone + s-metolachlor</i> BroadAxe 7EC	14 + 15	19-21 oz	0.104-0.115 + 0.94-1.03	24 H/ NL	Apply preemergence until 3 days after planting. Plant sunflowers at least 1.5" deep. On coarse soils with less than 1.5% OM, delay planting for 7 days. Do not use on soils classified as sand which have less than 1% OM. Can also be applied PPI. Crop rotation restrictions: field corn-10 months; sweet corn-18 months; cotton-18 months; peanuts-4 months; rye-4.5 months; sorghum-10 months; soybean-anytime; sunflowers-anytime; tobacco-10 months; tomato-4 months; wheat-4.5 months.
POSTEMERGENCE					
<i>clethodim</i> Select, Arrow, others 2EC	1	6-16 oz	0.09-0.25	24 H/ 70 D	For annual and perennial grass control. Include crop oil concentrate at 1% v/v (Select/Arrow). A NIS (0.25% v/v) can be used with Select Max /TapOut. Rain-free period is 1 hour.
Select Max / TapOut 0.97EC		12-32 oz			
<i>sethoxydim</i> Poast 1.5EC	1	1-1.5 pt	0.2-0.3	12 H/ 70 D	For annual grass control, apply at 1 pt/A when grasses are small. For johnsongrass, apply at 1.5 pt/A when grass is 12-20" tall. Include crop oil concentrate at 1% v/v with all applications. Do not use on sunflower inbred lines grown for seed. Poast Plus is not registered for use on sunflowers. Rain-free period is 1 hour.

SUNFLOWER WEED CONTROL

		BROADCAST RATE/ACRE			
HERBICIDE	MOA	AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
POSTEMERGENCE					
<i>quizalofop</i> Assure II 0.88EC	1	5-12 oz	0.03-0.08	12 H/ 60 D	For annual and perennial grass control. May be slightly less effective on Texas panicum than other POST grass herbicides. Include a NIS at 0.25% v/v or COC at 1% v/v. The maximum total use rate of Assure II is 18 oz/A/season. Unacceptable crop injury may occur if Assure II is applied under stress conditions (drought, abnormal weather patterns, water saturated soils, etc.). Delay applications until the stress passes and sunflowers have resumed growth. Rain-free period is 1 hour.
<i>imazamox</i> Beyond IAS	2	4 oz	0.031	4 H/ NL	ONLY FOR USE ON CLEARFIELD TOLERANT SUNFLOWER HYBRIDS. Do not use Beyond on conventional hybrids or severe crop injury will occur! Apply to sunflowers in the 2-8 leaf stage but before broadleaf weeds exceed 3" in height and grasses exceed 4-5 leaves. Refer to label for a list of specific weeds controlled. Beyond is not effective on sicklepod. Use a NIS (0.25%v/v) and nitrogen fertilizer such as 28% UAN (2.5% v/v) or AMS (12-15 lb/100 gals). Do not use a COC. Weed control will be improved if Beyond is used following a soil-applied herbicide. Crop rotations restrictions for Beyond are as follows: wheat-3 months; barley, rye-4 months; field corn-8.5 months; cabbage, cantaloupe, carrot, cotton, cucumber, grain sorghum, oats, onion, peanut, pepper, tobacco, tomato, turnip, watermelon-9 months. Rain-free period is 1 hour.
HOODED SPRAYER					
<i>carfentrazone</i> Aim 2EC	14	1-2 oz	0.156-0.031	12 H/ NL	Apply in a hooded-sprayer to control certain broadleaf weeds in sunflower row middles. Severe crop injury will occur if Aim is allowed to come into contact with green stems, blooms or fruit! Hooded sprayer should not be operated at speeds in excess of 5 mph. Use in combination with a NIS (0.25% v/v) or COC (1% v/v). Applications should be made before weeds exceed 4" in height. May be very useful for pigweed, annual morningglory (except smallflower), and tropical spiderwort control. Rain-free period is 6-8 hours.
HARVEST-AID/WEED DESICCATION					
<i>paraquat</i> Gramoxone Inteon/ Gramoxone SL 2 lb/gal Firestorm/Parazone/Helmquat 3 lb/gal	22	1.2-2 pt 0.8-1.3 pt	0.30-0.50	24 H/ 7 D	Apply when sunflowers are mature (35% moisture or less) for desiccation of weeds. Ground or air application permitted. Include nonionic surfactant at 0.25% v/v (1 qt/100 gal). Do not graze treated areas or feed treated forage to livestock. Rain-free period is 30 minutes.
<i>glyphosate</i> Roundup PowerMax 5.5 lb/gal	9	22 oz	0.95	4H/ 7D	Apply when backsides of sunflower heads are yellow and bracts are turning brown, and seed moisture is less than 35%. If hard water is used as the carrier (i.e. Ca+, K+, Na+ , etc), use in combination with AMS (8.5-17 lb/100 gals or liquid equivalent). Not all formulations of glyphosate are labeled for this use.

(Weed Response — Refer to weed response table for soybeans.)

TOBACCO: TOBACCO PLANT BED INSECT CONTROL

J. Michael Moore, Extension Agronomist - Tobacco

INSECT	MOA	CHEMICAL	RATE PER 100 SQ YD	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Aphids, flea beetles (preventive control)	1B	<i>disulfoton</i> Di-Syston 15G	9 oz	48 H/ NA	Apply granules broadcast just before seeding or over top of small plants—water in immediately. Do not exceed recommended rate.
Aphids, flea beetles or vegetable weevils	1B	<i>acephate</i> Orthene 75S Acephate 75SP Orthene 97PE	1 Tbsp in 1 gal water (1 lb/A) 0.75 Tbsp in 1 gal water (12 oz/A)	24 H/ 3 D	Apply to foliage as needed.
Budworms	1B	<i>acephate</i> Orthene 75S Acephate 75SP Orthene 97PE	1 Tbsp in 1 gal water (1 lb/A) 0.75 Tbsp in 1 gal water (12 oz/A)	24 H/ 3 D	Apply to foliage as needed.
Cutworms	1B	<i>acephate</i> Orthene 75S Acephate 75SP Orthene 97PE	1 Tbsp in 1 gal water (1 lb/A) 0.75 Tbsp in 1 gal water (12 oz/A)	24 H/ 3 D	Apply to foliage in late afternoon or at dusk. Scatter bait evenly at dusk around margins, walkways and open spaces in bed. Keep off plants as much as possible.
	1A	<i>carbaryl</i> Sevin 5% B	0.5-1 lb	12 H/ 0 D	
Green June beetle grubs	1A	<i>carbaryl</i> Sevin XLR Plus	5.5 oz in 50-100 gal water	12 H/ 0 D	Apply only to uprooted areas of bed.
Mole Crickets	1A	Carbaryl 5%B as applied for cutworms gives helpful control.		12 H/ 0 D	See remarks under cutworms.
Slugs and snails	5B	<i>metaldehyde</i> Deadline Bullets	1 lb/1,100-3,600 sq ft	12 H/ 0 D	Scatter bait evenly at dusk around margins, walkways and open spaces in bed. Do not apply directly to plants

INSECT CONTROL IN TOBACCO TRANSPLANTS GROWN IN GREENHOUSES

J. Michael Moore, Extension Agronomist - Tobacco

INSECT	MOA	CHEMICAL	RATE PER 100 SQ YD	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Aphids, cutworms, or flea beetles	1B	<i>acephate</i> Orthene75S Acephate 75SP Orthene 97PE	1 Tbsp in 3 gal of water 0.75 Tbsp in 3 gal water	24 H/ 3 D	Apply to foliage as a spray. Do not apply through an irrigation system. Over application can cause plant injury.
Aphids or flea beetles	4A	<i>imidacloprid</i> Admire Pro 4.6 Alias and others 2F	0.45-0.6 oz/1000 plants 1-1.4 oz/1000 plants	12 H/ 14 D	To control aphids or flea beetles in the field, apply as a drench to trays or flats not more than 7 days prior to transplanting. Water in immediately, using sufficient water volumes to remove any white residue from foliage.
	4A	<i>thiamethoxam</i> Platinum and T-Moxx 2SC	0.8-1.3 oz/1000 plants	12 H/ 14 D	
Slugs and snails	5B	Metaldehyde Deadline Bullets	1 lb/1,100 - 3,600 sq ft	12 H/ Day of harvest	Apply to margins, walkways and vacant areas at dusk. Do not apply to float water or directly to plants.
Mole crickets or wireworms Wireworms (only)	4A	<i>imidacloprid</i> Admire Pro 4.6 Alias and others 2F	0.6-1.2 oz/1000 plants 1.4-2.8 oz/1000 plants	12 H/ 14 D	To control mole crickets or wireworms in the field, apply as a drench to trays or flats prior to transplanting. Water in immediately, using sufficient water volumes to remove any white residue from foliage. To control wireworms in the field, apply as a drench to trays or flats prior to transplanting.
	4A	<i>thiamethoxam</i> Platinum and T-Moxx 2S	1.3 oz/1000 plants	12 H/ 14 D	

TOBACCO GREENHOUSE TRAY SANITATION

J. Michael Moore, Extension Agronomist - Tobacco

DISEASE	MOA	CHEMICAL	RATE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Rhizoctonia, Sclerotinia and Pythium	8A	<i>methyl bromide</i> 98%	3 lb/1000 cu ft	24 H/ 21 D	Stack polystyrene trays loosely with sticks separating trays after every 10 trays in the stack to improve movement of the gas into the trays. Release gas into and maintain a closed environment (plastic tarp or other container) for at least 72 hours when air temperature is at least 50° F. Greenhouses should not be used as fumigation chambers as they cannot be properly sealed. Trays should be ventilated prior to filling with media. Proper precautions should be taken to avoid worker injury from remaining gas when the cover is opened.
Rhizoctonia, Sclerotinia and Pythium		Steam	160°F-175°F for 30 minutes		Excessive heat for an extended period of time can cause trays to be brittle and warped resulting in problems during mechanical seeding.

TOBACCO GREENHOUSE DISEASE CONTROL

J. Michael Moore, Extension Agronomist - Tobacco

DISEASE	MOA	CHEMICAL	RATE PER 1000 SQ FT	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Blue Mold, Rhizoctonia (Damping Off & Target Spot)	M3	<i>mancozeb</i> Dithane DF	0.5 lb (1 level Tsp/gal)	24 H/ 21 D	Use 0.5 lb per 100 gallons of water. Spray to run-off (3 gal/1000 sq ft) every 5-7 days when plants reach dime size (0.5-1" tall). Gradually increase the spray volume to 6-12 gal/1000 sq ft as plants enlarge until transplanting to the field.
	11	<i>azoxystrobin</i> Quadris F	0.14 oz (4 ml)	12 H/ 100 D	This application is allowed by GA 24c Labeling. Apply in enough water for thorough coverage (5 gal/1000 sq ft). Make only one application prior to transplanting. Additional field applications may be made according to the Quadris federal label.
Pythium	14	<i>etrudiazole</i> Terramaster 35 WP Terramaster 4 EC	2 oz 1 fl oz	12 H/ 3 D	Mix Terramaster per 100 gal of water 2-3 weeks after seeding and again up to 8 weeks after seeding as needed. Mix Terramaster with water in a bucket and add to float water while providing thorough mixing. A sequential application may be made three weeks after the initial application as needed.
If Pythium shows up, a second treatment can be made up until 8 weeks after seedling. The plant producer assumes all responsibility for any stunting or plant injury that may occur.					

TOBACCO FIELD INSECT CONTROL

J. Michael Moore, Extension Agronomist - Tobacco

INSECT	MOA	CHEMICAL	RATE PER ACRE	POUNDS ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Aphids	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	2/3-1 lb 8-12 oz 2/3-1 lb	0.5-0.75 0.5-0.73 0.5-0.75	24 H/ 3 D	Good coverage is essential for control for all products. The use of drop nozzles will improve control by depositing insecticides on the underside of the leaves where aphids feed. Do not apply bifenthrin later than layby and do not apply more than 0.2 lb ai/A/season. See Tobacco Field Disease Control Section for recommendations to suppress tomato spotted wilt virus with imidacloprid as a tray drench in the greenhouse.
	4A	<i>acetamiprid</i> Assail 80SG	1.5-4 oz	0.075-2	12 H/ 7 D	
	3	<i>bifenthrin</i> Brigade 2EC Capture LFR	2.56-6.4 oz 3.4-6.8 oz	0.04-0.10	12 H/ 30 D Capture = 12 H	
	4A/NC	<i>imidacloprid</i> Admire Pro	0.7-1.4 oz	0.025-0.05	12 H/ 30 D	
	1A	<i>methomyl</i> Lannate 90SP 2.4LV	0.5 lb 24 oz	0.45 0.45	7 D/ 30 D	
	9B	<i>pymetrozine</i> Fulfill 50WG	2.75 oz	0.09	12 H/ 14 D	
	4A	<i>thiamethoxam</i> Actara 25WG	2-3 oz	0.03-0.05	12 H/ --	
Aphids (transplant water treatment)	4A/nc	<i>imidacloprid</i> Admire Pro 4.6 Alias and others 2F	0.45-0.6 oz/1000 plants 1-1.4 oz/1000 plants	0.016-0.02/1000 plants 0.01-0.02/1000 plants	12 H/ 30 D	Apply in transplant water. Mix thoroughly. Use 100+ gal of water/A for optimum control. See Tobacco Field Disease Control Section for recommendations to suppress tomato spotted wilt virus with imidacloprid as a transplant water application.
	4A	<i>thiamethoxam</i> Platinum and T-Moxx 2SC	0.8-1.4 oz/1000 plants	0.013-0.022/1000 plants	12 H/ 14 D	
	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	1 lb 0.75 lb 1 lb	0.75 0.73 0.75	24 H/ 3 D	
Budworms	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	1 lb 12 oz 1 lb	0.75 0.73 0.75	24 H/ 3 D	Use 8-10 gal of spray/A, using 1 hollow-cone nozzle per row when tobacco is less than 12-14" high. For the remainder of the season, apply 20-40 gal of spray using 3 hollow cone nozzles per row. Operate equipment at 60 lb pressure and do not exceed 4 miles per hour. Apply uniformly in the root zone or poor performance will occur For best results apply when worms are very small (less than 1/4" long). Bt must be eaten by the insect to be effective. Worms will die several days after feeding. Coragen is labeled for a transplant water treatment to give systemic control of all worms (TBW, THW, Cutworms) Apply in 110 gal of transplant water/A. Maintain soil moisture conditions to improve Coragen uptake by the plants and improve worm control and longevity. Control may often be expected to extend 49 days after transplanting.
	3	<i>bifenthrin</i> Brigade 2EC Capture LFR	2.56-6.4 oz 6.8-8.5 oz	0.04-0.10 0.08-0.1	12 H/ 30 D Capture = 12 H	
	28	<i>chlorantraniliprole</i> Coragen 1.67	5-7.5 oz	0.065-0.098	4 H/ 1 day	
	6	<i>emamectin benzoate</i> Denim .16EC	8-12 oz	0.01-0.015	48 H/ 14 D	
	28	<i>flubendiamide</i> Belt SC	2-3 oz	0.06-0.09	12 H/ 14 D	

TOBACCO FIELD INSECT CONTROL

INSECT	MOA	CHEMICAL	RATE PER ACRE	POUNDS ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Budworms (continued)	1A	<i>methomyl</i> Lannate 90SP 2.4LV	0.5 lb 24 oz	0.45 0.45	48 H/ 5 D	
	5	<i>spinosad</i> Tracer 4SC Blackhawk	1.4-2.9 oz 1.6-3.2 oz	0.044-0.09 0.044-0.09	4 H/ 3 D	
	11	<i>Bacillus thuringiensis</i> Dipel ES Dipel DF Agree S Biobit XL Biobit HP Condor OF Crymax WDG Javelin WG Lepinox WDG	2 pt 0.5-1 lb 1-2 lb 3 pt 1 lb 1.6 qt 1-1.5 lb 1-1.25 lb 1-2 lb		4 H/ 0 D	
Cabbage looper	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	1 lb 12 oz 1 lb	0.75 0.73 0.75	24 H/ 3 D	Apply thoroughly. Good lower leaf coverage is essential for control. See remarks under Budworms.
	6	<i>emamectin benzoate</i> Denim .16EC	8-12 oz	0.01-0.015	48 H/ 14 D	
	28	<i>flubendiamide</i> Belt SC	2-3 oz	0.06-0.09	12 H/ 14 D	
	1A	<i>methomyl</i> Lannate 90SP 2.4LV	0.5 lb 24 oz	0.45 0.45	7 D. 14 D	
	11	<i>Bacillus thuringiensis</i> See rates for budworms	2-2.9 oz	0.063-0.09	4 H/ 0 D	For best results apply when worms are small (0.5" long or less). Bt must be eaten by the insect to be effective. Worms will die several days after feeding.
	5	<i>spinosad</i> Tracer 4SC Blackhawk	1.4-2.9 oz 1.6-3.2 oz	0.045-0.089	4 D/ 3 D	
Cutworms	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	1 lb 0.75 lb 1 lb	0.75 0.73 0.75	24 H/ 3 D	Apply 25-50 gal of spray ovetop of plants. Make application during late afternoon.
	3A	<i>bifenthrin</i> Brigade 2EC Capture LFR	4-6.4 oz 3.4-8.5	0.0625-0.10 0.04-0.1	24 H/ 3 D Capture = 12 H	Apply bifenthrin as a pre-transplant broadcast application incorporated into the top 4" of the soil and no more than 0.2 lb ai/A/season.
	28	<i>chlorantroniliprole</i> <i>Rynaxypyr</i> Coragen	5-7.5 oz	0.065-0.098	4 H/ 1 D	

TOBACCO FIELD INSECT CONTROL

INSECT	MOA	CHEMICAL	RATE PER ACRE	POUNDS ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Cutworms (continued)	1B	<i>chlorpyrifos</i> Lorsban Advanced, Chlorfos 15G 4E Lorsban Advanced	13.5-20 lb 2-3 qt 2 qt	2-3 2-3 2	24 H/ 35 D	
	28	<i>flubendiamide</i> Belt SC	2-3 oz	0.06-0.09	4 H/ 1 D	
Cutworms (transplant water treatment)	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	1 lb 0.75 lb 1 lb	0.75 0.73 0.75	24 H/ 3 D	Apply in transplant water. Mix thoroughly. No more than 0.2 lb ai/A of bifenthrin can be applied per season.
	3A	<i>bifenthrin</i> Brigade 2EC Capture LFR	4-6.4 oz 3.4-6.8 oz	0.0625-0.10 0.04-0.10	24 H/ 3 D Capture = 12 H	
Flea beetles (transplant water treatment)	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	1 lb 0.75 lb 1 lb	0.75 0.73 0.75	24 H/ 3 D	Apply in transplant water. Mix thoroughly.
	4A/NC	<i>imidacloprid</i> Admire Pro 4.6 Alias and Others 2F	0.45-0.6 oz/1000 plants 1-1.4 oz/1000 plants	0.016-0.02/1000 plants 0.016-0.02	12 H/ 30 D	
	4A	<i>thiamethoxam</i> Platinum and T-Moxx 2SC	0.8-1.3 oz/1000 plants	0.01-0.02/1000 plants	12 H/ 14 D	
Flea beetles	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate) 75SP	0.6 lb 0.5 lb 0.6 lb	0.5 0.5 0.5	24 H/ 3 D	Use lower rates for small plants. Use higher rates for large plants and thoroughly cover the lower leaves. Do not apply bifenthrin later than layby and do not apply more than 0.2 lb ai/A/season.
	3A	<i>bifenthrin</i> Brigade 2EC Capture LFR	2.56-6.4 oz 3.4-6.8 oz	0.04-0.10 0.04-0.10	24 H/ 3 D Capture = 12 H	
	1A	<i>carbaryl</i> Sevin 80S Sevin XLR Plus	1.25-2.5 lb 1-2 qt	1-2 1-2	12 H/ 0 D	
	4A/NC	<i>imidacloprid</i> Admire Pro 4.6	0.7-1.4 fl	0.025-0.05	12 H/ 30 D	
	4A	<i>thiamethoxam</i> Actara 25WG	2-3 oz	0.03-0.05	12 H/ 14 D	
	1A	<i>methomyl</i> Lannate 90SP 2.4LV	0.25-0.5 lb 12-24 oz	0.23-0.45 0.23-0.45	48 H/ 5 D	

TOBACCO FIELD INSECT CONTROL

INSECT	MOA	CHEMICAL	RATE PER ACRE	POUNDS ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Grasshoppers	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	0.3-0.6 lb 0.25-0.5 lb 0.3-0.6 lb	0.25-0.5 0.2-0.5 0.25-0.5	24 H/ 3 D	Apply thoroughly. Spraying around field borders may aid in preventing infestations. Do not apply bifenthrin later than layby and do not apply more than 0.2 lb ai/A/season.
	3A	<i>bifenthrin</i> Brigade 2EC Capture LFR	0.56-6.4 oz 3.4-6.8 oz	0.04-0.10 0.04-0.10	24 H/ 3 D Capture = 12 H	
	1A	<i>carbaryl</i> Sevin 80S 4F Sevin XLR Plus	0.625-1.875 lb 0.5-1.5qt 0.5-1.5 qt	0.5-1.5 0.5-1.5 0.5-1.5	12 H/ 0 D	
Hornworms	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	0.6 lb 0.5 lb 0.6 lb	0.5 0.5 0.5	24 H/ 3 D	Apply thoroughly. Good coverage is essential for control. See remarks under Budworms.
	3A	<i>bifenthrin</i> Brigade 2EC Capture LFR	2.56-6.4 oz 6.8-8.5 oz	0.04-0.10 0.08-0.10	24 H/ 3 D Capture = 12 H	Do not apply bifenthrin later than layby and do not apply more than 0.2 lb ai/A/season.
	1A	<i>carbaryl</i> Sevin 80S Sevin XLR Plus	1.25-2.5 lb 1-2 qt	1-2 1-2	12 H/ 0 D	
	28	<i>chlorantraniliprole</i> Coragen 1.67	5-7.5 oz	0.065-0.098	4 H/ 1 day	
	6	<i>emamectin benzoate</i> Denim .16EC	8-12 oz	0.01-0.015	48 H/ 14 D	
	28	<i>flubendiamide</i> Belt SC	2-3 oz	0.06-0.09	12 H/ 14 D	
	3	<i>lambda-cyhalothrin</i> Warrior 1CS	1.9-3.8 oz	0.015-0.03	24 H/ 40 D	Do not apply lambda-cyhalothrin fewer than 40 days to harvest. Although labeled for budworm control this product is not recommended due to the presence of resistance in the budworm population in Georgia. Bt must be eaten by the insect to be effective. Worms will die several days after feeding.
	1A	<i>methomyl</i> Lannate 90SP 2.4LV	0.25-0.5 lb 12-24 oz	0.23-0.45 0.23-0.45 0.044-0.09	48 H/ 5 D	
	5	<i>spinosad</i> Tracer 4SC Blackhawk	1.4-2.9 oz 1.6-3.2 oz	0.045-0.089	4 D/ 3 D	
	11	<i>Bacillus thuringiensis</i> Dipel ES Dipel DF Agree S Biobit XL Biobit HP Condor OF Crymax WDG Javelin WG Lepinox WDG	0.5-1 pt 0.25-0.5 lb 1-2 lb 0.5-1 pt 0.25-0.5 lb 0.6-1 qt 0.5-1.5 lb 1-1.25 lb 1-2 lb		4 H/ 0 D	

TOBACCO FIELD INSECT CONTROL

INSECT	MOA	CHEMICAL	RATE PER ACRE	POUNDS ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Mole crickets	3A	<i>bifenthrin</i> Brigade 2EC Capture LFR	4-6.4 oz 3.4-6.8 oz	0.0625-0.10 0.04-0.10	24 H/ 3 D Capture = 12 H	Apply broadcast to the soil surface one week before transplanting and mix into the top 3-6" of soil immediately. Do not apply more than 0.2 lb ai/A of bifenthrin/season. Lorsban Advanced use rates are in excess of the product label and are supported by a GA 24c.
	1B	<i>chlorpyrifos</i> Chlorfos 4E	2-3 qt	2-3	24 H/ 3 D	
		<i>chlorpyrifos</i> Lorsban Advanced	2 qt	2		
	1B	<i>ethoprop</i> Mocap 6EC	1-2 gal	6-12	48 H/ NA	
Stink bugs	1B	<i>acephate</i> Orthene 75S Orthene 97PE Acephate 75SP	0.6-1 lb 0.5-0.75 lb 0.6-1 lb	0.5-0.75 0.5-0.73 0.5-0.75	24 H/ 3 D	Apply in sufficient water to give thorough coverage.
	3A	<i>Bifenthrin + imidacloprid</i> Brigadier 2SC	2.56-6.4 oz	0.04-0.10	12 H/ --	Do not apply after layby.
	3A	<i>bifenthrin</i> Brigade 2EC Capture LFR	2.56-6.4 oz 3.4-6.8 oz	0.04-0.10 0.04-0.10	24 H/ 3 D Capture = 12 H	Do not apply after layby.
Thrips		The foliar treatments for flea beetles give helpful control.				See Tobacco Field Disease Control Section for recommendations to suppress tomato spotted wilt virus with imidacloprid. Thrips are the vector for this disease.
Tobacco splitworm or potato tuberworm (transplant water treatment)	Timely foliar sprays of bifenthrin, l-cyhalothrin or chlorantraniliprole (also can be applied in transplant water) provide some control. See hornworm control for rates when applying foliar applications.					
	28	<i>chlorantraniliprole</i> Coragen 1.67	5-7.5 oz	0.065-0.098	4 H/ 1 day	Apply transplant water uniformly in the root zone or poor performance will occur.
Wireworms	3A	<i>bifenthrin</i> Brigade 2EC Capture LFR	4-6.4 oz 3.4-6.8 oz	0.0625-0.10 0.04-0.1	24 H/ 3 D Capture = 12 H	Apply all insecticides to the soil surface 1-2 weeks before transplanting and mix into the top 3-6" of soil immediately. Bifenthrin can also be applied at these rates as a transplant water treatment instead of a broadcast application. Lorsban Advanced use rates are in excess of the product label and are supported by a GA 24c.
	1A	<i>carbofuran</i> Furadan 4F	1.5 gal	6	48 H/ apply before transplanting	
	1B	<i>chlorpyrifos</i> Lorsban Advanced, Chlorfos 15G 4E Lorsban Advanced	13.5-20 lb 2-3 qt 2 qt	2-3 2-3 2	24 H/ 3 D	Broadcast treatment for wireworm control only. Use 1-2 gal of Mocap 6EC for both nematode and wireworm control.
	1B	<i>ethoprop</i> Mocap 6EC	1.3 qt	2	48 H/ NA	

TOBACCO FIELD INSECT CONTROL

INSECT	MOA	CHEMICAL	RATE PER ACRE	POUNDS ACTIVE INGREDIENT PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
(transplant water treatment) Mole crickets or wireworms	3A	<i>bifenthrin</i> Brigade 2EC Capture LFR	4-6.4 oz 3.4-6.8 oz	0.0625-0.10 0.04-0.10	24 H/ 3 D Capture = 12 H	Apply in transplant water. Mix thoroughly. Do not apply more than 0.2 lb ai/A of bifenthrin/season.
Wireworms (only)	4A	<i>imidacloprid</i> Admire Pro 4.6 Alias and Others 2F	0.6-1.2 oz/1000 plants 1.4-2.8 oz/1000 plants	0.02-0.04/1000 plants 0.02-0.04/1000 plants	12 H/ 30 D	Timely foliar sprays prior to layby of Brigade and Warrior can provide some control. See hornworm control for rates
	4A	<i>thiamethoxam</i> Platinum and T-Moxx 2SC	1.3 oz/1000 plants	0.02/1000 plants	12 H/ 14 D	

TOBACCO WEED CONTROL

(Flue-Cured)

J. Michael Moore, Extension Agronomist – Tobacco

TIMING	MOA	BROADCAST RATE/ACRE			REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		HERBICIDE	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT/A		
Plant Bed (for control of soil fungi, bacteria, nematodes, insects and weeds)	8A	Methyl Bromide 98%	9 lb/100 sq yd	8.82/sq yd	12 H/ 2 D	Apply methyl bromide when soil temperature is above 50°F. Cans: Release gas under plastic covering. Plastic should be sealed around the edges with soil. Leave covered for 24 hours. Seed bed after 72 hours of aeration. Cylinders: Inject into well prepared soil with chisel applicators. Cover immediately with plastic and seal all edges. Leave covered for 48 hours. Remove cover to provide sufficient aeration 72 hours prior to seeding.
		Methyl Bromide 68.6%	10-12 lb/100 sq yd	6.8-8.2 /sq yd		
	27	<i>metham-sodium</i> Vapam	1-1.5 gal/100 sq yd		5 D/ --	A. Spray Vapam on moist soil surface, incorporate 6" deep with Methyl Bromide. B. After treatment, wait 7 days before punching holes in plastic. C. After punching, wait 14-21 days before seeding.
	27	<i>metham-sodium</i> Vapam + <i>1-3D + chloropicrin</i> Telone C-17	37.5 gal/A + 10 gal/A		5 D/ --	A. Spray Vapam on moist soil surface, chisel in Telone C-17, incorporate/seal by tiller(6" deep) behind chisels, and cover with plastic all in a single operation as with Methyl Bromide. B. After treatment, wait 7 days before punching holes in plastic. C. After punching, wait 14-21 days before seeding.
(for post emergence control of grasses)	1	<i>sethoxydim</i> Poast 1.5 lb/gal	1 pt (0.33 fl oz/100 sq yd)	0.19	12 H/ 42 D	Addition of a non-phytotoxic oil concentrate at 1 qt/A (0.67 fl oz/100 sq yd) is required. Allow plants to completely dry before covering, especially with plastic.
Preplant	13	<i>clomazone</i> Command 3ME 3 lb/gal	2-2.66 pt/A	0.75-1	12 H/ 65 D	Apply Command as a broadcast spray at low pressure and large droplet size. Incorporate to a depth not to exceed 1" prior to transplanting. Transplant roots should be placed below the treated area. Off-site movement of spray drift or vapors of Command can cause foliar whitening or yellowing of some plants (fruit and nut trees, berries, roses, other landscape plants and greenhouse plants). Temporary whitening and/or yellowing of the treated crop and rotational crops may occur. The crop should grow through this with no adverse impact. Do not plant small grain for grain less than 12 months after application of Command. Do not graze treated areas for 9 months.
	3	<i>isopropalin</i> Paarlan 6E 6 lb/gal	1 qt	1.5	24 H/ --	Apply and soil incorporate within 14 days prior to transplanting. Prior to bedding, apply and soil incorporate either Paarlan, Prowl or Devrinol with a power-driven rotary tiller set to cut 4" deep or incorporate by disking and cross disking with a disk harrow set to cut 4-6" deep. If applied to preformed beds, "board off" to planting level and incorporate with a power-driven rotary tiller set to cut 4" deep.
	3	<i>pendimethalin</i> Prowl 3.3E Pendimax Repose Acumen 3.3 lb/gal Prowl H2O 3.8 EC	1.8-2.4 pt 1.8-2.4 pt 1.8-2.4 pt 1.8-2.4 pt 3.8 lb/gal	0.75-1	24 H/ --	

TOBACCO WEED CONTROL (Flue Cured)

TIMING	MOA	BROADCAST RATE/ACRE			REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		HERBICIDE	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT/A		
Preplant (continued)	17	<i>napropamide</i> Devrinol 50W Devrinol 2E	2-4 qt 2-4 qt	1-2	24 H/ --	Devrinol is for field use only. Not labeled for tobacco seedbeds due to plant injury.
	8	<i>pebulate</i> Tillam 6E	5 pt 5 fl oz	4	12 H/ --	Tillam should be used if nutsedge is a problem in the field. Apply and incorporate immediately either before or after bedding as discussed above. If possible, apply Tillam at least 2 days before transplanting.
	8	<i>pebulate</i> 4.0 Tillam 6E 6 lb/gal + <i>napropamide</i> Devrinol 50W Devrinol 2E	5 pt 5 fl oz + 2 lb 2 qt	4 + 1	12 H/ --	Tillam and Devrinol may be tank-mixed to provide control of nut-sedge and many annual grasses and some broadleaf weeds. Apply and incorporate immediately either before or after bedding as discussed above. If possible, apply this combination at least 2 days before transplanting.
Pretrans-Plant (surface application only)	14	<i>sulfentrazone</i> Spartan 4F Blanket 4F 4 lb ai/gal	8 oz	0.25	12 H/ --	DO NOT INCORPORATE !! CALIBRATION IS IMPORTANT !!
	4 + 14	<i>carfentrazone-ethyl</i> + <i>sulfentrazone</i> Spartan Charge 0.35 + 3.15 lb ai/gal	5.7-10.2 oz	0.016-0.028 + 0.157-0.25	12 H/ --	Application rate for Spartan Charge and Spartan DF should be limited to 0.25 lb ai/A (10.2 oz Spartan Charge; 8 oz Spartan 4F) . Excessive application rates or poor calibration may result in injury to the tobacco. Spartan Charge and Spartan 4F should not be applied to soils classified as sand with less than 1% organic matter and shallow groundwater. Most Georgia tobacco soils would make the loamy sand or sandy loam categories of coarse textured soils. Application methods should be directed toward applying and maintaining the chemical at the soil surface. Spartan may be surface applied up to 14 days prior to transplanting after all other soil incorporation practices have been performed where transplanting occurs without bedding. If beds are formed prior to transplanting, the top of the beds should be dragged or knocked off prior to application of Spartan . Transplant into the treated bed without pushing additional soil from the bed. Spartan should not be incorporated into the bed greater than 2". DO NOT APPLY SPARTAN or SPARTAN CHARGE POST-TRANSPLANT OVER THE TOP OF TOBACCO AS CROP INJURY MAY OCCUR. Rotational Guidelines limit recropping treated soil to: wheat-4 months, field corn-10 months, cotton-18 months, canola-24 months. Although recropping to vegetables is not mentioned on the label, the limited information available would discourage recropping treated soil to most vegetables in less than 12 months after treatment.
Post Transplanting – with hooded or shielded sprayer	17	<i>napropamide</i> Devrinol 50W	2-4 lb	1-2	24 H/ --	Apply directly over the top of tobacco immediately after transplanting to control weeds before they emerge. Irrigate with 0.5" of water if no rainfall occurs within 3-4 days. Refer to Remarks for Command under the Preplant section for comments on application, off-site movement and rotation. Tender plant bed plants and particularly greenhouse plants have been shown to be very sensitive to Command and some leaves may turn white for a short period of time. This does not usually cause a reduction in yield and has not been widely observed in Georgia.
	13	<i>clomazone</i> Command 3ME 3 lb/gal	2-2.66 pt/A	0.75-1	12 H/ 65 D	

TOBACCO WEED CONTROL (Flue Cured)

TIMING	MOA	BROADCAST RATE/ACRE			REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		HERBICIDE	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT/A		
Post Transplanting (continued) – with hooded or shielded sprayer	14	<i>sulfentrazone</i> Spartan 4F Blanket 4F 4 lb ai/lb	8 oz	0.25	12 H/ --	Based on the results of accumulated work in Georgia Spartan 4F or Spartan Charge has received 2 (ee) labeling providing for the application of Spartan 4F or Spartan Charge with a shielded sprayer within 7 days after transplanting but prior to weed emergence and cultivation.
	4 + 14	<i>carfentrazone-ethyl</i> + <i>sulfentrazone</i> Spartan Charge 0.35 + 3.15 lb ai/gal	5.7-10.2 oz	0.016-0.028 + 0.157-0.25	12 H/ 6 D	Tobacco transplants should be protected from Spartan 4F or Spartan Charge spray using an appropriately shielded sprayer. Apply Spartan 4F or Spartan Charge solution to provide coverage of all row-bed surfaces excluding 4" on both sides of the tobacco transplants (8" band). Cultivate tobacco as soon as possible and within 7 days of Spartan 4F or Spartan Charge application to provide slight incorporation and move treated soil around plants and to cover untreated press wheel track (8" band).
	14	<i>carfentrazone</i> Aim EC 2 lb ai/gal	0.8-1.5 fl oz	0.013-0.023 lb ai	12 H/ 6 D	Use Aim EC for postemergence control of many broadleaf weeds (including most morningglory species other than small flowers) up to 4" high growing in between the rows of tobacco. Use higher rates when treating more mature weeds or dense vegetative growth. COVERAGE IS ESSENTIAL FOR GOOD CONTROL. Use adequate spray volume to achieve thorough coverage, but a minimum of 10 gal of finished spay per acre is required. Use a quality crop oil concentrate (COC) at 1% v/v (1 gal of COC/100 gal of spray solution). Do Not Allow spray solution to contact tobacco foliage or green stem tissue. Do Not Apply within 6 days of harvest. Do Not Apply more than 3.06 fl oz (0.48 lb ai)/A/season.
LAYBY (for post emergence control of grasses)	17	<i>napropamide</i> Devrinol 50W	2 lb	1-2	24 H/ --	These herbicides are applied following the last cultivation (usually 4-6 weeks after transplanting). Spray equipment should be set up with drop nozzles to direct the herbicide spray to the shoulders of the tobacco beds and middles. These herbicides will not control established weeds; therefore,
	3	<i>pendimethalin</i> Prowl 3.3E Pendimax Repose Acumen 3.3 lb/gal Prowl H2O 3.8 EC	1.8-2.4 pt 1.8-2.4 pt 1.8-2.4 pt 1.8-2.4 pt 3.8 lb/gal	0.75-1	24 H/ --	
	1	<i>sethoxydim</i> Poast 1.5 lb/gal	1-1.5 pt	0.19	12 H/ 42 D	Provides selective broad Spectrum postemergence control of annual and perennial grass weeds. Poast does not control sedges or broadleaf weeds. Addition of a non-phytotoxic oil concentrate at 1 qt/A is required. Do Not apply within 42 days of harvest. Do Not apply to grasses under stress, such as stress due to lack of moisture or herbicide injury, as unsatisfactory control may result. Do not cultivate within 7 days before or 7 days after applying Poast.

TOBACCO WEED CONTROL (Flue Cured)

TIMING	MOA	BROADCAST RATE/ACRE			REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
		HERBICIDE	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT/A		
After First Harvest Post– Directed or Banded	14	<i>carfentrazone</i> Aim EC 2 lb ai/gal	0.8-1.5 fl oz	0.013-0.023 lb ai	12 H/ --	<p>Aim EC may be applied with drop nozzles or other spray equipment capable of directing the spray to the target weeds and away from sensitive plant parts. Aim EC may be applied up to the maximum rate for the target crop for the control of larger weed sizes or weeds not controlled with lower use rates.</p> <p>Directed spray after first priming (Flue-Cured Tobacco Only). Aim EC may be applied as a directed spray application after the first priming in only flue cured tobacco only for the control of emerged and actively growing broadleaf weeds. Directed spray equipment should position nozzles a minimum of 3-4” above the soil, with nozzles directed underneath the crop canopy. Spray solution should be directed at the base of tobacco plants for minimal contact with foliage while maintaining maximum contact with broadleaf weeds that are at appropriate treatment size. Do not apply when conditions favor drift or wind is above 10 mph.</p> <p>Use Aim EC for postemergence control of many broadleaf weeds (including most morningglory species other than small flowers) up to 4” high growing in between the rows of tobacco. Use higher rates when treating more mature weeds or dense vegetative growth. COVERAGE IS ESSENTIAL FOR GOOD CONTROL. Use adequate spray volume to achieve thorough coverage, but a minimum of 10 gal of finished spray/A is required. Use a quality crop oil concentrate (COC) at 1% v/v (1 gal of COC/100 gal of spray solution). Do Not Allow spray solution to contact tobacco foliage or green stem tissue.</p> <p>Do Not Apply within 6 days of harvest. Do Not Apply more than 3.06 fl oz (0.48 lb ai)/A/season.</p>

TOBACCO WEED RESPONSE TO HERBICIDES (Flue-Cured)

J. Michael Moore, Extension Agronomist – Tobacco

	PLANT BED & FIELD	FIELD APPLICATION										
		PRE-TRANSPLANT						POST TRANSPLANT	LAYBY		POST-DIRECTED OR BANDED	
		SURFACE APPLIED	INCORPORATED									
	Poast	Spartan Charge	Command	Prowl	Devrinol	Tillam	Devrinol + Tillam	Devrinol	Command	Devrinol	Prowl	Aim EC
PERENNIAL WEEDS												
purple nutsedge	P	E	P	P	P	P	P	P	P	P	P	N
yellow nutsedge	P	E	P	P	P	F	F	P	P	P	P	N
ANNUAL GRASSES												
crabgrass	E	F-G	E	E	E	E	G	E	E	E	E	N
crowfootgrass	E	F	G	E	E	E	G	E	G	E	E	N
goosegrass	E	F-G	G	E	E	G	G	E	G	E	E	N
fall panicum	E	F-G	G	G	G	G	G	G	G	G	G	N
johnsongrass (seedling)	E	F	F	G	F	G	G	F	F	F	G	N
sandbur	G	P-F	F	G	-	G	G	-	F	-	G	N
Texas panicum	G	F	G	G	-	P	P	-	G	-	G	N
BROADLEAFS												
bristly starbur	P	F-G	P	P	P	G	G	P	P	P	P	N
Florida beggarweed	P	G-E	F-G	P	P	P	P	P	F-G	P	P	F
cocklebur	N	F-G		P	P	P	P	P		P	P	G
Florida pusley	P	F-G	F-G	E	G	E	E	G	F-G	G	E	
lambsquarters	N	E	F-G	G	G	G	G	G	F-G	G	G	E
pigweeds	N	E	P	G-E	G	G	G	G	P	G	G-E	E
prickly sida	N	P	G	P	P	F	F	P	G	P	P	
purslane	N	G-E	F-G	E	E	G	E	E	F-G	E	E	E
ragweed	N	P	F	P	F	G	G	F	F	F	P	F
smartweed	N	E	G	PF	P	P	P	P	G	P	PF	E
morningglory sp.	N	E	P	P	P	P	P	P	P	P	P	G-E

E= Excellent control, weed kill 90 % or above.
 G= Good control, weed kill 80% or above.
 F = Fair control, weed kill 70% or above.
 P = Poor control, less than 70% control.
 N= No Control
 If no symbol is given, weed response is unknown.
 Ratings are based on average to good soil and weather conditions for herbicide performance.

Bermudagrass and rhizome johnsongrass cannot be controlled with presently labeled tobacco herbicides in the same growing season. However, control can be achieved with Round-Up in the season prior to transplanting tobacco (check label for rates and application).

Transplant into the **Spartan Charge** treated bed surface without pushing additional soil from the bed. **Spartan Charge** should not be incorporated into the bed greater than 2". **Do Not** apply **Spartan Charge** post-transplant over the top of tobacco as crop injury may occur.

TOBACCO SUCKER CONTROL (Flue-Cured)

J. Michael Moore, Extension Agronomist – Tobacco

CHEMICAL TYPE	CHEMICAL	FORMULATION RATE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Contact	Fatty Alcohol C ₆ , C ₈ , C ₁₀ and C ₁₂ alcohol mixture			Solution concentration and timing of fatty alcohol solutions are very important. Apply the first contact treatment at a 3% concentration (1.5 gal of chemical in 48.5 gal of water) when 30-40% of plants are in the early button stage. Make a second contact application at a 4% concentration (2 gal of chemical in 48 gal of water) 5-7 days later. Third applications may be made 5-7 days later if the crop is not uniform, weather conditions are not suitable for application of maleic hydrazide or if harvest must occur within 7 days. Use approximately 50 gal of solution/A or enough to provide for spray solution to reach the bottom of the stalk. Use 2 TG-3 nozzle tips and 1 TG5 or equivalents per row with 20-25 psi pressure operated from 12-16" above the top of the button or stalk at 2.5-3 mph. Excess nitrogen or high soil and plant moisture conditions may increase the chance of leaf drop where contact solutions are applied and promotes excess sucker growth. If the application of contacts starts after the 30%-40% early button stage, start with 4% and follow 5-7 days later with a 5% application.
	85% Active Ingredient			
	Various Brands Fair 85 Off-Shoot T Royaltac-M Sucker Plucker	1.5-2.5 gal 1.5-2.5 gal 1.5-2.5 gal 1.5-2.5 gal	24 H/ 7 D	
	n-Decanol (C ₁₀) 79% Active Ingredient Antak Fair-Tac Royaltac	1.5-2.25 gal 1.5-2.25 gal 1.5-2.25 gal	24 H/ 7 D	
Systemic	Maleic Hydrazide (potassium salt) (MH) Various Brands		12 H/ 7 D	Apply 57 days after last contact treatment. Use 30-40 gal of water/A and a pump pressure of 25-35 psi. Apply to upper sides of leaves on upper one third of stalks.
	(1.5 lb MH/gal) Fair Plus Royal MH Super Sucker Stuff	1.5 gal 1.5 gal 1.5 gal	12 H/ 7 D	Do Not Apply Sucker Control Chemicals When Tobacco Is Wilted or Wet or under Windy Conditions. Do Not Use drop nozzles for application of MH. Allow 7 Days or until after rainfall between MH application and harvest.
	(2.25 lb MH/gal) Fair 30 Royal MH Xtra Sucker Stuff	1 gal 1 gal 1 gal	12 H/ 7 D	
	Water-Soluble MH 60% by wt of MH Fair 80 SP Royal MH-30 SG Sucker Stuff 60 WS	3.75 lb 4-5 lb 3.75 lb	12 H/ 7 D	Fair 80 SP is a water-soluble powder packaged in dissolvable 3.75 lb containers. Royal MH-30 SG is a water-soluble granular material packaged in dissolvable 7.5 lb containers. Sucker Stuff 60 WS is packaged in water dissolvable packets. Two packets are packaged in one paper over-pack bag weighing 3.75 lbs to provide 2.25 lbs MH.
Contact-Systemic Mix	38.3% ai Fatty alcohol (n-Decanol) and 11.1% ai MH (potassium salt) FST-7 Leven-38	3 gal 3 gal	12 H/ 7 D	Provides 2 lb ai MH/A and a 4% contact solution. Mix with 47 gal of water and apply approximately 50 gal/A to plants in early flower stage (one week after button) all day except when plants are wet or temperature exceeds 90°F with bright sunlight. Use 3 nozzles/row to deliver a coarse spray at 20-25 psi pressure targeted to the upper one-third of the plant. Do not apply within 7 days prior to harvest unless irrigation or rainfall will occur to minimize MH residues.
Contact - Contact-Localized - Systemic Mix	Fatty Alcohol C ₆ , C ₈ , C ₁₀ and C ₁₂ alcohol mixture - FLUMETRALIN 1.2 lb/gal premix Plucker Plus	3 gal	12 H/ 7 D	Provides a 4% contact solution and 2 qt of a 1.2 lb/gal flumetralin when tank mixed with 47 gal of water. Apply approximately 50 gal/A to plants in early flower stage (one week after button) all day except when plants are wet or temperature exceeds 90°F with bright sunlight. Use three nozzles per row to deliver a coarse spray at 20-25 psi pressure targeted to the flower of the plant. This application should follow one or more applications of contact and may be followed by multiple contacts and possibly an application of MH for a total sucker control program.

TOBACCO SUCKER CONTROL (Flue-Cured)

CHEMICAL TYPE	CHEMICAL	FORMULATION RATE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Contact-Localized-Systemic + or / Systemic Combination (Tank mixed)	[flumetralin +MH] [Tankmixed] <i>flumetralin</i> 1.2 lb/gal + MH 1.5 lb/gal or MH 2.25lb/gal	2 qt + 1.5 gal or 1 gal	24 H/ 7 D	Flumetralin (Drexalin Plus, Flupro, or Prime+) TANK MIXED WITH MH Flumetralin may be tank mixed with the labeled rate of any MH product which does not specifically prohibit the tank mix in approximately 50 gal of water and applied as a contact to run down the stalk (approximately 50 gal solution per acre). Apply 5-7 days after the last application of contact and after a majority of the plants have been topped. Direct spray at 20-25 psi into the top leaf axils of plants.
(Sequential)	<i>flumetralin</i> 1.2 lb/gal + MH 1.5 lb/gal or MH 2.25lb/gal	2 qt + 1.5 gal or 1 gal	24 H/ 7 D	SEQUENTIAL APPLICATION OF FLUMETRALIN (Drexalin Plus, Flupro, or Prime+) WITH MH Mix 2 qt of flumetralin in 50 gal of water and apply either by handheld dropline nozzles or with powered spray equipment as a contact to run down the stalk. Timing of flumetralin should be during the elongated button to early flower stage of tobacco. Approximately 3-5 days after the flumetralin application, apply maleic hydrazide according to the label directions, precautions, and restrictions on that label.
Contact/	Fatty alcohol 3%	1.5 gal	24 H/ 7 D	NO MH SUCKER CONTROL PROGRAM, REPEATED CONTACTS WITH FLUMETRALIN Apply multiple applications of contacts of increasing concentrations (3%/4%/5%) beginning when not more than 30%-40% of the plants are in the early button stage and continuing on a 5-7 day schedule to control early suckers as they emerge and allow the upper plant leaves to more fully develop. Top plants that have flowered after each application. Apply 30-50 gal of a solution prepared by mixing 2 quarts of flumetralin OR 3 qts of flumetralin in 50 gal of water/A with droplines, jugs, or a power sprayer 3-5 days following the last contact application. Accuracy of control is improved with hand application using droplines or jugs, but increases the labor requirements. Apply as a contact to run down the stalk. Stalks must be standing straight for the most efficient control. An additional application of no more than 1 quart of flumetralin applied with a mechanical sprayer may improve long term control by treating untreated leaf axils when applied 5-7 days after the initial flumetralin application. Additional applications of 5% contact solutions may be required on a 5-7 day schedule to provide additional control of missed suckers. Additional hand sucker removal may be required to prevent suckers from becoming unwanted foreign material in the harvested leaf.
Contact/	Fatty alcohol 4%	2 gal	24 H/ 7 D	
Contact/	Fatty alcohol 5%	2.5 gal	24 H/ 7 D	
Contact-Localized-Systemic/	Fatty alcohol 5% FLUMETRALIN/	2.5 gal/2 qt	24 H/ 7 D	
Contact/	Fatty alcohol 5%	2.5 gal	24 H/ 7 D	
Contact/	Fatty alcohol 5%	2.5 gal	24 H/ 7 D	
(3 Way Tankmix)	[FLUMETRALIN + MH + CONTACT] [3 way tankmix] [FLUMETRALIN (1.2 lb/gal) + MH (1.5 lb/gal) or MH (2.25 lb/gal) + CONTACT]	2 qt + 1.5 gal or 1 gal + 2.5 gal	24 H/ 7 D	3 WAY TANKMIX PROGRAM - FLUMETRALIN (Drexalin Plus, Flupro, or Prime+) TANK MIXED WITH MH and CONTACT Flumetralin may be tank mixed with the labeled rate of any MH product which does not specifically prohibit the tank mix. To provide additional control a 5% solution of any contact fatty alcohol product may be included by adding 2.5 gal of product for each 47.5 gal of total solution. Apply in approximately 50 gal of water/A as a contact to run down the stalk (approximately 50 gal solution/A). Apply the 3-way tank mix 5-7 days after the last application of contact and after a majority of the plants have been topped. Direct spray at 20-25 psi into the top leaf axils of plants. FST-7 or Leven-38 may be used in combination with flumetralin to provide MH and Contact material for the 3-Way Tankmix. Following label instructions will result in lower application rates of MH and contact than suggested above.

TOBACCO SUCKER CONTROL (Flue-Cured)

CHEMICAL TYPE	CHEMICAL	FORMULATION RATE PER ACRE	REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
Contact: Late Season Clean-Up	Fatty Alcohol (C ₆ , C ₈ , C ₁₀ and C ₁₂ alcohol mixture) 85% Active Ingredient (Various Brands) Fair 85 Off-Shoot T Sucker Plucker Royaltac-M n-Decanol (C ₁₀) 79% Active Ingredient Antak Fair-Tac Royaltac	 2.5 gal 2.5 gal 2.5 gal 2.5 gal 2.25 gal 2.25 gal 2.25 gal	24 H/ 7 D	Late season application (up to 3 weeks after MH or Contact-localized-systemic) of a 5% contact solution (2.5 gal in 47.5 gal water) may be useful in controlling late season sucker growth or suckers uncontrolled by previously applied materials. Use the three nozzle arrangement described above. Care should be taken not to apply this solution in bright sunlight when the temperature is high or when tobacco is moisture stressed. C10 alcohols are long chain alcohols and are said to be “hotter” than the mixture of alcohols found in the other products. The rate is normally reduced 0.5% less than for the products that are mixtures of C6, C8, C10 and C12 alcohols. Late season applications may be made to older growth which is less likely to be controlled by normal lower application concentrations.
<p><u>Program Codes</u> Chemical Types Separated By A Slash “/” Symbol Means Chemical Types Are Applied Sequentially Over Time. Generally A “/” Means 3-5 or 5-7 Days Between Application Of Listed Chemical Types.</p>				

YELLOWING AGENT FOR FLUE-CURED TOBACCO

J. Michael Moore, Extension Agronomist – Tobacco

CHEMICAL TYPE	CHEMICAL	MOA	RATE PER ACRE	REI/PHI (Hour or Days)	REMARKS AND PRECAUTIONS
Yellowing Agent	<i>ethephon</i> Ethephon 2 2 lb/gal	5	4-8 qt	48 H/ 2 D	Use after second or third priming when remaining leaves are physiologically mature.
	<i>ethephon</i> Mature XL 6 lb/gal	5	1.33-2.66 pt	48 H/ 2 D	Directed Spray: Mix the lower amount in 50-60 gal of water and apply on a warm, sunny day as a fine spray mist with drop nozzles which direct the spray so that all mature leaves are covered. This treatment may make determining which leaves to harvest a little difficult as the tips of some upper leaves may yellow more rapidly than the butts. Harvest all leaves with 20% or more yellowing.
	<i>ethephon</i> Oskie 3 lb/gal	5	2-3 pt	48 H/ 2 D	Over the Top: Use the higher rate in 40-60 gal of water for an acreage of coverage. Apply to all remaining leaves on the stalk.
	<i>ethephon</i> Prep 6 lb/gal	5	1.33-2.66 pt	48 H/ 2 D	Determining time of application requires some experience and some trial and error; therefore, use a test kit to treat a few plants and observe the results before treating the whole field.
	<i>ethephon</i> Super Boll 6 lb/gal	5	1.33-2.66 pt	48 H/ 2 D	Harvest yellowed leaves when they reach desired degree of yellowness, usually within 24-72 hours. Harvest may be completed the day after treatment. Excessive delay in harvest may result in loss of yield and quality or leaf drop.
	<i>ethephon</i> Ethephon 6 6 lb/gal	5	1.33-2.66 pt	48 H/ 2 D	Tobacco which is sufficiently mature when treated and which yellows prior to harvest may require an advanced curing schedule with reduced yellowing time. Close attention should be paid to the curing schedule.

VEGETABLES: COMMERCIAL VEGETABLE INSECT CONTROL

Alton N. Sparks, Jr., Extension Entomologist and David G. Riley, Research Entomologist

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BRASSICA & LEAFY VEGETABLES (Broccoli, Cabbage, Collards, Kale, Mustard, Spinach, and Turnip)

PEST	INSECTICIDE	MOA	Broccoli Cabbage	Collard Kale Mustard	Spinach	Turnip	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
PRE-PLANT, AT-PLANTING, AND CHEMIGATION TREATMENTS										
Pre-mixes for multiple pests	<i>thiamethoxam</i> 1.67 lb/gal + <i>chlorantraniliprole</i> 0.835 lb/gal Durivo SC	4A 28	✓	✓	✓	Not Labeled	10-13 fl oz	0.13-0.17 + 0.065-0.085	12 H/ 30 D	
aphid, whitefly	<i>clothianidin</i> Belay 2.13SC	4A	✓	✓	✓	✓	9-12 fl oz	0.15-0.2	12 H/ 21 D	
	<i>cyantraniliprole</i> Verimark 1.67SC	28	✓	✓	✓	✓	5-13.5 fl oz Rate varies with pest targeted.		4 H/ at planting	Also labeled for transplant drench no earlier than 72 hours prior to planting.
	<i>dinotefuran</i> Venom 70SG	4A	✓	Not Labeled	✓	Not Labeled	5-6 oz	0.226-0.268	12 H/ 21 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	✓	✓	✓	4.4-10.5 fl oz	0.158-0.375	12 H/ 21 D	
	<i>thiamethoxam</i> Platinum 75SG	4A	✓	✓	✓	Not Labeled	1.66-3.67 oz	0.078-0.17	12 H/ 30 D	Also in a pre-mix for multiple pests.
caterpillar pests	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	Not Labeled	3.5-5 fl oz	0.045-0.065	4 H/ Spinach = 1 D Others = 3 D	Labeled at higher rates for suppression of whitefly nymphs. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Verimark 1.67SC	28	✓	✓	✓	✓	5-13.5 fl oz Rate varies with pest targeted.		4 H/ at planting	Also labeled for transplant drench no earlier than 72 hours prior to planting.
soil insects	<i>bifenthrin</i> Empower 1.15G	3	✓	Not Labeled	Not Labeled	Not Labeled	3.5-8.7 lb	0.04-0.1	5 D/ 7 D	May be applied pre-plant or during the season.
	<i>chlorpyrifos</i> Lorsban 15G, 75WG, 4E, Advanced	1B	✓	✓	Not Labeled	✓	See Label.		24 H/ See Label	Labeled for preplant, at planting and broadcast application.
	<i>diazinon</i> 4E 50W	1B	✓	✓	See Remarks	Not Labeled	2-4 qt 4-8 lb	2-4 2-4	4 D/ Preplant	Spinach PHI = 3 days.
FOLIAR TREATMENTS										
Pre-mixes for multiple pests	<i>flubendiamide</i> 0.33 lb/gal + <i>buprofezin</i> 2.33 lb/gal Vetica SC	28 16	✓	✓	See Remarks	✓	10-20 fl oz	0.026-0.05 + 0.18-0.36	12 H/ Spinach=7 D Others =1 D	Primarily for caterpillar pests and whitefly. Spinach rates are 12-17 fl oz.
	<i>imidacloprid</i> 2 lb/gal + <i>beta-cyfluthrin</i> 1 lb/gal Leverage 360 SC	4A 3	✓	✓	✓	✓	3 fl oz	0.047 + 0.023	12 H/ 7 D	
	<i>lambda-cyhalothrin</i> 0.417 lb/gal + <i>chlorantraniliprole</i> 0.835 lb/gal Voliam Xpress SC	3 28	✓	Not Labeled	Not Labeled	Not Labeled	5-9 fl oz Rate varies with targeted pests		24 H/ 3 D	

COMMERCIAL VEGETABLE INSECT CONTROL

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BRASSICA & LEAFY VEGETABLES (Broccoli, Cabbage, Collards, Kale, Mustard, Spinach, and Turnip)

PEST	INSECTICIDE	MOA	Broccoli Cabbage	Collard Kale Mustard	Spinach	Turnip	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
	<i>lambda-cyhalothrin</i> 0.88 lb/gal + <i>thiamethoxam</i> 1.18 lb/gal Endigo ZC SC	3 4A	✓	Not Labeled	Not Labeled	Not Labeled	4-4.5 fl oz	0.028-0.03 + 0.037-0.04	24 H/ 1 D	
	<i>thiamethoxam</i> 0.2 lb/lb + <i>chlorantraniliprole</i> 0.2 lb/lb Voliam Flexi WDG	4A 28	✓	✓	✓	Not Labeled	4-7 oz	0.05-0.0875 + 0.05-0.0875	12 H/ Cole Crops = 3 D Others = 7 D	
	<i>zeta-cypermethrin</i> 0.31 lb/gal + <i>bifenthrin</i> 0.93 lb/gal Hero EC	3 3	✓	✓	Not Labeled	Not Labeled	4-10.3 fl oz	0.01-0.025 + 0.03-0.075	12 H/ 7 D	
aphid	<i>acetamiprid</i> Assail 30SG	4A	✓	See Remarks	✓	See Remarks	2-4 oz	0.038-0.075	12 H/ See Remarks	Maximum rate on collard, kale, mustard and turnip is 5.3 oz with 3-day PHI. All others 7 day PHI.
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	See Remarks	✓	2.1-6.4 fl oz	0.033-0.10	12 H/ See Remarks	Also in a pre-mix for multiple pests. Spinach PHI = 40 days, Cole Crops PHI = 3 days, All others = 7 days.
	<i>clothianidin</i> Belay 2.13SC	4A	✓	✓	✓	✓	3-4 fl oz	0.05-0.067	12 H/ 7 D	
	<i>cyantraniliprole</i> Exirel 0.83SC	28	✓	✓	✓	✓	13.5-20.5 fl oz	0.088-0.133	12 H/ 1 D	
	<i>dimethoate</i> 4EC 2.67EC	1B	See Remarks	See Remarks	Not Labeled	✓	0.5 pt 0.75 pt	0.25 0.25	48 H/ Broccoli = 7 D Others = 14 D	Also available as Cygon 3.35 EC. Not labeled on cabbage or collard. Maximum rate on broccoli is 0.5 lb ai.
	<i>dinotefuran</i> Venom 70SG	4A	✓	Not Labeled	See Remarks	Not Labeled	1-4 oz	0.045-0.179	12 H/ Cole Crops = 1 D Spinach = 7 D	Rates on spinach 1-3 oz.
	<i>flonicamid</i> Beleaf 50SG	9C	✓	✓	✓	✓	2-2.8 oz	0.062-0.089	12 H/ 0 D	
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	✓	✓	✓	✓	7-12 fl oz	0.09-0.156	4 H/ 1 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	✓	✓	See Remarks	1.3 fl oz	0.047	12 H/ 7 D	Also in a pre-mix for multiple pests. Rate is 1.2 fl oz on turnips.
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	Not Labeled	Not Labeled	Not Labeled	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests.
<i>malathion</i> 5EC 8EC	1B	✓	✓	✓	✓	See Label	See Label	12-48 H/ 2-7 D	Rate, REI, PHI varies with product selec- tion.	

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PEST	INSECTICIDE	MOA	Broccoli Cabbage	Collard Kale Mustard	Spinach	Turnip	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
aphid (continued)	<i>pymetrozine</i> Fulfill 50WDG	9B	✓	✓	✓	✓	2.75 oz	0.086	12 H/ 7 D	
	<i>spirotetramat</i> Movento 2SC	23	✓	✓	✓	Not Labeled	4-5 fl oz	0.0625-0.078	24 H/ Cole Crops = 1 D Spinach = 3 D	Use of an adjuvant is necessary.
	<i>sulfoxaflor</i> Closer 2SC	4C	✓	✓	✓	✓	1.5-2 fl oz	0.023-0.031	12 H/ Turnips = 7 D Others = 3 D	
	<i>thiamethoxam</i> Actara 25WDG	4A	✓	✓	✓	Not Labeled	1.5-3 oz	0.023-0.0468	12 H/ Cole Crops = 0 D Others = 7 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
beet armyworm, diamondback moth caterpillar	<i>Bacillus thuringiensis</i> "Bt" various names	11B	✓	✓	✓	✓	Follow label		4 H/ 0 D	
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ Cole Crops = 3 D Others = 1 D	Use of an adjuvant is recommended. Also in a premix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	✓	✓	✓	✓	7-13.5 fl oz	0.045-0.088	12 H/ 1 D	
	<i>emamectin benzoate</i> Proclaim 5% WDG	6	✓	✓	✓	✓	2.4-4.8 oz	0.0075-0.015	12 H/ See Remarks	PHI Cabbage, Broccoli & Spinach = 7 days, Others = 14 days
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	See Remarks	✓	2-2.4 fl oz	0.0625-0.075	12 H/ 8 D	Adjuvants have been shown to increase efficacy. Also in a pre-mix for multiple pests. Spinach rate is 1.5 fl oz with 1 day PHI.
	<i>indoxacarb</i> Avaunt 30WDG	22	✓	✓	✓	✓	3.5 oz	0.065	12 H/ 3 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	See Remarks	See Remarks	See Remarks	See Remarks	4-10 fl oz	0.06-0.16	4 H/ 1 D	Not recommended for diamondback moth caterpillars.
	<i>novaluron</i> Rimon 0.83EC	15	✓	Not Labeled	Not Labeled	Not Labeled	6-12 fl oz	0.039-0.078	12 H/ 7 D	
	<i>spinetoram</i> Radiant 1SC	5	✓	Not Labeled	✓	✓	5-10 fl oz	0.039-0.078	4 H/ Turnips = 3 D Others = 1 D	
diamondback moth caterpillar	NOTE: Registered carbamate (Group 1A), organophosphate (Group 1B), and pyrethroid (Group 3) insecticides can provide good control of non-resistant caterpillars; however, resistance to any registered insecticides is a potential problem in Georgia. Resistance management programs for this pest should be strictly followed.									

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PEST	INSECTICIDE	MOA	Broccoli Cabbage	Collard Kale Mustard	Spinach	Turnip	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
cabbage looper, cabbage webworm, imported cabbageworm, cross-striped cabbageworm	<i>Bacillus thuringiensis</i> "Bt" various names	11B	✓	✓	✓	✓	Follow label		4 H/ 0 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	✓	✓	1.6-2.4 fl oz	0.0125-0.019	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	See Remarks	✓	2.1-6.4 fl oz	0.033-0.10	12 H/ See Remarks	Also in a pre-mix for multiple pests. Spinach PHI = 40 days, Cole Crops = 3 days, Others = 7 days.
	<i>carbaryl</i> Sevin 4F	1A	See Remarks	See Remarks	See Remarks	See Remarks	1-2 qt	1-2	12 H/ See Remarks	Not labeled for loopers. PHI Broccoli & Cabbage = 3 days, Others = 14 days
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ Cole Crops = 3 D Others = 1 D	Use of an adjuvant is recommended. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	✓	✓	✓	✓	10-17 fl oz	0.065-0.11	12 H/ 1 D	Rates listed are for loopers, minimum rate for others is 7 fl oz.
	<i>cyfluthrin</i> Tombstone 2EC	3	✓	✓	✓	✓	1.6-2.4 fl oz	0.025-0.038	12 H/ 0 D	
	<i>cypermethrin</i> Ammo 2.5EC	3	See Remarks	See Remarks	Not Labeled	Not Labeled	3.75-5 fl oz	0.075-0.1	12 H/ 1 D	Rates listed are for loopers. Labeled at 2.5-5 fl oz. for other caterpillars.
	<i>emamectin benzoate</i> Proclaim 5% WDG	6	✓	✓	✓	✓	3.2-4.8 oz	0.01-0.015	12 H/ See Remarks	PHI Broccoli, Cabbage and Spinach = 7 days, Others = 14 days
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	See Remarks	Not Labeled	✓	5.8-9.6 fl oz	0.03-0.05	12 H/ See Remarks	Not labeled on Kale. PHI Broccoli & Cabbage = 3 days, Other PHI = 7 days
	<i>fenpropathin</i> Danitol 2.4EC	3	✓	Not Labeled	Not Labeled	Not Labeled	10.66-16 fl oz	0.2-0.3	24 H/ 7 D	
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	See Remarks	✓	2-2.4 fl oz	0.0625-0.075	12 H/ 8 D	Adjuvants have been shown to increase efficacy. Also in a pre-mix for multiple pests. Belt on Spinach: 1.5 fl oz, PHI is 1.
<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	Not Labeled	Not Labeled	Not Labeled	2.56-3.84 fl oz	0.01-0.015	24 H/ 1 D		

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PEST	INSECTICIDE	MOA	Broccoli Cabbage	Collard Kale Mustard	Spinach	Turnip	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
cabbage looper cabbage webworm, imported cabbageworm, cross-striped cabbageworm (continued)	<i>indoxacarb</i> Avaunt 30WDG	22	√	√	See Remarks	√	2.5-3.5 oz	0.045-0.065	12 H/ 3 D	Spinach: 3.5 oz. only.
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	√	Not Labeled	Not Labeled	Not Labeled	0.96-1.6 fl oz	0.015-0.025	24 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>malathion</i> 5EC 8EC	1B	See Remarks	See Remarks	Not Labeled	√	See Label	See Label	12-48 H/ 2-7 D	Not labeled for loopers. Rate, REI, PHI varies with product selection.
	<i>methomyl</i> Lannate 2.4LV	1A	√	√	√	√	1.5-3 pt	0.45-0.9	48 H/ See Remarks	90 SP formulation also registered. PHI Cabbage = 1 day, Broccoli = 3 days, Spinach = 7 days, Others = 10 days.
	<i>methoxyfenozide</i> Intrepid 2F	18	√	√	√	√	4-10 fl oz	0.06-0.16	4 H/ 1 D	
	<i>novaluron</i> Rimon 0.83EC	15	√	Not Labeled	Not Labeled	Not Labeled	6-12 fl oz	0.039-0.078	12 H/ 7 D	
	<i>permethrin</i> Permethrin 3.2EC	3	See Remarks	See Remarks	See Remarks	√	4-8 fl oz	0.1-0.2	12 H/ 1 D	Also available as 25WP formulation. Not labeled on Kale or Mustard Greens.
	<i>spinetoram</i> Radiant 1SC	5	√	Not Labeled	√	√	5-10 fl oz	0.039-0.078	4 H/ Turnips = 3 D Others = 1 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	√	√	√	√	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests. Rates listed are for loopers. Labeled at 2.24-4 fl oz for other caterpillars.
corn earworm	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	√	√	√	√	2.4-3.2 fl oz	0.019-0.025	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	√	√	See Remarks	√	2.1-6.4 fl oz	0.033-0.10	12 H/ See Remarks	Also in a pre-mix for multiple pests. PHI Spinach = 40 days, Cole Crops = 3 days, all others = 7 days.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	√	√	√	√	3.5-5 fl oz	0.045-0.065	4 H/ Cole crops = 3 D Others = 1 D	Use of an adjuvant is recommended. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	√	√	√	√	7-13.5 fl oz	0.045-0.088	12 H/ 1 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	√	√	√	√	2.4-3.2 fl oz	0.038-0.050	12 H/ 0 D	
	<i>cypermethrin</i> Ammo 2.5EC	3	√	√	Not Labeled	Not Labeled	2.5-5 fl oz	0.05-0.10	12 H/ 1 D	

COMMERCIAL VEGETABLE INSECT CONTROL

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BRASSICA & LEAFY VEGETABLES (Broccoli, Cabbage, Collards, Kale, Mustard, Spinach, and Turnip)

PEST	INSECTICIDE	MOA	Broccoli Cabbage	Collard Kale Mustard	Spinach	Turnip	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
corn earworm (continued)	<i>emamectin benzoate</i> Proclaim 5% WDG	6	✓	✓	✓	✓	2.4-4.8 oz	0.0075-0.015	12 H/ See Remarks	PHI Cabbage, Broccoli, Spinach = 7 days Others = 14 days
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	See Remarks	✓	2-2.4 fl oz	0.0625-0.075	12 H/ 8 D	Rate on spinach is 1.5 fl oz with a PHI of 1 day.
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	Not Labeled	Not Labeled	Not Labeled	2.56-3.84 fl oz	0.01-0.015	24 H/ 1 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	Not Labeled	Not Labeled	Not Labeled	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>novaluron</i> Rimon 0.83EC	15	✓	Not Labeled	Not Labeled	Not Labeled	6-12 fl oz	0.039-0.078	12 H/ 7 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	2.24-4 fl oz	0.014-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
NOTE: Danitol, Asana, Lannate, and Permethrin give adequate control on labeled crops.										
cutworm	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	✓	✓	0.8-1.6 fl oz	0.0065-0.0125	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	See Remarks	✓	2.1-6.4 fl oz	0.033-0.10	12 H/ See Remarks	Also in a pre-mix for multiple pests. PHI Spinach = 40 days, Cole Crops = 3 days, all others = 7 days.
	<i>cyfluthrin</i> Tombstone 2EC	3	✓	✓	✓	✓	0.8-1.6 fl oz	0.013-0.025	12 H/ 0 D	
	<i>cypermethrin</i> Ammo 2.5EC	3	✓	✓	Not Labeled	Not Labeled	2.5-5 fl oz	0.05-0.10	12 H/ 1 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	See Remarks	Not Labeled	✓	5.8-9.6 fl oz	0.03-0.05	12 H/ See Remarks	Not labeled on Kale. PHI Broccoli & Cabbage = 3 days, Others = 7 days
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	Not Labeled	Not Labeled	Not Labeled	1.92-3.2 fl oz	0.0075-0.0125	24 H/ 1 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	Not Labeled	Not Labeled	Not Labeled	0.96-1.6 fl oz	0.015-0.025	24 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>permethrin</i> Permethrin 3.2 EC	3	See Remarks	See Remarks	See Remarks	✓	2-4 fl oz	0.05-0.1	12 H/ 1 D	Not labeled on Kale or Mustard Greens. Maximum rate on Cabbage and Spinach is 8 fl oz.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	2.24-4 fl oz	0.014-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
NOTE: Chlorpyrifos (Lorsban) as applied for root maggots gives good control of cutworms present at time of planting.										
flea beetle	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	✓	✓	2.4-3.2 fl oz	0.019-0.025	12 H/ 0 D	Also in a pre-mix for multiple pests.

COMMERCIAL VEGETABLE INSECT CONTROL

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BRASSICA & LEAFY VEGETABLES (Broccoli, Cabbage, Collards, Kale, Mustard, Spinach, and Turnip)

PEST	INSECTICIDE	MOA	Broccoli Cabbage	Collard Kale Mustard	Spinach	Turnip	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
flea beetle (continued)	<i>bifenthrin</i> Brigade 2EC	3	√	√	See Remarks	√	2.1-6.4 fl oz	0.033-0.10	12 H/ See Remarks	Also in a pre-mix for multiple pests. PHI Spinach = 40 days, Cole Crops = 3 days, All others = 7 days.
	<i>carbaryl</i> Sevin 4F	1A	√	√	√	√	0.5-1 qt	0.5-1	12 H/ See Remarks	PHI Broccoli & Cabbage = 3 days, Others = 14 days
	<i>clothianidin</i> Belay 2.13SC	4A	√	√	√	√	3-4 fl oz	0.05-0.067	12 H/ 7 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	√	√	√	√	2.4-3.2 fl oz	0.038-0.05	12 H/ 0 D	
	<i>cypermethrin</i> Ammo 2.5EC	3	√	√	Not Labeled	Not Labeled	2.5-5 fl oz	0.05-0.10	12 H/ 1 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	√	See Remarks	Not Labeled	√	5.8-9.6 fl oz	0.03-0.05	12 H/ See Remarks	Not labeled on Kale. PHI Broccoli & Cabbage = 3 days, Others = 7 days
	<i>imidacloprid</i> Admire Pro 4.6F	4A	√	√	√	See Remarks	1.3 fl oz	0.047	12 H/ 7 D	Also in a pre-mix for multiple pests. Rate on turnips is 1.2 fl oz.
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	√	Not Labeled	Not Labeled	Not Labeled	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>malathion</i> 5EC 8EC	1B	√	√	√	√	See Label	See Label	12-48 H/ 2-7 D	Rate, REI, PHI varies with product selection.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	√	√	√	√	2.24-4 fl oz	0.014-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
harlequin bug	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	√	√	√	√	2.4-3.2 fl oz	0.019-0.025	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	√	√	See Remarks	√	2.1-6.4 fl oz	0.033-0.10	12 H/ See Remarks	Also in a pre-mix for multiple pests. PHI Spinach = 40 days, Cole Crops = 3 days, All others = 7 days.
	<i>cyfluthrin</i> Tombstone 2EC	3	√	√	√	√	2.4-3.2 fl oz	0.038-0.050	12 H/ 0 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	√	Not Labeled	Not Labeled	Not Labeled	2.56-3.84 fl oz	0.01-0.015	24 H/ 1 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	√	Not Labeled	Not Labeled	Not Labeled	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	√	√	√	√	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.

COMMERCIAL VEGETABLE INSECT CONTROL

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BRASSICA & LEAFY VEGETABLES (Broccoli, Cabbage, Collards, Kale, Mustard, Spinach, and Turnip)

PEST	INSECTICIDE	MOA	Broccoli Cabbage	Collard Kale Mustard	Spinach	Turnip	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
silverleaf whitefly	<i>acetamiprid</i> Assail 30SG	4A	√	See Remarks	√	See Remarks	2.5-4 oz	0.05-0.075	12 H/ See Remarks	Maximum rate on Collard, Kale, Mustard and Turnip is 5.3 oz with 3 day PHI. All others PHI = 7 days.
	<i>buprofezin</i> Courier 3.6SC	16	√	√	See Remarks	√	9-13.6 fl oz	0.25-0.38	12 H/ Spinach = 7 D All others = 1 D	Primarily active against nymphs. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	√	√	√	√	13.5-20.5 fl oz	0.088-0.133	12 H/ 1 D	
	<i>dinotefuran</i> Venom 70SG	4A	√	Not Labeled	See Remarks	Not Labeled	1-4 oz	0.045-0.179	12 H/ Cole crops = 1 D Spinach = 7 D	Spinach rate is 1-3 oz.
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	√	√	√	√	10.5-14 fl oz	0.136-0.18	4 H/ 1 D	
	<i>pyriproxyfen</i> Knack 0.86EC	7C	√	√	Not Labeled	√	8-10 fl oz	0.054-0.067	12 H/ 7 D	Activity on eggs and last instar nymphs.
	<i>spiromesifen</i> Oberon 2SC	23	√	Not Labeled	√	Not Labeled	7-8.5 fl oz	0.11-0.13	12 H/ 7 D	
	<i>spirotetramat</i> Movento 2SC	23	√	√	√	Not Labeled	4-5 fl oz	0.0625-0.078	24 H/ Spinach = 3 D Others = 1 D	Use of an adjuvant is necessary. Activity on early instar nymphs.
	<i>thiamethoxam</i> Actara 25WDG	4A	√	√	√	Not Labeled	3-5.5 oz	0.0468-0.086	12 H/ Cole crops = 0 D Others = 7 D	Also in a pre-mix for multiple pests.
NOTE: Reduced residual activity has been noted with all Group 4A insecticides. NOTE: Group 4A insecticides should not be used for foliar applications if a Group 4A was applied in the soil. NOTE: Coragen as applied for caterpillars has provided good control of whiteflies. Primary activity is on nymphs.										

EFFICACY OF INSECTICIDES/ACARACIDES FOR CONTROLLING ARTHROPOD PESTS OF VEGETABLE CROPS

Alton N. Sparks, Jr., Extension Entomologist

BRASSICA VEGETABLES

Chemical class (IRAC)	Common Name	Example Product	Flea Beetle	Corn earworm	Cabbage looper	Imported cabbageworm	Diamondback moth	Beet armyworm	Stink bugs, Squash bug	Aphids	Thrips	Silverleaf Whitefly	Cutworms
1A	<i>methomyl</i>	Lannate	+	++	++	++	++	+	++	+	+++	+	-
1B	<i>malathion</i>	Malathion	++	+	+	++	+	-	+	+	+	-	+
3	<i>permethrin</i>	Pounce	++	++	++	+++	+	-	++	+	+	-	++
	<i>zeta-cypermethrin</i>	Mustang Max	+++	++	++	+++	+	-	++	+	++	-	+++
	<i>beta-cyfluthrin</i>	Baythroid	++	++	++	+++	+	-	++	+	+	-	+++
	<i>lambda-cyhalothrin</i>	Karate	+++	++	++	+++	+	-	++	+	++	-	+++
	<i>esfenvalerate</i>	Asana XL	+++	++	++	+++	+	-	+	+	+	-	++
	<i>fenpropathrin</i>	Danitol	++	++	+	+++	+	-	++	+	+	+	++
	<i>bifenthrin</i>	Brigade	+++	++	+	+++	+	-	++	+	++	+	+++
4A	<i>imidacloprid</i>	Admire Pro	+++	-	-	-	-	-	-	+++	+	++	-
	<i>acetamiprid</i>	Assail	++	-	-	-	-	-	+	+++	+	++	-
	<i>thiamethoxam</i>	Platinum/Actara	+++	-	-	-	-	-	++	+++	+	++	-
	<i>dinotefuran</i>	Venom	+++	-	-	-	-	-	++	++	+	++	-
4C	<i>sulfoxaflor</i>	Closer	-	-	-	-	-	-	-	+++	-	+	-
4D	<i>flupyradifurone</i>	Sivanto	-	-	-	-	-	-	-	+++	-	++	-
5	<i>spinetoram</i>	Radiant	-	+++	++	+++	++	++	-	-	+++	-	+
6	<i>emamectin benzoate</i>	Proclaim	-	++	+++	+++	+++	+++	-	-	-	-	+
7C	<i>pyriproxyfen</i>	Knack	-	-	-	-	-	-	-	-	-	++	-
9B	<i>pymetrozine</i>	Fulfill	-	-	-	-	-	-	-	+++	-	+	-
9C	<i>flonicamid</i>	Beleaf	-	-	-	-	-	-	-	+++	-	-	-
11	<i>Bt</i>	Dipel, various	-	+	++	+++	+	+	-	-	-	-	-

EFFICACY OF INSECTICIDES/ACARACIDES FOR CONTROLLING ARTHROPOD PESTS OF VEGETABLE CROPS

BRASSICA VEGETABLES

Chemical class (IRAC)	Common Name	Example Product	Flea Beetle	Corn earworm	Cabbage looper	Imported cabbageworm	Diamondback moth	Beet armyworm	Stink bugs, Squash bug	Aphids	Thrips	Silverleaf Whitefly	Cutworms
15	<i>novaluron</i>	Rimon	-	++	++	+++	++	+++	+	-	+	+	-
16	<i>buprofezin</i>	Courier	-	-	-	-	-	-	-	-	-	++	-
18	<i>methoxyfenozide</i>	Intrepid	-	++	+++	+++	+	+++	-	-	-	-	-
22	<i>indoxacarb</i>	Avaunt	+	+++	+++	+++	++	+++	-	-	-	-	+
23	<i>spiromesifen</i>	Oberon	-	-	-	-	-	-	-	-	-	+	-
	<i>spirotetramat</i>	Movento	-	-	-	-	-	-	-	++	-	++	-
28	<i>chlorantraniliprole</i>	Coragen	-	+++	+++	+++	+++	+++	-	-	-	++	+
	<i>cyantraniliprole</i>	Verimark/Exirel	-	+++	+++	+++	+++	+++	-	+++	+	++	+
	<i>flubendiamide</i>	Belt	-	+++	+++	+++	+++	+++	-	-	-	-	+

Rating for products was initially conducted at the 2009 Southeast Extension Vegetable Workers Conference in Fletcher, NC.

Efficacy ratings do not necessarily indicate a labeled use for all crops in this group. Please refer to the appropriate section of the Pest Management Handbook for details on product labeling.

Efficacy ratings:

- = Ineffective or insufficient data
- + = Somewhat effective
- ++ = Effective
- +++ = Very effective

COMMERCIAL VEGETABLE INSECT CONTROL

CARROT

PEST	INSECTICIDE	MOA	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
PRE-PLANT, AT-PLANTING, AND CHEMIGATION TREATMENTS						
aphids, flea beetle, leafhopper	<i>imidacloprid</i> Admire Pro 4.6F	4A	4.4-10.5 fl oz	0.156-0.375	12 H/ 21 D	
	<i>thiamethoxam</i> Platinum 75SG	4A	1.7-4.01 oz	0.078-0.1875	12 H/ AP	
soil insects	<i>diazinon</i> 4E 50W	1B	2-4 qt 4-8 lb	2-4 2-4	3 D/ Pre-plant	
FOLIAR TREATMENTS						
Pre-mixes for multiple pests	<i>imidacloprid</i> 2 lb/gal + <i>beta-cyfluthrin</i> 1 lb/gal Leverage 360 SC	4A 3	2.4-2.8 fl oz	0.038-0.044 + 0.019-0.022	12 H/ 7 D	
	<i>zeta-cypermethrin</i> 0.31 lb/gal + <i>bifenthrin</i> 0.93 lb/gal Hero EC	3 3	4-10.3 fl oz	0.01-0.025 + 0.03-0.075	12 H/ 21 D	
aphid	<i>bifenthrin</i> Brigade 2EC	3	5.12-6.4 fl oz	0.08-0.1	12 H/ 21 D	Also in a pre-mix for multiple pests.
	<i>flonicamid</i> Beleaf 50SG	9C	2-2.8 oz	0.062-0.089	12 H/ 3 D	
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	7-10.5 fl oz	0.09-0.136	4 H/ 7 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	1.2 fl oz	0.043	12 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>sulfoxaflor</i> Closer 2SC	4C	1.5-2 fl oz	0.023-0.031	12 H/ 7 D	
	<i>thiamethoxam</i> Actara 25 WDG	4A	1.5-3 oz	0.023-0.047	12 H/ 7 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
armyworm	<i>chlorantraniliprole</i> Coragen 1.67SC	28	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	8-16 fl oz	0.12-0.25	4 H/ 1 D	
	<i>spinetoram</i> Radiant 1SC	5	6-8 fl oz	0.047-0.063	4 H/ 3 D	
	<i>spinosad</i> Blackhawk 36WDG	5	1.7-3.3 oz	0.038-0.074	4 H/ 3 D	
carrot weevil	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	2.8 fl oz	0.022	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>cyfluthrin</i> Tombstone 2E	3	2.8 fl oz	0.044	12 H/ 0 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	9.6 fl oz	0.05	12 H/ 7 D	
	<i>oxamyl</i> Vydate 2L	1A	2-4 pt	0.5-1	48 H/ 14 D	

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CARROT

PEST	INSECTICIDE	MOA	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS						
cutworm	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	1.6-2.8 fl oz	0.0125-0.022	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	5.12-6.4 fl oz	0.08-0.1	12 H/ 21 D	Also in a pre-mix for multiple pests.
	<i>cyfluthrin</i> Tombstone 2E	3	1.6-2.8 fl oz	0.025-0.044	12 H/ 0 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	5.8-9.6 fl oz	0.03-0.05	12 H/ 7 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8 EC	3	1.28-4 fl oz	0.008-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
flea beetles	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	1.6-2.8 fl oz	0.0125-0.022	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	5.12-6.4 fl oz	0.08-0.1	12 H/ 21 D	Also in a pre-mix for multiple pests.
	<i>carbaryl</i> Sevin 4F	1A	0.5-1 qt	0.5-1	12 H/ 7 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	1.6-2.8 fl oz	0.025-0.044	12 H/ 0 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	1.2 fl oz	0.04	12 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>thiamethoxam</i> Actara 25WDG	4A	1.5-3 oz	0.023-0.047	12 H/ 7 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8 EC	3	1.76-4 fl oz	0.011-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
leafhoppers	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	1.6-2.8 fl oz	0.0125-0.022	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>carbaryl</i> Sevin 4F	1A	0.5-1 qt	0.5-1	12 H/ 7 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	1.6-2.8 fl oz	0.025-0.044	12 H/ 0 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	5.8-9.6 fl oz	0.03-0.05	12 H/ 7 D	
	<i>methomyl</i> Lannate 2.4LV	1A	1.5-3 pt	0.45-0.9	48 H/ 1 D	90 SP formulation also registered.
	<i>thiamethoxam</i> Actara 25WDG	4A	1.5-3 fl oz	0.023-0.047	12 H/ 7 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8 EC	3	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
vegetable weevil	NOTE: Group 3 insecticides (pyrethroids) as applied for other pests will give helpful control.					

COMMERCIAL VEGETABLE INSECT CONTROL

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CORN (Sweet)

PEST	INSECTICIDE	MOA	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
PRE-PLANT, AT-PLANTING, AND CHEMIGATION TREATMENTS						
soil insects	<i>bifenthrin</i> Brigade 2EC Empower 1.15G	3	0.15-0.3 fl oz/1000 ft of row 3.2-8 oz/1000 ft of row		Brigade = 24 H/30 D Empower = 18 D/AP	
	<i>chlorothoxyfos</i> Fortress 5G	1B	3-3.75 oz/1,000 ft of row		48 H/ AP	Maximum rate for rootworms is 4.5 oz.
	<i>cyfluthrin</i> Aztec 2.1G 4.67G	3	6.7 oz/1000 ft of row 3 oz/1000 ft of row		48 H/ AP	
	<i>ethoprop</i> Mocap 15G	1B	8 oz/1000 ft of row		48 H/ AP	Also labeled for broadcast application prior to planting.
	<i>phorate</i> Thimet 20G	1B	4-5.6 oz/1,000 ft of row		48 H/ 30 D	Also registered for application at cultivation. Do not apply in-furrow.
	<i>tefluthrin</i> Force 3G	3	3-5 oz/1,000 ft of row		0 H/ AP	Also labeled for cultivation application within 30 days of crop emergence.
	<i>terbufos</i> Counter 20G	1B	4.5-6 oz/1,000 ft of row		48 H/ 60 D	Also labeled for postemergence incorporated application.
pre-tassel caterpillar pests	<i>chlorantraniliprole</i> Coragen 1.67SC	28	5 fl oz	0.065	4 H/ AP	See 24C label for application instructions.
cutworm, soil insects	<i>chlorpyrifos</i> Lorsban 4E, 15G, 75WG, Advanced	1B	See label		24 H/ 21 D	Labeled for pre-plant, at-planting and post-planting (except 15G) application.
FOLIAR TREATMENTS						
pre-mixes for multiple pests	<i>lambda-cyhalothrin</i> 0.417 lb/gal + <i>chlorantraniliprole</i> 0.835 lb/gal Besiege SC	3 28	6-10 fl oz Rate varies with targeted pests		24 H/ 1 D	
	<i>zeta-cypermethrin</i> 0.31 lb/gal + <i>bifenthrin</i> 0.93 lb/gal Hero EC	3 3	4-10.3 fl oz	0.01-0.025 + 0.03-0.075	12 H/ 3 D	
aphid	<i>acetamiprid</i> Assail 30SG	4A	2.1-2.9 oz	0.04-0.054	12 H/ 1 D	
	<i>bifenthrin</i> Brigade 2EC	3	2.1-6.4 fl oz	0.033-0.10	12 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	7-10.5 fl oz	0.09-0.136	4 H/ 7 D	
corn earworm, European corn borer	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	1.6-2.8 fl oz	0.0125-0.022	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC	3	2.1-6.4 fl oz	0.033-0.10	12 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Also in a pre-mix for multiple pests.

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CORN (Sweet)

PEST	INSECTICIDE	MOA	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
corn earworm, European corn borer (continued)	<i>cyfluthrin</i> Tombstone 2EC	3	1.6-2.8 fl oz	0.025-0.044	12 H/ 0 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	5.8-9.6 fl oz	0.03-0.05	12 H/ 1 D	
	<i>flubendiamide</i> Belt 4SC	28	2-3 fl oz	0.06-0.094	12 H/ 1 D	Adjuvants have been shown to increase efficacy.
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	2.56-3.84 fl oz	0.01-0.015	24 H/ 1 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>methomyl</i> Lannate 2.4LV	1A	0.75-1.5 pt	0.225-0.45	48 H/ 0 D	90 SP formulation also registered.
	<i>permethrin</i> Permethrin 3.2EC	3	4-8 fl oz	0.1-0.2	12 H/ 1 D	Also available as 25WP formulation.
	<i>spinetoram</i> Radiant 1SC	5	3-6 fl oz	0.023-0.047	4 H/ 1 D	
	<i>spinosad</i> Blackhawk 36WDG	5	2.2-3.3 oz	0.05-0.074	4 H/ 1 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	2.8-4 fl oz	0.0175-0.025	12 H/ 3 D	Also in a pre-mix for multiple pests.
European corn borer (not corn earworm)	<i>indoxacarb</i> Avaunt 30WDG	22	2.5-3.5 oz	0.045-0.065	12 H/ 3 D	For application through tassel push only. PHI is 14 days if hand-harvested.
	<i>methoxyfenozide</i> Intrepid 2F	18	4-16 fl oz	0.06-0.25	4 H/ 3 D	
fall armyworm	<i>chlorantraniliprole</i> Coragen 1.67SC	28	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>flubendiamide</i> Belt 4SC	28	2-3 fl oz	0.06-0.094	12 H/ 1 D	Adjuvants have been shown to increase efficacy.
	<i>indoxacarb</i> Avaunt 30WDG	22	2.5-3.5 oz	0.045-0.065	12 H/ 3 D	For application through tassel push only. PHI is 14 days if hand-harvested.
	<i>methomyl</i> Lannate 2.4LV	1A	0.75-1.5 pt	0.225-0.45	48 H/ 0 D	90 SP formulation also registered.
	<i>novaluron</i> Rimon 0.83EC	15	6-12 fl oz	0.038-0.078	12 H/ 1 D	If used after tassel push, tank mix with a knockdown product.
	<i>spinetoram</i> Radiant 1SC	5	3-6 fl oz	0.023-0.047	4 H/ 1 D	
	<i>spinosad</i> Blackhawk 36WDG	5	1.67-3.3 oz	0.038-0.074	4 H/ 1 D	

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CORN (Sweet)

PEST	INSECTICIDE	MOA	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS						
spider mites	<i>propargite</i> Comite 6.55EC	12C	32-48 fl oz	1.64-2.45	13 D/ 30 D	Apply when mite populations are low. Apply only when corn leaves are dry.
	<i>spinomesifen</i> Oberon 4SC	23	2.85-8 fl oz	0.089-0.25	12 H/ 5 D	
stinkbugs	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	1.6-2.8 fl oz	0.0125-0.022	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC	3	2.1-6.4 fl oz	0.033-0.1	12 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>cyfluthrin</i> Tombstone 2EC	3	1.6-2.8 fl oz	0.025-0.044	12 H/ 0 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	2.56-3.84 fl oz	0.01-0.015	24 H/ 1 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests.

CUCURBIT CROPS (Cantaloupe, Cucumber, Pumpkin, Squash, and Watermelon)

PEST	INSECTICIDE	MOA	Cantaloupe Watermelon	Cucumber	Squash Pumpkin	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
PRE-PLANT, AT-PLANTING, AND CHEMIGATION TREATMENTS									
Pre-mixes for multiple pests	<i>thiamethoxam</i> 1.67 lb/gal + <i>chlorantraniliprole</i> 0.835 lb/gal Durivo SC	4A 28	✓	✓	✓	10-13 fl oz	0.13-0.17 + 0.065-0.085	12 H/ 30 D	
aphids, whitefly	<i>cyantraniliprole</i> Verimark 1.67SC	28	✓	✓	✓	6.75-13.5 fl oz Rate varies with pest targeted		4 H/ 1 D	Rates for drip chemigation are 5-10 fl oz. Also labeled for transplant drench no earlier than 72 hours prior to planting.
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	✓	✓	✓	21-28 fl oz See Remarks	0.274-0.365	4 H/ 21 D	2(ee) recommendation allows for use from 14-21 oz in Georgia and Florida.
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	✓	✓	Planthouse: 0.44 fl oz/10,000 plants		12 H/ NA	Apply within 7 days prior to transplanting.
aphid, whitefly, cucumber beetles	<i>clothianidin</i> Belay 2.13SC	4A	✓	✓	✓	9-12 fl oz	0.15-0.2	12 H/ 21 D	
	<i>dinotefuran</i> Venom 70SG	4A	✓	✓	✓	5-6 oz	0.226-0.268	12 H/ 21 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	✓	✓	7-10.5 fl oz	0.25-0.375	12 H/ 21 D	
	<i>thiamethoxam</i> Platinum 75SG	4A	✓	✓	✓	1.66-3.67 oz	0.078-0.17	12 H/ 30 D	Also in a pre-mix for multiple pests.

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CUCURBIT CROPS (Cantaloupe, Cucumber, Pumpkin, Squash, and Watermelon)

PEST	INSECTICIDE	MOA	Cantaloupe Watermelon	Cucumber	Squash Pumpkin	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
PRE-PLANT, AT-PLANTING, AND CHEMIGATION TREATMENTS									
caterpillar pests, whitefly	<i>cyantraniliprole</i> Verimark 1.67SC	28	✓	✓	✓	6.75-13.5 fl oz Rate varies with pest targeted		4 H/ 1 D	Rates for drip chemigation are 5-10 fl oz. Also labeled for transplant drench no earlier than 72 hours prior to planting.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	See label for application timing. Also in a pre-mix for multiple pests. Labeled up to 7.5 fl oz for whitefly.
soil insects	<i>bifenthrin</i> Empower 1.15G	3	✓	✓	✓	3.5-8.7 lb	0.04-0.1	24 H/ 3 D	May be applied pre-plant or during the season.
	<i>diazinon</i> 4E 50W	1B	✓	Not Labeled	Not Labeled	2-4 qt 4-8 lb	2-4 2-4	3 D/ Pre-plant	
FOLIAR TREATMENTS									
Pre-mixes for multiple pests	<i>bifenthrin + avermectin</i> Athena	3 6	✓	✓	✓	7-17 fl oz	0.04-0.1 + 0.006-0.015	12 H/ 7 D	
	<i>flubendiamide+ buprofezin</i> Vetica	28 16	✓	✓	✓	12-17 fl oz	0.03-0.044 + 0.22-0.31	12 H/ 1 D	Primarily for caterpillar pests and whitefly.
	<i>lambda-cyhalothrin + chlorantraniliprole</i> Voliam xpress	3 28	✓	✓	✓	6-9 fl oz	0.02-0.029 + 0.039-0.059	24 H/ 1 D	
	<i>lambda-cyhalothrin + thiamethoxam</i> Endigo ZC	3 4A	✓	✓	✓	4-4.5 fl oz	0.028-0.03 + 0.037-0.04	24 H/ 1 D	
	<i>thiamethoxam+ chlorantraniliprole</i> Voliam flexi WDG	4A 28	✓	✓	✓	4-7 oz	0.05-0.0875 + 0.05-0.0875	12 H/ 1 D	
	<i>zeta-cypermethrin+ bifenthrin</i> Hero	3 3	✓	✓	✓	4-10.3 fl oz	0.01-0.025 + 0.03-0.075	12 H/ 3 D	
aphid	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	✓	2.5-4 oz	0.047-0.075	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	2.6-6.4 fl oz	0.04-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>clothianidin</i> Belay 2.13SC	4A	✓	✓	✓	3-4 fl oz	0.05-0.067	12 H/ 7 D	
	<i>cyantraniliprole</i> Exirel 0.83SC	28	✓	✓	✓	13.5-20.5 fl oz	0.088-0.133	12 H/ 1 D	

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CUCURBIT CROPS (Cantaloupe, Cucumber, Pumpkin, Squash, and Watermelon)

PEST	INSECTICIDE	MOA	Cantaloupe Watermelon	Cucumber	Squash Pumpkin	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or D)	REMARKS
aphid (continued)	FOLIAR TREATMENTS								
	<i>dimethoate</i> 4EC 2.67EC	1B	See Remarks	Not Labeled	Not Labeled	0.5-1 pt 0.75-1.5 pt	0.25-0.5 0.25-0.5	48 H/ 3 D	Also available as Cygon 3.35EC. Minimum labeled rate on cantaloupe is 0.5 lb. AI.
	<i>dinotefuran</i> Venom 70SG	4A	✓	✓	✓	1-4 oz	0.045-0.179	12 H/ 1 D	
	<i>flonicamid</i> Beleaf 50SG	9C	✓	✓	✓	2-2.8 oz	0.062-0.089	12 H/ 0 D	
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	✓	✓	✓	7-12 fl oz	0.09-0.156	4 H/ 1 D	
	<i>malathion</i> Malathion 5EC 8EC	1B	✓	✓	✓	See Label	See Label	12-24 H/ 1 D	Rate, REI, PHI varies with product selection.
	<i>oxamyl</i> Vydate 2L	1A	✓	✓	✓	2-4 pt	0.5-1	48 H/ 1 D	
	<i>pymetrozine</i> Fulfill 50 WDG	9B	✓	✓	✓	2.75 oz	0.086	12 H/ 0 D	
	<i>sulfoxaflor</i> Closer 2SC	4C	✓	✓	✓	1.5-2 fl oz	0.023-0.031	12 H/ 1 D	
<i>thiamethoxam</i> Actara 25WDG	4A	✓	✓	✓	1.5-3 oz	0.023-0.0468	12 H/ 0 D	Also in a pre-mix for multiple pests.	
aphid/mosaic suppression in squash and pumpkin	JMS stylet oil Saf-T-Side Sunspray UFO		✓	✓	✓	3 qt/100 gal finished spray 1 gal/100 gal finished spray 1 ga/100 gal finished spray		4 H/ 0 D	
	NOTE: Oils when used at the above rates applied 2 to 3 times per week with a high pressure (400 PSI) high volume (100 GPA) sprayer give noted suppression of aphid transmitted virus infection. To prevent aphid colonization, treat with a neonicotinoid insecticide (4A) at planting or tank mix an effective contact insecticide with every 2 to 3 applications of oil.								
beet armyworms	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Use of an adjuvant is recommended. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	✓	✓	✓	7-13.5 fl oz	0.045-0.088	12 H/ 1 D	
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	✓	1.5 fl oz	0.046	12 H/ 1 D	Adjuvants have been shown to increase efficacy. Also in a pre-mix for multiple pests.
	<i>indoxacarb</i> Avaunt 30WDG	22	✓	✓	✓	3.5-6 oz	0.065-0.11	12 H/ 3 D	
	<i>methoxyfenozide</i> Intrepid 2F	18	✓	✓	✓	4-10 fl oz	0.06-0.16	4 H/ 3 D	

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CUCURBIT CROPS (Cantaloupe, Cucumber, Pumpkin, Squash, and Watermelon)

PEST	INSECTICIDE	MOA	Cantaloupe Watermelon	Cucumber	Squash Pumpkin	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS									
beet armyworms (continued)	<i>novaluron</i> Rimon 0.83EC	15	√	√	√	9-12 fl oz	0.058-0.078	12 H/ 1 D	
	<i>spinetoram</i> Radiant 1SC	5	√	√	√	5-10 fl oz	0.039-0.078	4 H/ Cucumber = 1 D Others = 3 D	
cucumber beetle	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	√	√	√	2.4-2.8 fl oz	0.019-0.022	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC	3	√	√	√	2.6-6.4 fl oz	0.04-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests
	<i>carbaryl</i> Sevin 4F	1A	√	√	√	1 qt	1	12 H/ 3 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	√	√	√	2.4-2.8 fl oz	0.038-0.044	12 H/ 0 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	√	√	√	5.8-9.6 fl oz	0.03-0.05	12 H/ 3 D	
	<i>fenpropathrin</i> Danitol 2.4EC	3	√	√	√	10.66-16 fl oz	0.2-0.3	24 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	√	√	√	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests
	<i>malathion</i> Malathion 5EC 8EC	1B	√	√	√	See Label	See Label	12-24 H/ 1 D	Rate, REI, PHI varies with product selection.
	<i>permethrin</i> Permethrin 3.2EC	3	√	√	√	4-8 fl oz	0.1-0.2	12 H/ 0 D	Also available as 25WP formulation.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	√	√	√	2.8-4 fl oz	0.018-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
cutworm	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	√	√	√	0.8-1.6 fl oz	0.0065-0.0125	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC	3	√	√	√	2.6-6.4 fl oz	0.04-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>cyfluthrin</i> Tombstone 2EC	3	√	√	√	0.8-1.6 fl oz	0.013-0.025	12 H/ 0 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	√	√	√	5.8-9.6 fl oz	0.03-0.05	12 H/ 3 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	√	√	√	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests.

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CUCURBIT CROPS (Cantaloupe, Cucumber, Pumpkin, Squash, and Watermelon)

PEST	INSECTICIDE	MOA	Cantaloupe Watermelon	Cucumber	Squash Pumpkin	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS									
cutworm (continued)	<i>permethrin</i> Permethrin 3.2EC	3	√	√	√	4-8 fl oz	0.1-0.2	12 H/ 0 D	Also available as 25WP formulation.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	√	√	√	1.28-4 fl oz	0.008-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
leafminer	<i>abamectin</i> Agri-Mek 0.15EC 0.7SC	6	√	√	√	0.5-1 pt 1.75-3.5 fl oz	0.01-0.02 0.01-0.02	12 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	√	√	√	5-7 fl oz	0.065-0.09	4 H/ 1 D	Also in a pre-mix for multiple pests. Use of a surfactant is recommended.
	<i>cyromazine</i> Trigard 75 WP	17	√	√	√	2.66 oz	0.125	12 H/ 0 D	
	<i>spinetoram</i> Radiant 1SC	5	√	√	√	6-10 fl oz	0.047-0.078	4 H/ Cucumber = 1 D Others = 3 D	
pickleworm, melonworm, rindworm complex	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	√	√	√	1.6-2.4 fl oz	0.0125-0.019	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC	3	√	√	√	2.6-6.4 fl oz	0.04-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>carbaryl</i> Sevin 4F	1A	See Remarks	See Remarks	See Remarks	0.5-1 qt	0.5-1	12 H/ 3 D	Not labeled for rindworm complex.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	√	√	√	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	√	√	√	7-13.5 fl oz	0.045-0.088	12 H/ 1 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	√	√	√	1.6-2.4 fl oz	0.025-0.038	12 H/ 0 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	√	√	√	5.8-9.6 fl oz	0.03-0.05	12 H/ 3 D	
	<i>flubendiamide</i> Belt 4SC	28	√	√	√	1.5 fl oz	0.046	12 H/ 1 D	Adjuvants have been shown to increase efficacy. Also in a pre-mix for multiple pests.
	<i>indoxacarb</i> Avaunt 30WDG	22	√	√	√	2.5-6 oz	0.045-0.11	12 H/ 3 D	Not labeled for rindworm complex but should provide good control of most species.
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	√	√	√	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests.

COMMERCIAL VEGETABLE INSECT CONTROL

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CUCURBIT CROPS (Cantaloupe, Cucumber, Pumpkin, Squash, and Watermelon)

PEST	INSECTICIDE	MOA	Cantaloupe Watermelon	Cucumber	Squash Pumpkin	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS									
pickleworm, melonworm, rindworm complex (continued)	<i>malathion</i> Malathion 5EC 8EC	1B	✓	✓	✓	See Label	See Label	12-24 H/ 1 D	Rate, REI, PHI varies with product selection.
	<i>methomyl</i> Lannate 2.4LV	1A	✓	✓	See Remarks	1.5-3 pt	0.45-0.9	48 H/ 1-3 D	90 SP formulation also registered. Not labeled on pumpkin.
	<i>methoxyfenozide</i> Intrepid 2F	18	✓	✓	✓	4-10 fl oz	0.06-0.16	4 H/ 3 D	
	<i>novaluron</i> Rimon 0.83EC	15	✓	✓	✓	12 fl oz	0.078	12 H/ 1 D	
	<i>permethrin</i> Permethrin 3.2EC	3	✓	✓	✓	4-8 fl oz	0.1-0.2	12 H/ 0 D	Also available as 25WP formulation.
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	5-10 fl oz	0.039-0.078	4 H/ Cucumber = 1 D Others = 3 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	2.8-4 fl oz	0.018-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
spider mite	<i>abamectin</i> Agri-Mek 0.15EC 0.7SC	6	✓	✓	✓	0.5-1 pt 1.75-3.5 fl oz	0.01-0.02 0.01-0.02	12 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>acequinocyl</i> Kanemite 15SC	20B	✓	✓	Not Labeled	31 fl oz	0.3	12 H/ 1 D	See adjuvant mixing instructions on label.
	<i>bifenazate</i> Acramite 50WS	un	✓	✓	✓	0.75-1 lb	0.375-0.5	12 H/ 3 D	Good coverage is essential.
	<i>etoxazole</i> Zeal 72WG	10B	✓	✓	✓	2-3 oz	0.09-0.135	12 H/ 7 D	Predominately an ovicide/larvicide.
	<i>fenpyroximate</i> Portal 0.4EC	21A	✓	✓	Not Labeled	2 pt	0.1	12 H/ Cucumber = 1 D Others = 3 D	
	<i>spiromesifen</i> Oberon 2SC	23	✓	✓	✓	7-8.5 fl oz	0.11-0.13	12 H/ 7 D	
squash bug (see note)	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	2.6-6.4 fl oz	0.04-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	✓	1 qt	1	12 H/ 3 D	

COMMERCIAL VEGETABLE INSECT CONTROL

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CUCURBIT CROPS (Cantaloupe, Cucumber, Pumpkin, Squash, and Watermelon)

PEST	INSECTICIDE	MOA	Cantaloupe Watermelon	Cucumber	Squash Pumpkin	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS									
squash bug (continued) (see note)	<i>esfenvalerate</i> Asana 0.66EC	3	√	√	√	5.8-9.6 fl oz	0.03-0.05	12 H/ 3 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	√	√	√	1.28-1.92 fl oz	0.02-0.03	24 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>methomyl</i> Lannate 2.4LV	1A	√	√	See Remarks	1.5-3 pt	0.45-0.9	48 H/ 1-3 D	90 SP formulation also registered. Not labeled on pumpkin.
	<i>permethrin</i> Permethrin 3.2EC	3	√	√	√	8 fl oz	0.2	12 H/ 0 D	Also available as 25WP formulation.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	√	√	√	2.8-4 fl oz	0.018-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
NOTE: This pest is difficult to control. Efficacy studies suggest best control with a tank mix of methomyl plus bifenthrin.									
silverleaf whitefly	<i>acetamiprid</i> Assail 30SG	4A	√	√	√	2.5-5.3 oz	0.047-0.1	12 H/ 0 D	
	<i>buprofezin</i> Courier 3.6SC	16	√	√	√	9-13.6 fl oz	0.25-0.38	12 H/ 1 D	Activity on nymphs. Also in a pre-mix for multiple pests.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	√	√	√	5-7 fl oz	0.065-0.09	4 H/ 1 D	Activity on nymphs. Addition of an adjuvant has shown increased efficacy. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	√	√	√	13.5-20.5 fl oz	0.088-0.133	12 H/ 1 D	
	<i>dinotefuran</i> Venom 70SG	4A	√	√	√	1-4 oz	0.045-0.179	12 H/ 1 D	
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	√	√	√	10.5-14 fl oz	0.136-0.18	4 H/ 1 D	
	<i>pyriproxyfen</i> Knack 0.86EC	7C	√	√	√	8-10 fl oz	0.054-0.067	12 H/ 7 D	Activity on eggs and last instar nymphs.
	<i>spiromesifen</i> Oberon 2SC	23	√	√	√	7-8.5 fl oz	0.11-0.13	12 H/ 7 D	
	<i>thiamethoxam</i> Actara 25WDG	4A	√	√	√	3-5.5 oz	0.0468-0.086	12 H/ 0 D	Also in a pre-mix for multiple pests.
NOTE: Reduced residual activity has been noted with all Group 4A insecticides. NOTE: Group 4A insecticides should not be used for foliar applications if a Group 4A was applied in the soil.									
thrips, western flower	<i>dinotefuran</i> Venom 70SG	4A	√	√	√	1-4 oz	0.045-0.179	12 H/ 1 D	
	<i>spinetoram</i> Radiant 1SC	5	√	√	√	6-10 fl oz	0.047-0.078	4 H/ Cucumber = 1 D Others = 3 D	
NOTE: methomyl (Lannate) at rate for pickleworm gives good controlNOTE: Assail as applied for whiteflies provides suppression of thrips.									

EFFICACY OF INSECTICIDES/ACARACIDES FOR CONTROLLING ARTHROPOD PESTS OF VEGETABLE CROPS

Alton N. Sparks, Jr., Extension Entomologist

CUCURBIT VEGETABLES

Chemical class (IRAC)	Common Name	Example Product	Cucumber beetles	Cabbage looper	Beet armyworm	Stink bugs, Squash bug	Aphids	Thrips	Western Flower Thrips	Silverleaf Whitefly	Cutworms	Spider mites	Pickleworm, melonworm	Leafminer
1A	<i>carbaryl</i>	Sevin	++	+	-	-	-	+	-	-	+	-	+	-
	<i>methomyl</i>	Lannate	-	++	+	++	+	+++	++	+	-	-	++	-
1B	<i>malathion</i>	Malathion	++	+	-	+	+	+	-	-	+	-	+	-
3	<i>permethrin</i>	Pounce	++	++	-	++	+	+	-	-	++	-	++	-
	<i>zeta-cypermethrin</i>	Mustang Max	+++	++	-	++	+	++	-	-	+++	-	+++	-
	<i>beta-cyfluthrin</i>	Baythroid	++	++	-	++	+	+	-	-	+++	-	+++	-
	<i>lambda-cyhalothrin</i>	Karate	+++	++	-	++	+	++	-	-	+++	-	+++	-
	<i>esfenvalerate</i>	Asana XL	++	++	-	+	+	+	-	-	++	-	+++	-
	<i>fenpropathrin</i>	Danitol	++	+	-	++	+	+	-	-	++	-	+++	-
	<i>bifenthrin</i>	Brigade	+++	+	-	++	+	++	-	-	+++	-	+++	-
4A	<i>imidacloprid</i>	Admire Pro	+++	-	-	-	+++	+	-	++	-	-	-	-
	<i>acetamiprid</i>	Assail	++	-	-	+	+++	+	-	++	-	-	-	-
	<i>thiamethoxam</i>	Platinum/Actara	++	-	-	++	+++	+	-	++	-	-	-	-
	<i>dinotefuran</i>	Venom	++	-	-	++	++	+	-	++	-	-	-	-
4C	<i>sulfoxaflor</i>	Closer	-	-	-	-	+++	-	-	+	-	-	-	-
4D	<i>flupyradifurone</i>	Sivanto	-	-	-	-	+++	-	-	++	-	-	-	-
5	<i>spinetoram</i>	Radiant	-	++	++	-	-	+++	++	-	+	-	+++	+
6	<i>abamectin</i>	AgriMek	-	-	-	-	-	++	+	-	-	+++	-	+++
7C	<i>pyriproxyfen</i>	Knack	-	-	-	-	-	-	-	++	-	-	-	-
9B	<i>pymetrozine</i>	Fulfill	-	-	-	-	+++	-	-	+	-	-	-	-

Rating for products was initially conducted at the 2009 Southeast Extension Vegetable Workers Conference in Fletcher, NC.

Efficacy ratings do not necessarily indicate a labeled use for all crops in this group. Please refer to the appropriate section of the Pest Management Handbook for details on product labeling.

Efficacy ratings:

- = Ineffective or insufficient data
- + = Somewhat effective
- ++ = Effective
- +++ = Very effective

EFFICACY OF INSECTICIDES/ACARACIDES FOR CONTROLLING ARTHROPOD PESTS OF VEGETABLE CROPS

CUCURBIT VEGETABLES (continued)

Chemical class (IRAC)	Common Name	Example Product	Cucumber beetles	Cabbage looper	Beet armyworm	Stink bugs, Squash bug	Aphids	Thrips	Western Flower Thrips	Silverleaf Whitefly	Cutworms	Spider mites	Pickleworm, melonworm	Leafminer
9C	<i>flonicamid</i>	Beleaf	-	-	-	-	+++	-	-	-	-	-	-	-
10B	<i>etoxazole</i>	Zeal	-	-	-	-	-	-	-	-	-	++	-	-
11	<i>Bt</i>	Dipel, various	-	++	+	-	-	-	-	-	-	-	+	-
15	<i>novaluron</i>	Rimon	-	++	+++	+	-	+	+	+	-	-	+++	-
16	<i>buprofezin</i>	Courier	-	-	-	-	-	-	-	++	-	-	-	-
17	<i>cyromazine</i>	Trigard	-	-	-	-	-	-	-	-	-	-	-	+++
18	<i>methoxyfenozide</i>	Intrepid	-	+++	+++	-	-	-	-	-	-	-	++	-
20B	<i>acequinocyl</i>	Kanemite	-	-	-	-	-	-	-	-	-	++	-	-
21	<i>fenpyroximate</i>	Portal	-	-	-	-	-	-	-	-	-	+++	-	-
22	<i>indoxacarb</i>	Avaunt	+	+++	+++	-	-	-	-	-	+	-	+++	-
23	<i>spiromesifen</i>	Oberon	-	-	-	-	-	-	-	+	-	++	-	-
28	<i>chlorantraniliprole</i>	Coragen	-	+++	+++	-	-	-	-	++	+	-	+++	+
	<i>cyantraniliprole</i>	Verimark/Exirel	-	+++	+++	-	+++	++	+	++	+	-	+++	+
	<i>flubendiamide</i>	Belt	-	+++	+++	-	-	-	-	-	+	-	+++	-
un	<i>bifenazate</i>	Acramite	-	-	-	-	-	-	-	-	-	+++	-	-

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Efficacy ratings do not necessarily indicate a labeled use for all crops in this group. Please refer to the appropriate section of the Pest Management Handbook for details on product labeling.

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- + = Somewhat effective
- ++ = Effective
- +++ = Very effective

COMMERCIAL VEGETABLE INSECT CONTROL

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
PRE-PLANT, AT-PLANTING, AND CHEMIGATION TREATMENTS										
Pre-mixes for multiple pests	<i>thiamethoxam</i> 1.67 lb/gal + <i>chlorantraniliprole</i> 0.835 lb/gal Durivo SC	4A 28	✓	✓	✓	Not Labeled	10-13 fl oz	0.13-0.17 + 0.065-0.085	12 H/ 30 D	
aphid whitefly	<i>cyantraniliprole</i> Verimark 1.67SC	28	✓	✓	✓	✓	5-13.5 fl oz Rate varies with pest targeted.		4 H/ 1 D	Rates for drip chemigation are 5-10 fl oz. Also labeled for transplant drench no earlier than 72 hours prior to planting.
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	✓	✓	✓	✓	21-28 fl oz	0.274-0.365	4 H/ 45 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	✓	✓	✓	Planthouse: 0.44 fl oz/10,000 plants		12 H/ NA	Apply within 7 days prior to transplanting.
aphid, cucumber beetle, whitefly	<i>clothianidin</i> Belay 2.13SC	4A	✓	✓	✓	Not Labeled	9-12 fl oz	0.15-0.2	12 H/ 21 D	
	<i>dinotefuran</i> Venom 70SG	4A	✓	✓	✓	Not Labeled	5-6 oz	0.226-0.268	12 H/ 21 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	See Remarks	✓	See Remarks	7-10.5 fl oz	0.25-0.375	12 H/ 21 D	Maximum rate on pepper and okra is 14 fl oz.
	<i>thiamethoxam</i> Platinum 75SG	4A	✓	✓	✓	Not Labeled	1.66-3.67 oz	0.078-0.17	12 H/ 30 D	Also in a pre-mix for multiple pests.
caterpillar pests	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Coragen is labeled at higher rates for suppression of whitefly. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Verimark 1.67SC	28	✓	✓	✓	✓	5-13.5 fl oz Rate varies with pest targeted.		4 H/ 1 D	Rates for drip chemigation are 5-10 fl oz. Also labeled for transplant drench no earlier than 72 hours prior to planting.
soil insects	<i>bifenthrin</i> Empower 1.15G	3	Not Labeled	✓	✓	Not Labeled	3.5-8.7 oz	0.4-1	24 H, Eggplant = 9D/ 9 D	May be applied pre-plant or during the season.
	<i>diazinon</i> 4E 50W	1B	✓	Not Labeled	Not Labeled	Not Labeled	2-4 qt 4-8 lb	2-4 2-4	2 D/ Pre-plant	
FOLIAR TREATMENTS										
Pre-mixes for multiple pests	<i>bifenthrin</i> + <i>avermectin</i> Athena	3 6	✓	✓	✓	Not Labeled	7-17 fl oz	0.04-0.1 + 0.006-0.015	12 H/ 7 D	
	<i>flubendiamide</i> 0.33 lb/gal + <i>buprofezin</i> 2.33 lb/gal Vetica SC	28 16	✓	✓	✓	✓	12-17 fl oz	0.03-0.044 + 0.22-0.31	12 H/ 1 D	Primarily for caterpillar pests and whitefly.
	<i>imidacloprid</i> 2 lb/gal + <i>beta-cyfluthrin</i> 1 lb/gal Leverage 360 SC	4A 3	✓	✓	✓	Not Labeled	3.8-4.1 fl oz	0.059-0.064 + 0.03-0.032	12 H/ Tomato = 0 D Others = 7 D	

COMMERCIAL VEGETABLE INSECT CONTROL

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
Pre-mixes for multiple pests (continued)	<i>lambda-cyhalothrin</i> 0.417 lb/gal + <i>chlorantraniliprole</i> 0.835 lb/gal Voliam Xpress SC	3 28	✓	✓	✓	Not Labeled	5-9 fl oz Rate varies with targeted pests.		24 H/ 5 D	
	<i>lambda-cyhalothrin</i> 0.88 lb/gal + <i>thiamethoxam</i> 1.18 lb/gal Endigo ZC SC	3 4A	✓	✓	✓	Not Labeled	4-4.5 fl oz	0.028-0.03 + 0.037-0.04	24 H/ 5 D	
	<i>thiamethoxam</i> 0.2 lb/lb + <i>chlorantraniliprole</i> 0.2 lb/lb Voliam Flexi WDG	4A 28	✓	✓	✓	Not Labeled	4-7 oz	0.05-0.0875 + 0.05-0.0875	12 H/ 1 D	
	<i>zeta-cypermethrin</i> 0.31 lb/gal + <i>bifenthrin</i> 0.93 lb/gal Hero EC	3 3	✓	✓	✓	✓	4-10.3 fl oz	0.01-0.025 + 0.03-0.075	12 H/ Tomato = 1 D Others = 7 D	
aphid	<i>acephate</i> Orthene 97	1B	Not Labeled	✓	Not Labeled	Not Labeled	0.5-1 lb	0.5-1	24 H/ 7 D	
	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	✓	✓	2-4 oz	0.038-0.075	12 H/ 7 D	
	<i>bifenthrin</i> Brigade 2EC	3	See Remarks	✓	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H; Tomato = 1 D Others = 7 D	Also in a pre-mix for multiple pests. Maximum rate on tomato 5.2 fl oz.
	<i>clothianidin</i> Belay 2.13SC	4A	✓	✓	✓	Not Labeled	3-4 fl oz	0.05-0.067	12 H/ Pepper = 1 D Others = 7 D	
	<i>cyantraniliprole</i> Exirel 0.83SC	28	✓	✓	✓	✓	13.5-20.5 fl oz	0.088-0.133	12 H/ 1 D	
	<i>dimethoate</i> 4EC 2.67EC	1B	✓	See Remarks	Not Labeled	Not Labeled	0.5-1 pt 0.75-1.5 pt	0.25-0.5 0.25-0.5	48 H/ Pepper = 0 D Tomato = 7 D	Maximum rate on pepper is 0.33 lb ai. Also available as Cygon 3.35EC.
	<i>dinotefuran</i> Venom 70SG	4A	✓	✓	✓	Not Labeled	1-4 oz	0.045-0.179	12 H/ 1 D	
	<i>flonicamid</i> Beleaf 50SG	9C	✓	✓	✓	✓	2.8-4.28 oz	0.089-0.133	12 H/ 0 D	
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	✓	✓	✓	✓	7-12 fl oz	0.09-0.156	4 H/ 1 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	✓	✓	✓	1.3-2.2 fl oz	0.047-0.079	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>malathion</i> 5EC 8EC	1B	✓	✓	✓	✓	See Label.	See Label.	12 H/ 1-3 D	Rate, REI, PHI varies with product selection.

COMMERCIAL VEGETABLE INSECT CONTROL

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
aphid (continued)	<i>oxamyl</i> Vydate 2L	1A	✓	✓	✓	Not Labeled	2-4 pt	0.5-1	48 H/ See Remarks	PHI Eggplant = 1 day, Tomato = 3 days, Pepper = 7 days
	<i>pymetrozine</i> Fulfill 50WDG	9B	✓	✓	✓	Not Labeled	2.75 oz	0.086	12 H/ 0 D	
	<i>spirotetramat</i> Movento 2SC	23	✓	✓	✓	✓	4-5 fl oz	0.0625-0.078	24 H/ 1 D	Use of an adjuvant is necessary.
	<i>sulfoxaflor</i> Closer 2SC	4C	✓	✓	✓	Not Labeled	1.5-2 fl oz	0.023-0.031	12 H/ 1 D	
	<i>thiamethoxam</i> Actara 25WDG	4A	✓	✓	✓	Not Labeled	2-3 oz	0.03-0.0468	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
beet armyworms fall armyworm	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Use of an adjuvant is recommended. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	✓	✓	✓	✓	7-13.5 fl oz	0.045-0.088	12 H/ 1 D	
	<i>emamectin benzoate</i> Proclaim 5WDG	6	✓	✓	✓	Not Labeled	2.4-4.8 oz	0.0075-0.015	12 H/ 7 D	
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	✓	✓	1.5 fl oz	0.046	12 H/ 1 D	Adjuvants have been shown to increase efficacy. Also in a pre-mix for multiple pests.
	<i>indoxacarb</i> Avaunt 30WDG	22	✓	✓	✓	✓	3.5 oz	0.065	12 H/ 3 D	
	<i>methomyl</i> Lannate 2.4LV	1A	✓	✓	✓	Not Labeled	1.5-3 pt	0.45-0.9	48 H/ See Remarks	Not recommended for Beet Armyworm. PHI Tomato = 1 day, Pepper = 3 days, Eggplant = 5 days
	<i>methoxyfenozide</i> Intrepid 2F	18	✓	✓	✓	✓	4-16 fl oz	0.06-0.25	4 H/ 1 D	
	<i>novaluron</i> Rimon 0.83EC	15	✓	✓	✓	✓	9-12 fl oz	0.058-0.078	12 H/ 1 D	
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	✓	5-10 fl oz	0.039-0.078	4 H/ 1 D	
cabbage looper, hornworm	<i>Bacillus thuringiensis</i> "Bt" various names	11B	✓	✓	✓	✓	Follow label		4 H/ 0 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	✓	Not Labeled	2.1-2.8 fl oz	0.0165-0.022	12 H/ Tomato = 0 D Others = 7 D	Hornworm minimum rate is 1.6 fl oz. Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	See Remarks	✓	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ Tomato = 1 D Others = 7 D	Also in a pre-mix for multiple pests. Maximum rate on tomato is 5.2 fl oz.

COMMERCIAL VEGETABLE INSECT CONTROL

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Use of an adjuvant is recommended. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	✓	✓	✓	✓	10-17 fl oz	0.065-0.11	12 H/ 1 D	Rates listed are loopers, minimum rate for others is 7 fl oz.
	<i>cyfluthrin</i> Tombstone 2E	3	✓	✓	✓	Not Labeled	2.1-2.8 fl oz	0.033-0.044	12 H/ Tomato = 0 D Others = 7 D	Hornworm minimum rate is 1.6 fl oz.
	<i>emamectin benzoate</i> Proclaim 5WDG	6	✓	✓	✓	Not Labeled	3.2-4.8 oz	0.01-0.015	12 H/ 7 D	Hornworm minimum rate is 2.4 fl oz.
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	✓	✓	Not Labeled	5.8-9.6 fl oz	0.03-0.05	12 H/ Tomato = 1 D Others = 7 D	Hornworm minimum rate is 2.9 fl oz.
	<i>fenpropathrin</i> Danitol 2.4EC	3	✓	✓	✓	Not Labeled	10.66 fl oz	0.2	24 H/ 3 D	
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	✓	✓	1.5 fl oz	0.046	12 H/ 1 D	Adjuvants have been shown to increase efficacy. Also in a pre-mix for multiple pests.
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	Not Labeled	1.92-3.2 fl oz	0.0075-0.0125	24 H/ 5 D	
	<i>indoxacarb</i> Avaunt 30WDG	22	✓	✓	✓	✓	2.5-3.5 oz	0.045-0.065	12 H/ 3 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	Not Labeled	0.96-1.6 fl oz	0.015-0.025	24 H/ 5 D	Also in a pre-mix for multiple pests.
	<i>methomyl</i> Lannate 2.4LV	1A	✓	✓	✓	Not Labeled	1.5-3 pt	0.45-0.9	48 H/ See Remarks	90 SP formulation also registered. PHI Tomato = 1 day, Pepper = 3 days, Eggplant = 5 days
	<i>methoxyfenozide</i> Intrepid 2F	18	✓	✓	✓	✓	4-16 fl oz	0.06-0.25	4 H/ 1 D	
	<i>novaluron</i> Rimon 0.83EC	15	✓	✓	✓	✓	9-12 fl oz	0.058-0.078	12 H/ 1 D	
	<i>permethrin</i> Permethrin 3.2EC	3	✓	✓	✓	Not Labeled	4-8 fl oz	0.1-0.2	12 H/ Tomato = 0 D Others = 3 D	Also available as 25WP formulation.
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	✓	5-10 fl oz	0.039-0.078	4 H/ 1 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Hornworm minimum rate is 2.24 fl oz. Also in a pre-mix for multiple pests.

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
Colorado potato beetle, flea beetle, blister beetle	<i>abamectin</i> Agri-Mek 0.15EC 0.7SC	6	✓	✓	✓	Not Labeled	0.5-1 pt 1.75-3.5 fl oz	0.01-0.02 0.01-0.02	12 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	✓	✓	1.5-2.5 oz	0.028-0.047	12 H/ 7 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	✓	Not Labeled	2.8 fl oz	0.022	12 H/ Tomato = 0 D Others = 7 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	See Remarks	✓	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ Tomato = 1 D Others = 7 D	Also in a pre-mix for multiple pests. Maximum rate on tomato is 5.2 fl oz.
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	✓	See Remarks	1-2 qt	1-2	12 H/ 3 D	Maximum rate on okra is 1.5 qt.
	<i>clothianidin</i> Belay 2.13SC	4A	✓	✓	✓	Not Labeled	3-4 fl oz	0.05-0.067	12 H/ Pepper = 1 D Others = 7 D	
	<i>cyfluthrin</i> Tombstone 2E	3	✓	✓	✓	Not Labeled	1.6-2.8 fl oz	0.025-0.044	12 H/ Tomato = 0 D Others = 7 D	
	<i>dinotefuran</i> Venom 20SG	4A	✓	✓	✓	Not Labeled	1-4 oz	0.045-0.179	12 H/ 1 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	✓	✓	Not Labeled	5.8-9.6 fl oz	0.03-0.05	12 H/ Tomato = 1 D Others = 7 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	Not Labeled	2.56-3.84 fl oz	0.01-0.015	24 H/ 5 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	✓	✓	✓	1.3-2.2 fl oz	0.047-0.079	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>lamda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	Not Labeled	1.28-1.92 fl oz	0.02-0.03	24 H/ 5 D	Also in a pre-mix for multiple pests.
	<i>novaluron</i> Rimon 0.83EC	15	✓	✓	✓	✓	9-12 fl oz	0.058-0.078	12 H/ 1 D	Not recommended for flea beetle or blister beetle.
	<i>oxamyl</i> Vydate 2L	1A	✓	✓	✓	Not Labeled	2-4 pt	0.5-1	48 H/ See Remarks	PHI Eggplant = 1 day, Tomato = 3 days, Pepper = 7 days
<i>thiamethoxam</i> Actara 25WDG	4A	✓	✓	✓	Not Labeled	2-3 oz	0.03-0.0468	12 H/ 0 D	Also in a pre-mix for multiple pests.	
<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	2.24-4 fl oz	0.014-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.	

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
tomato fruitworm (corn earworm), tomato pinworm, european corn borer	<i>abamectin</i> Agri-Mek.15EC 0.7SC	6	See Remarks	See Remarks	See Remarks	See Remarks	0.5-1 pt 1.75-3.5 oz	0.01-0.02 0.01-0.02	12 H/ 7 D	For tomato pinworm control only.
	<i>acephate</i> Orthene 97	1B	Not Labeled	See Remarks	Not Labeled	Not Labeled	0.75-1 lb	0.75-1	24 H/ 7 D	Labeled for ECB only.
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	✓	Not Labeled	1.6-2.8 fl oz	0.0125-0.022	12 H/ Tomato = 0 D Others = 7 D	Pinworm minimum rate is 2.1 fl oz. Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	See Remarks	✓	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ Tomato = 1 D Others = 7 D	Maximum rate: tomato 5.2 fl oz. Also in a pre-mix for multiple pests.
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	✓	See Remarks	1-2 qt	1-2	12 H/ 3 D	Okra maximum rate 1.5 qt.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Use of an adjuvant is recommended. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	✓	✓	✓	✓	7-13.5 fl oz	0.045-0.088	12 H/ 1 D	
	<i>cyfluthrin</i> Tombstone 2E	3	✓	✓	✓	Not Labeled	1.6-2.8 fl oz	0.025-0.044	12 H/ Tomato = 0 D Others = 7 D	Minimum rate 2.1 fl oz for pinworm.
	<i>emamectin benzoate</i> Proclaim 5WDG	6	✓	✓	✓	Not Labeled	2.4-4.8 oz	0.0075-0.015	12 H/ 7 D	Not labeled for European corn borer.
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	✓	✓	Not Labeled	5.8-9.6 fl oz	0.03-0.05	12 H/ Tomato = 1 D Others = 7 D	
	<i>fenpropathrin</i> Danitol 2.4EC	3	✓	✓	✓	Not Labeled	10.66 fl oz	0.2	24 H/ 3 D	
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	✓	✓	1.5 fl oz	0.046	12 H/ 1 D	Adjuvants have been shown to increase efficacy. Also in a pre-mix for multiple pests.
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	Not Labeled	2.56-3.84 oz	0.01-0.015	24 H/ 5 D	
	<i>indoxacarb</i> Avaunt 30WDG	22	✓	✓	✓	✓	3.5 oz	0.065	12 H/ 3 D	
<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	Not Labeled	1.28-1.92 fl oz	0.02-0.03	24 H/ 5 D	Also in a pre-mix for multiple pests.	

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
tomato fruitworm (corn earworm), tomato pinworm, european corn borer (continued)	<i>methomyl</i> Lannate 2.4LV	1A	✓	✓	✓	Not Labeled	1.5-3 pt	0.45-0.9	48 H/ See Remarks	90 SP formulation also registered. PHI Tomato = 1 day, Pepper = 3 days, Eggplant = 5 days
	<i>methoxyfenozide</i> Intrepid 2F	18	See Remarks	See Remarks	See Remarks	See Remarks	4-16 fl oz	0.06-0.25	4 H/ 1 D	Labeled for ECB. Pinworm and fruitworm suppression only.
	<i>novaluron</i> Rimon 0.83EC	15	✓	✓	✓	✓	9-12 fl oz	0.058-0.078	12 H/ 1 D	
	<i>permethrin</i> Permethrin 3.2EC	3	✓	✓	✓	Not Labeled	4-8 fl oz	0.1-0.2	12 H/ Tomato = 0 D Others = 3 D	Minimum rate for corn borer is 8 fl oz. Also available as 25WP formulation.
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	✓	5-10 fl oz	0.039-0.078	4 H/ 1 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	2.24-4 fl oz	0.014-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
cutworm	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	✓	Not Labeled	2.1-2.8 fl oz	0.0165-0.022	12 H/ Tomato = 0 D Others = 7 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	See Remarks	✓	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ Tomato = 1 D Others = 7 D	Also in a pre-mix for multiple pest Maximum rate for tomato is 5.2 fl oz.
	<i>cyfluthrin</i> Tombstone 2E	3	✓	✓	✓	Not Labeled	2.1-2.8 fl oz	0.033-0.044	12 H/ Tomato = 0 D Pepper = 7 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	✓	✓	Not Labeled	5.8-9.6 fl oz	0.03-0.05	12 H/ Tomato = 1 D Others = 7 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	Not Labeled	1.92-3.2 fl oz	0.0075-0.0125	24 H/ 5 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	Not Labeled	0.96-1.6 fl oz	0.015-0.025	24 H/ 5 D	Also in a pre-mix for multiple pests.
	<i>permethrin</i> Permethrin 3.2EC	3	✓	✓	✓	Not Labeled	4-8 fl oz	0.1-0.2	12 H/ Tomato = 1 D Others = 3 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	2.24-4 fl oz	0.014-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
leafminer	<i>abamectin</i> Agri-Mek 0.15EC 0.7SC	6	✓	✓	✓	Not Labeled	0.5-1 pt 1.75-3.5 fl oz	0.01-0.02 0.01-0.02	12 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	✓	5-7.5 fl oz	0.065-0.098	4 H/ 1 D	Adjuvants have been shown to increase efficacy. Also in a pre-mix for multiple pests.
	<i>cyromazine</i> Trigard 75WP	17	✓	✓	Not Labeled	Not Labeled	2.66 oz	0.125	12 H/ 0 D	
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	✓	6-10 fl oz	0.047-0.078	4 H/ 1 D	
pepper weevil	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	✓	✓	2.5-4 oz	0.047-0.075	12 H/ 7 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	✓	Not Labeled	2.8 fl oz	0.022	12 H/ Tomato = 0 D Others = 7 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	See Remarks	✓	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ Tomato = 1 D Others = 7 D	Also in a pre-mix for multiple pests. Maximum rate on Tomato is 5.2 fl oz.
	<i>clothianidin</i> Belay 2.13SC	4A	✓	✓	✓	Not Labeled	3-4 fl oz	0.05-0.067	12 H/ Pepper = 1 D Others = 7 D	
	<i>cyfluthrin</i> Tombstone 2E	3	✓	✓	✓	Not Labeled	2.8 fl oz	0.044	12 H/ Tomato = 0 D Others = 7 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	✓	✓	Not Labeled	5.8-9.6 fl oz	0.03-0.05	12 H/ Tomato = 1 D Others = 7 D	
	<i>oxamyl</i> Vydate 2L	1A	✓	✓	✓	Not Labeled	2-4 pt	0.5-1	48 H/ See Remarks	PHI Eggplant = 1 day, Tomato = 3 days, Peppers = 7 days
	<i>permethrin</i> Permethrin 3.2EC	3	✓	✓	✓	Not Labeled	4-8 fl oz	0.1-0.2	12 H/ Tomato = 0 D Others = 3 D	Also available as 25WP formulation.
	<i>thiamethoxam</i> Actara 25WDG	4A	✓	✓	✓	Not Labeled	3-5.5 oz	0.047-0.086	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	2.24-4 fl oz	0.014-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
spider mite, broad mite (see remarks)	<i>abamectin</i> Agri-Mek.15EC 0.7SC	6	✓	✓	✓	Not Labeled	0.5-1 pt 1.75-3.5 fl oz	0.01-0.02 0.01-0.02	12 H/ 7 D	Also in a pre-mix for multiple pests. Provides good control of broad mite.
	<i>acequinocyl</i> Kanemite 15SC	20B	✓	✓	✓	✓	31 fl oz	0.3	12 H/ 1 D	See adjuvant mixing instructions on label.
	<i>bifenazate</i> Acramite 50WS	un	✓	✓	✓	✓	0.75-1 lb	0.375-0.5	12 H/ 3 D	Good coverage is essential.
	<i>etoxazole</i> Zeal 72WG	10B	Not Labeled	✓	✓	✓	2-3 oz	0.09-0.135	12 H/ 7 D	Predominately an ovicide/larvicide.
	<i>fenpyroximate</i> Portal 0.4EC	21A	✓	✓	✓	✓	2 pt	0.1	12 H/ 1 D	Provides good control of broad mite.
	<i>hexakis</i> Vendex 50WP	12B	Not Labeled	Not Labeled	✓	Not Labeled	2-3 lb	1-1.5	48 H/ 3 D	
	<i>spiromesifen</i> Oberon 2SC	23	✓	✓	✓	Not Labeled	7-8.5 fl oz	0.11-0.13	12 H/ 1 D	Provides control of broad mite but must be used preventively.
NOTE: Proclaim at moderate to high rates has provided good control of spider mites.										
stink bug, leaffooted bug	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	✓	Not Labeled	1.6-2.8 fl oz	0.0125-0.022	12 H/ Tomato = 0 D Others = 7 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	See Remarks	✓	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ Tomato = 1 D Others = 7 D	Also in a pre-mix for multiple pests. Maximum rate: tomato 5.2 fl oz.
	<i>cyfluthrin</i> Tombstone 2E	3	✓	✓	✓	Not Labeled	1.6-2.8 fl oz	0.025-0.044	12 H/ Tomato = 0 D Others = 7 D	
	<i>fenpropathrin</i> Danitol 2.4EC	3	✓	✓	✓	Not Labeled	10.66 fl oz	0.2	24 H/ 3 D	
	<i>gamma-cyhalothin</i> Proaxis 0.5EC	3	✓	✓	✓	Not Labeled	2.56-3.84 fl oz	0.01-0.015	24 H/ 5 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	Not Labeled	1.28-1.92 fl oz	0.02-0.03	24 H/ 5 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.

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FRUITING VEGETABLES (Eggplant, Okra, Pepper, and Tomato)

PEST	INSECTICIDE	MOA	Tomato	Pepper	Eggplant	Okra	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS										
western flower thrips	<i>acetamiprid</i> Assail 30SG	4A	√	√	√	√	4 oz	0.075	12 H/ 7 D	
	<i>dinotefuran</i> Venom 70SG	4A	√	√	√	Not Labeled	1-4 oz	0.045-0.179	12 H/ 1 D	
	<i>spinetoram</i> Radiant 1SC	5	√	√	√	√	6-10 fl oz	0.047-0.078	4 H/ 1 D	
	NOTE: Lannate as applied for registered pests gives fair to good control of western flower thrips with short residual activity.									
silverleaf whitefly	<i>acetamiprid</i> Assail 30SC	4A	√	√	√	√	2.5-4 oz	0.05-0.075	12 H/ 7 D	
	<i>buprofezin</i> Courier 3.6SC	16	√	√	√	√	9-13.6 fl oz	0.25-0.38	12 H/ 1 D	Activity on nymphs. Also in a pre-mix for multiple pests.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	√	√	√	√	5-7.5 fl oz	0.065-0.098	4 H/ 1 D	Activity on nymphs. Addition of an adjuvant has shown increased efficacy. Also in a pre-mix for multiple pests.
	<i>cyantraniliprole</i> Exirel 0.83SC	28	√	√	√	√	13.5-20.5 fl oz	0.088-0.133	12 H/ 1 D	
	<i>dinotefuran</i> Venom 70SG	4A	√	√	√	Not Labeled	1-4 oz	0.045-0.179	12 H/ 1 D	
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	√	√	√	√	10.5-14 fl oz	0.136-0.18	4 H/ 1 D	
	<i>pyriproxyfen</i> Knack 0.86EC	7C	√	√	√	√	8-10 fl oz	0.054-0.067	12 H/ 1 D	Activity on eggs and last instar nymphs.
	<i>spiromesifen</i> Oberon 2SC	23	√	√	√	Not Labeled	7-8.5 fl oz	0.11-0.13	12 H/ 1 D	
	<i>spirotetramat</i> Movento 2SC	23	√	√	√	√	4-5 fl oz	0.0625-0.078	24 H/ 1 D	Use of an adjuvant is necessary. Activity on early instar nymphs.
	<i>thiamethoxam</i> Actara 25WDG	4A	√	√	√	Not Labeled	3-5.5 oz	0.0468-0.086	12 H/ 0 D	Also in a pre-mix for multiple pests.
NOTE: If a Group 4 or Group 23 insecticide was applied in the soil, an alternative Group should be used for at least two foliar applications after the residual period of the soil applied insecticide.										

EFFICACY OF INSECTICIDES/ACARACIDES FOR CONTROLLING ARTHROPOD PESTS OF VEGETABLE CROPS

Alton N. Sparks, Jr., Extension Entomologist

FRUITING VEGETABLES

Chemical class (IRAC)	Common Name	Example Product	Flea Beetle	Colorado Potato Beetle	Corn Earworm	European Corn Borer	Fall Armyworm	Beet Armyworm	Stink Bugs, Squash Bug	Aphids	Thrips	Western Flower Thrips	Silverleaf Whitefly	Cutworms	Spider Mites	Broad Mite	Leafminer
1A	<i>carbaryl</i>	Sevin	+++	+	+	++	+	-	-	-	+	-	-	+	-	-	-
	<i>methomyl</i>	Lannate	+	-	++	++	++	+	++	+	+++	++	-	-	-	-	-
1B	<i>malathion</i>	Malathion	++	+	+	+	+	-	+	+	+	-	-	+	-	-	-
	<i>acephate</i>	Orthene	-	-	+	+++	++	-	-	++	++	-	-	++	-	-	-
3	<i>permethrin</i>	Pounce	++	++	++	++	+	-	++	+	+	-	-	++	-	-	-
	<i>zeta-cypermethrin</i>	Mustang Max	+++	+	++	+++	+	-	++	+	++	-	-	+++	-	-	-
	<i>beta-cyfluthrin</i>	Baythroid	++	++	++	++	+	-	++	+	+	-	-	+++	-	-	-
	<i>lambda-cyhalothrin</i>	Karate	+++	+	++	+++	+	-	++	+	++	-	-	+++	-	-	-
	<i>esfenvalerate</i>	Asana XL	+++	++	++	++	+	-	+	+	+	-	-	++	-	-	-
	<i>fenpropathrin</i>	Danitol	++	-	++	++	+	-	++	+	+	-	-	++	-	-	-
	<i>bifenthrin</i>	Brigade	+++	-	++	++	+	-	++	+	++	-	-	+++	-	-	-
4A	<i>imidacloprid</i>	Admire Pro	+++	+++	-	-	-	-	-	+++	+	-	++	-	-	-	-
	<i>acetamiprid</i>	Assail	++	+++	-	-	-	-	+	+++	+	-	++	-	-	-	-
	<i>thiamethoxam</i>	Platinum/Actara	+++	+++	-	-	-	-	++	+++	+	-	++	-	-	-	-
	<i>dinotefuran</i>	Venom	+++	+++	-	-	-	-	++	++	+	-	++	-	-	-	-
4C	<i>sulfoxaflor</i>	Closer	-	-	-	-	-	-	-	+++	-	-	+	-	-	-	-
4D	<i>flupyradifurone</i>	Sivanto	-	-	-	-	-	-	-	+++	-	-	++	-	-	-	-
5	<i>spinetoram</i>	Radiant	-	+++	+++	+++	++	++	-	-	+++	++	-	+	-	-	+
6	<i>abamectin</i>	AgriMek	-	+++	-	-	-	-	-	-	++	+	-	-	+++	+++	+++
	<i>emamectin benzoate</i>	Proclaim	-	-	++	++	++	+++	-	-	-	-	-	+	+++	-	-
7C	<i>pyriproxifen</i>	Knack	-	-	-	-	-	-	-	-	-	-	++	-	-	-	-
9B	<i>pymetrozine</i>	Fulfill	-	-	-	-	-	-	-	+++	-	-	+	-	-	-	-

Rating for products was initially conducted at the 2009 Southeast Extension Vegetable Workers Conference in Fletcher, NC.

Efficacy ratings do not necessarily indicate a labeled use for all crops in this group. Please refer to the appropriate section of the Pest Management Handbook for details on product labeling.

Efficacy ratings:

- = Ineffective or insufficient data
- + = Somewhat effective
- ++ = Effective
- +++ = Very effective

EFFICACY OF INSECTICIDES/ACARACIDES FOR CONTROLLING ARTHROPOD PESTS OF VEGETABLE CROPS

FRUITING VEGETABLES (continued)

Chemical class (IRAC)	Common Name	Example Product	Flea Beetle	Colorado Potato Beetle	Corn Earworm	European Corn Borer	Fall Armyworm	Beet Armyworm	Stink Bugs, Squash Bug	Aphids	Thrips	Western Flower Thrips	Silverleaf Whitefly	Cutworms	Spider Mites	Broad Mite	Leafminer
9C	<i>flonicamid</i>	Beleaf	-	-	-	-	-	-	-	+++	-	-	-	-	-	-	-
10B	<i>etoxazole</i>	Zeal	-	-	-	-	-	-	-	-	-	-	-	-	++	-	-
11	<i>Bt</i>	Dipel, various	-	-	+	+	+	+	-	-	-	-	-	-	-	-	-
15	<i>novaluron</i>	Rimon	-	+++	++	+++	+++	+++	+	-	+	+	+	-	-	-	-
16	<i>buprofezin</i>	Courier	-	-	-	-	-	-	-	-	-	-	++	-	-	-	-
17	<i>cyromazine</i>	Trigard	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+++
18	<i>methoxyfenozide</i>	Intrepid	-	-	++	++	+++	+++	-	-	-	-	-	-	-	-	-
20B	<i>acequinocyl</i>	Kanemite	-	-	-	-	-	-	-	-	-	-	-	-	++	-	-
21	<i>fenpyroximate</i>	Portal	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	-
22	<i>indoxacarb</i>	Avaunt	+	+++	+++	++	++	+++	-	-	-	-	-	+	-	-	-
23	<i>spiromesifen</i>	Oberon	-	-	-	-	-	-	-	-	-	-	+	-	+++	++	-
	<i>spirotetramat</i>	Movento	-	-	-	-	-	-	-	++	-	-	++	-	-	-	-
28	<i>chlorantraniliprole</i>	Coragen	-	+++	+++	+++	+++	+++	-	-	++	-	++	+	-	-	+
	<i>cyantraniliprole</i>	Verimark/Exirel	-	+++	+++	+++	+++	+++	-	+++	+	+	++	+	-	-	+
	<i>flubendiamide</i>	Belt	-	++	+++	+++	++	+++	-	-	-	-	-	+	-	-	-
un	<i>bifenazate</i>	Acramite	-	-	-	-	-	-	-	-	-	-	-	-	+++	-	-

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COMMERCIAL VEGETABLE INSECT CONTROL

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LEGUME VEGETABLES (Snap Bean, Lima Bean, Cowpea)

PEST	INSECTICIDE	MOA	Snap	Lima	Cowpea	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
PRE-PLANT, AT-PLANTING, AND CHEMIGATION TREATMENTS									
Soil Insects	<i>bifenthrin</i> Empower 1.15G	3	✓	✓	✓	3.5-8.7 lb	0.04-0.1	See Remarks	May be applied pre-plant or during the season. REI: 24 hours for processing, 9 days for fresh market. PHI: 3 days, 9 days if hand-harvested.
	<i>diazinon</i> 4E 50W	1B	✓	✓	✓	2-4 qt 4-8 lb	2-4 2-4	3 D/preplant	
	<i>chlorpyrifos</i> Lorsban 4E, Advanced	1B	✓	✓	✓	See Label		24 H/ See Remarks	Labeled for preplant and at-planting application.
aphid, whitefly	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	✓	✓	7-10.5 fl oz	0.25-0.375	12 H/ 21 D	
FOLIAR TREATMENTS									
Pre-mixes for multiple pests	<i>flubendiamide</i> 0.33 lb/gal + <i>buprofezin</i> 2.33 lb/gal Vetica SC	28 16	✓	✓	✓	12-17 fl oz	0.03-0.044 + 0.22-0.31	12 H/ 14 D	
	<i>lambda-cyhalothrin</i> 0.417 lb/gal + <i>chlorantraniliprole</i> 0.835 lb/gal Besiege SC	3 28	✓	✓	✓	5-10 fl oz Rate varies with targeted pests		24 H/ 7 D	
	<i>zeta-cypermethrin</i> 0.31 lb/gal + <i>bifenthrin</i> 0.93 lb/gal Hero EC	3 3	✓	✓	✓	4-10.3 fl oz	0.01-0.025 + 0.03-0.075	12 H/ 3 D	
aphid	<i>acephate</i> Orthene 97	1B	Not Labeled	✓	Not Labeled	0.5-1 lb	0.5-1	24 H/ 1 D	
	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	✓	2.5-5.3 oz	0.047-0.1	12 H/ 7 D	
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	2.1-6.4 fl oz	0.033-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>dimethoate</i> 4E 2.67EC	1B	✓	✓	Not Labeled	0.5-1 pt 0.75-1.5 pt	0.25-0.5 0.25-0.5	48 H/ 0 D	Also available as Cygon 3.35EC.
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	Not Labeled	✓	5.8-9.6 fl oz	0.03-0.05	12 H/ 3 D	
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	✓	✓	✓	7-10.5 fl oz	0.09-0.136	4 H/ 7 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	✓	✓	1.2 fl oz	0.04	12 H/ 7 D	Also in a pre-mix for multiple pests.

COMMERCIAL VEGETABLE INSECT CONTROL

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LEGUME VEGETABLES (Snap Bean, Lima Bean, Cowpea)

PEST	INSECTICIDE	MOA	Snap	Lima	Cowpea	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS									
aphid (continued)	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>spirotetramat</i> Movento 2SC	23	✓	✓	✓	4-5 fl oz	0.063-0.08	24 H/ 1 D	Use of an adjuvant is necessary.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
beet armyworms, fall armyworms	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	✓	2-3 fl oz	0.062-0.094	12 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>methomyl</i> Lannate 2.4 LV	1A	See Remarks	See Remarks	See Remarks	1.5 pt	0.45	48 H/ 1-3 D	Not recommended for beet armyworm. 90 SP formulation also registered.
	<i>methoxyfenozide</i> Intrepid 2F	18	✓	✓	✓	4-16 fl oz	0.06-0.25	4 H/ 7 D	
	<i>novaluron</i> Rimon 0.83EC	15	✓	Not Labeled	Not Labeled	6-12 fl oz	0.039-0.078	12 H/ 1 D	
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	4-8 fl oz	0.03-0.063	4 H/ 3 D	
	<i>spinosad</i> Blackhawk 36WDG	5	✓	✓	✓	2.2-3.3 oz	0.05-0.074	4 H/ 3 D	
bean leaf beetle	<i>acephate</i> Orthene 97	1B	Not Labeled	✓	Not Labeled	0.5-1 lb.	0.5-1	24 H/ 1 D	
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	2.1-6.4 fl oz	0.033-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	✓	0.5-1 qt	0.5-1	12 H/ 3 D	
	<i>dimethoate</i> 4EC 2.67EC	1B	✓	✓	Not Labeled	0.5-1 pt 0.75-1.5 pt	0.25-0.5 0.25-0.5	48 H/ 0 D	Also available as Cygon 3.35EC.
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	2.56-3.84 fl oz	0.01-0.015	24 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	2.72-4 fl oz	0.017-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.

COMMERCIAL VEGETABLE INSECT CONTROL

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LEGUME VEGETABLES (Snap Bean, Lima Bean, Cowpea)

PEST	INSECTICIDE	MOA	Snap	Lima	Cowpea	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS									
corn earworm, European corn borer	<i>acephate</i> Orthene 97	1B	Not Labeled	✓	Not Labeled	0.75-1 lb	0.75-1	24 H/ 1 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	Not Labeled	Not Labeled	✓	1.6-2.1 fl oz	0.0125-0.0165	12 H/ 3 D	
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	2.1-6.4 fl oz	0.033-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>cyfluthrin</i> Tombstone 2EC	3	Not Labeled	Not Labeled	✓	1.6-2.1 fl oz	0.025-0.033	12 H/ 3 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	Not Labeled	✓	5.8-9.6 fl oz	0.03-0.05	12 H/ 3 D	
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	✓	2-3 fl oz	0.062-0.094	12 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	2.56-3.84 fl oz	0.01-0.015	24 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>methomyl</i> Lannate 2.4LV	1A	✓	✓	✓	1.5-3 pt	0.45-0.9	48 H/ 1-3 D	90 SP formulation also registered.
	<i>methoxyfenozide</i> Intrepid 2F	18	See Remarks	See Remarks	See Remarks	4-16 fl oz	0.06-0.25	4 H/ 7 D	Labeled for corn earworm suppression only.
	<i>spinetoram</i> Radiant 1SC	5	See Remarks	See Remarks	See Remarks	4-8 fl oz	0.03-0.063	4 H/ 3 D	Minimum rate for ECB is 3 fl oz.
	<i>spinosad</i> Blackhawk 36WDG	5	✓	✓	✓	2.2-3.3 oz	0.05-0.074	4 H/ 3 D	Minimum rate for ECB is 1.7 oz.
<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	2.72-4 fl oz	0.017-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.	
cowpea curculio (see note)	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	Not Labeled	Not Labeled	✓	2.1 fl oz	0.0165	12 H/ 3 D	
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>cyfluthrin</i> Tombstone 2EC	3	Not Labeled	Not Labeled	✓	1.6-2.1 fl oz	0.025-0.033	12 H/ 3 D	

COMMERCIAL VEGETABLE INSECT CONTROL

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LEGUME VEGETABLES (Snap Bean, Lima Bean, Cowpea)

PEST	INSECTICIDE	MOA	Snap	Lima	Cowpea	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS									
cowpea curculio (see note) (continued)	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	2.56-3.84 fl oz	0.01-0.015	24 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	2.72-4 fl oz	0.017-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
	NOTE: Cowpeas are the preferred host. A preventive program starting prior to curculio reproduction is necessary for good control. NOTE: Methomyl (Lannate) as applied for caterpillars gives some control. NOTE: Field failures have occurred with all registered insecticides. Insecticide resistance can be severe with this pest.								
cutworm	<i>acephate</i> Orthene 97	1B	Not Labeled	✓	Not Labeled	0.5-1 lb	0.5-1	24 H/ 1 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	Not Labeled	Not Labeled	✓	0.8-1.6 fl oz	0.0065-0.0125	12 H/ 3 D	
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>cyfluthrin</i> Tombstone 2EC	3	Not Labeled	Not Labeled	✓	0.8-1.6 fl oz	0.013-0.025	12 H/ 3 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	Not Labeled	✓	5.8-9.6 fl oz	0.03-0.05	12 H/ 3 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	1.92-3.2 fl oz	0.0075-0.0125	24 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	0.96-1.6 fl oz	0.015-0.025	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	1.28-4 fl oz	0.008-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
leafminer	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	✓	7.5 fl oz	0.098	4 H/ 1 D	
	<i>cyromazine</i> Trigard 75WP	17	✓	✓	✓	2.66 oz	0.125	12 H/ 7 D	
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	5-8 fl oz	0.039-0.063	4 H/ 3 D	
	NOTE: Avoid over use of broad spectrum insecticides that may encourage leafminer infestations.								

COMMERCIAL VEGETABLE INSECT CONTROL

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LEGUME VEGETABLES (Snap Bean, Lima Bean, Cowpea)

PEST	INSECTICIDE	MOA	Snap	Lima	Cowpea	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS									
lygus bug, stink bug	<i>acephate</i> Orthene 97	1B	Not Labeled	See Remarks	Not Labeled	0.5-1 lb	0.5-1	24 H/ 1 D	Not labeled for stink bugs.
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	Not Labeled	Not Labeled	✓	1.6-2.1 fl oz	0.0125-0.0165	12 H/ 3 D	
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	5.12-6.4 fl oz	0.08-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	✓	1-1.5 qt	1-1.5	12 H/ 3 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	Not Labeled	Not Labeled	✓	1.6-2.1 fl oz	0.025-0.033	12 H/ 3 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	2.56-3.84 fl oz	0.01-0.015	24 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
Mexican bean beetle	<i>acephate</i> Orthene 97	1B	Not Labeled	✓	Not Labeled	0.5-1 lb	0.5-1	24 H/ 1 D	
	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	✓	2.5-5.3 fl oz	0.047-0.1	12 H/ 7 D	
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	✓	0.5-1 qt	0.5-1	12 H/ 3 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	Not Labeled	✓	2.9-5.8 fl oz	0.015-0.03	12 H/ 3 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	1.92-3.2 fl oz	0.0075-0.0125	24 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	0.96-1.6 fl oz	0.015-0.025	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	2.72-4 fl oz	0.017-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
looper	<i>Bacillus thuringiensis</i> "Bt" various names	11B	✓	✓	✓	Follow label		4 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	2.1-6.4 fl oz	0.033-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.

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LEGUME VEGETABLES (Snap Bean, Lima Bean, Cowpea)

PEST	INSECTICIDE	MOA	Snap	Lima	Cowpea	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS									
looper (continued)	<i>esfenvalerate</i> Asana 0.66EC	3	✓	Not Labeled	✓	5.8-9.6 fl oz	0.03-0.05	12 H/ 3 D	
	<i>flubendiamide</i> Belt 4SC	28	✓	✓	✓	2-3 fl oz	0.062-0.094	12 H/ 1 D	Also in a pre-mix for multiple pests.
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	2.56-3.84 fl oz	0.01-0.015	24 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	1.92 fl oz	0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>methoxyfenozide</i> Intrepid 2F	18	✓	✓	✓	4-16 fl oz	0.06-0.25	4 H/ 7 D	
	<i>novaluron</i> Rimon 0.83EC	15	✓	Not Labeled	Not Labeled	6-12 fl oz	0.039-0.078	12 H/ 1 D	
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	4-8 fl oz	0.03-0.063	4 H/ 3 D	
	<i>spinosad</i> Blackhawk 36WDG	5	✓	✓	✓	2.2-3.3 oz	0.05-0.074	4 H/ 3 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
spider mite	<i>acequinocyl</i> Kanemite 15SC	20B	✓	✓	✓	31 fl oz	0.3	12 H/ 7 D	See adjuvant mixing instructions on label.
	<i>bifenazate</i> Acramite 4SC 5OWS	un	✓	✓	✓	16-24 fl oz 1-1.5 lb	0.5-0.75	12 H/ 3 D	Good coverage is essential.
	<i>fenpyroximate</i> Portal 0.4EC	21A	✓	Not Labeled	Not Labeled	2 pt	0.1	12 H/ 1 D	
thrips	PRE-BLOOM TREATMENTS								
	<i>acephate</i> Orthene 97	1B	Not Labeled	✓	Not Labeled	0.5-1 lb	0.5-1	24 H/ 1 D	
	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	✓	4.5-5.3 oz	0.085-0.1	12 H/ 7 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	Not Labeled	Not Labeled	✓	1.6-2.1 fl oz	0.0125-0.0165	12 H/ 3 D	

COMMERCIAL VEGETABLE INSECT CONTROL

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LEGUME VEGETABLES (Snap Bean, Lima Bean, Cowpea)

PEST	INSECTICIDE	MOA	Snap	Lima	Cowpea	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
thrips (continued)	PRE-BLOOM TREATMENTS								
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	✓	2.1-6.4 fl oz	0.033-0.10	12 H/ 3 D	Also in a pre-mix for multiple pests.
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	✓	1 qt	1	12 H/ 3 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	Not Labeled	Not Labeled	✓	1.6-2.1 fl oz	0.025-0.033	12 H/ 3 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	✓	✓	✓	2.56-3.84 fl oz	0.01-0.015	24 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>methomyl</i> Lannate 2.4LV	1A	✓	✓	✓	1.5-3 pt	0.45-0.9	48 H/ 1-3 D	90 SP formulation also registered.
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	5-8 fl oz	0.039-0.063	4 H/ 3 D	
<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.	
thrips (bloom stage)	BLOOM STAGE TREATMENTS								
	<i>acephate</i> Orthene 97	1B	Not Labeled	✓	Not Labeled	0.5-1 lb	0.5-1	24 H/ 1 D	
	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	✓	4.5-5.3 oz	0.085-0.1	12 H/ 7 D	
	<i>methomyl</i> Lannate 2.4LV	1A	✓	✓	✓	1.5-3 pt	0.45-0.9	48 H/ 1-3 D	90 SP formulation also registered.
<i>spinetoram</i> Radiant 1SC	5	✓	✓	✓	5-8 fl oz	0.039-0.063	4 H/ 3 D		
silverleaf whitefly	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	✓	4-5.3 oz	0.075-0.1	12 H/ 7 D	
	<i>buprofezin</i> Courier 3.6SC	16	✓	✓	✓	9-13.6 fl oz	0.25-0.38	12 H/ 14 D	Activity on nymphs.
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	✓	✓	✓	10.5-14 fl oz	0.136-0.18	4 H/ 7 D	
	<i>pyriproxyfen</i> Knack 0.86EC	7C	✓	✓	✓	8-10 fl oz	0.054-0.067	12 H/ 7 D	Activity on eggs and last instar nymphs.
	<i>spirotetramat</i> Movento 2SC	23	✓	✓	✓	4-5 fl oz	0.063-0.08	24 H/ 1 D	Use of an adjuvant is necessary. Activity against early instar nymphs.
NOTE: Reduced residual activity has been noted with all Group 4A insecticides. NOTE: Group 4A insecticides should not be used for foliar applications if a Group 4A was applied in the soil. NOTE: Coragen as applied for caterpillars has provided good control of whiteflies. Primary activity is on nymphs.									

EFFICACY OF INSECTICIDES/ACARACIDES FOR CONTROLLING ARTHROPOD PESTS OF VEGETABLE CROPS

Alton N. Sparks, Jr., Extension Entomologist

LEGUME VEGETABLES

Chemical class (IRAC)	Common Name	Example Product	Cucumber beetles	Corn earworm	European corn borer	Fall armyworm	Cabbage looper	Beet armyworm	Stink bugs, Squash bug	Aphids	Thrips	Western Flower Thrips	Silverleaf whitefly	Cutworms	Spider mites	Leafminer
1A	<i>carbaryl</i>	Sevin	++	+	++	+	+	-	-	-	+	-	-	+	-	-
	<i>methomyl</i>	Lannate	-	++	++	++	++	+	++	+	+++	++	-	-	-	-
1B	<i>malathion</i>	Malathion	++	+	+	+	+	-	+	+	+	-	-	+	-	-
3	<i>zeta-cypermethrin</i>	Mustang Max	+++	++	+++	+	++	-	++	+	++	-	-	+++	-	-
	<i>beta-cyfluthrin</i>	Baythroid	++	++	++	+	++	-	++	+	+	-	-	+++	-	-
	<i>lambda-cyhalothrin</i>	Karate	+++	++	+++	+	++	-	++	+	++	-	-	+++	-	-
	<i>esfenvalerate</i>	Asana XL	++	++	++	+	++	-	+	+	+	-	-	++	-	-
	<i>bifenthrin</i>	Brigade	+++	++	++	+	+	-	++	+	++	-	-	+++	-	-
4A	<i>imidacloprid</i>	Admire Pro	+++	-	-	-	-	-	-	+++	+	-	++	-	-	-
	<i>acetamiprid</i>	Assail	++	-	-	-	-	-	+	+++	+	-	++	-	-	-
4D	<i>flupyradifurone</i>	Sivanto	-	-	-	-	-	-	-	+++	-	-	++	-	-	-
5	<i>spinetoram</i>	Radiant	-	+++	+++	++	++	++	-	-	+++	++	-	+	-	+
	<i>spinosad</i>	Blackhawk	-	+++	+++	++	++	++	-	-	+	+	-	+	-	+
7C	<i>pyriproxyfen</i>	Knack	-	-	-	-	-	-	-	-	-	-	++	-	-	-
11	<i>Bt</i>	Dipel, various	-	+	+	+	++	+	-	-	-	-	-	-	-	-
15	<i>novaluron</i>	Rimon	-	++	+++	+++	++	+++	+	-	+	+	+	-	-	-
16	<i>buprofezin</i>	Courier	-	-	-	-	-	-	-	-	-	-	++	-	-	-
17	<i>cyromazine</i>	Trigard	-	-	-	-	-	-	-	-	-	-	-	-	-	+++
18	<i>methoxyfenozide</i>	Intrepid	-	++	++	+++	+++	+++	-	-	-	-	-	-	-	-
20B	<i>acequinocyl</i>	Kanemite	-	-	-	-	-	-	-	-	-	-	-	-	+++	-
21A	<i>fenpyroximate</i>	Portal	-	-	-	-	-	-	-	-	-	-	-	-	+++	-

EFFICACY OF INSECTICIDES/ACARACIDES FOR CONTROLLING ARTHROPOD PESTS OF VEGETABLE CROPS

LEGUME VEGETABLES

Chemical class (IRAC)	Common Name	Example Product	Cucumber beetles	Corn earworm	European corn borer	Fall armyworm	Cabbage looper	Beet armyworm	Stink bugs, Squash bug	Aphids	Thrips	Western Flower Thrips	Silverleaf whitefly	Cutworms	Spider mites	Leafminer
23	<i>spirotetramat</i>	Movento	-	-	-	-	-	-	-	+++	-	-	++	-	-	-
28	<i>flubendiamide</i>	Belt	-	+++	+++	++	+++	+++	-	-	-	-	-	+	-	-
	<i>chlorantraniliprole</i>	Coragen	-	+++	+++	+++	+++	+++	-	-	-	-	++	+	-	+
un	<i>bifenazate</i>	Acramite	-	-	-	-	-	-	-	-	-	-	-	-	+++	-

<p>Rating for products was initially conducted at the 2009 Southeast Extension Vegetable Workers Conference in Fletcher, NC.</p> <p>Efficacy ratings do not necessarily indicate a labeled use for all crops in this group. Please refer to the appropriate section of the Pest Management Handbook for details on product labeling.</p>	<p>Efficacy ratings:</p> <ul style="list-style-type: none"> - = Ineffective or insufficient data + = Somewhat effective ++ = Effective +++ = Very effective
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ONION

PEST	INSECTICIDE	MOA	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
PRE-PLANT, AT-PLANTING, AND CHEMIGATION TREATMENTS						
soil insects	<i>chlorpyrifos</i> Lorsban 4E, Advanced, 15G, 75WG	1B	See Label		24 H/ 60 D	15G labeled for at-planting only. All others labeled for at-planting and post-planting applications.
	<i>diazinon</i> 4E 50W	1B	2-4 qt 4-8 lb	2-4 2-4	3 D/ Preplant	
FOLIAR TREATMENTS						
cutworms, seedcorn maggot adults	<i>cypermethrin</i> Ammo 2.5EC	3	2-5 fl oz	0.04-0.1	12 H/ 7 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	1.92-3.2 fl oz	0.0075-0.0125	24 H/ 14 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	0.96-1.6 fl oz	0.015-0.025	24 H/ 14 D	
	<i>permethrin</i> Permethrin 3.2EC	3	4-12 fl oz	0.1-0.3	12 H/ 1 D	Also available as 25WP formulation.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	2.24-4 fl oz	0.014-0.025	12 H/ 7 D	
seedcorn maggot adults	<i>malathion</i> 5EC 8EC	1B	See Label	See Label	12 H/ 3-7 D	Rate, REI, PHI varies with product selection.
thrips	<i>acetamiprid</i> Assail 30SG	4A	5-8 oz	0.097-0.15	12 H/ 7 D	
	<i>cyantraniliprole</i> Exirel 0.83SC	28	13.5-20.5 fl oz	0.088-0.133	12 H/ 1 D	
	<i>cypermethrin</i> Ammo 2.5EC	3	4-5 fl oz	0.08-0.1	12 H/ 7 D	
	<i>gamma-cyhalothrin</i> Proaxis 0.5EC	3	2.56-3.84 fl oz	0.01-0.015	24 H/ 14 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	1.28-1.92 fl oz	0.02-0.03	24 H/ 14 D	
	<i>malathion</i> 5EC 8EC	1B	See Label	See Label	12 H/ 3-7 D	Rate, REI, PHI varies with product selection.
	<i>methomyl</i> Lannate 2.4LV	1A	3 pt	0.9	48 H/ 7 D	90 SP formulation also registered.
	<i>permethrin</i> Permethrin 3.2EC	3	6-12 fl oz	0.15-0.3	12 H/ 1 D	Also available as 25WP formulation.
	<i>spinetoram</i> Radiant 1SC	5	6-10 fl oz	0.047-0.078	4 H/ 1 D	

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ONION

PEST	INSECTICIDE	MOA	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS						
thrips (continued)	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	2.88-4 fl oz	0.018-0.025	12 H/ 7 D	
NOTE: Reduced efficacy of IRAC group 1B and group 3 insecticides has been noted in the past few years (this may also be associated with the prevalence of onion thrips in some fields). Reliance on any single chemistry can result in rapid development of resistance in thrips.						

POTATO (Irish and Sweet)

PEST	INSECTICIDE	MOA	Irish	Sweet	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
PRE-PLANT, AT-PLANTING, AND CHEMIGATION TREATMENTS								
soil insects	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	9.6-19.2 fl oz 3.2-9.6 fl oz	0.15-0.3 0.05-0.15	12 H/ 21 D	(at planting) (lay-by)
	<i>chlorpyrifos</i> Lorsban 4E, Advanced 75WG 15G	1B	Not Labeled	✓	4 pt 2.67 lb 13.5 lb	2 2 2	24 H/ 125 D	Applied pre-plant incorporated.
	<i>phorate</i> Thimet 20G	1B	✓	Not Labeled	8.5-17.3 oz/1,000 ft of row		48 H/ 90 D	Also labeled for post-emergence application at 8.5-11.3 oz.
	<i>ethoprop</i> Mocap 15G	1B	See Remarks	✓	1.6-2.1 oz/1,000 ft of row		48 H/ See Remarks	Rate on Irish potato is 1.4 oz.
NOTE: Growers should avoid planting sweet potatoes in fields that have a high potential for soil insect problems or that have had a history of problems.								
aphid, Colorado potato beetle, flea beetle, leafhopper, whitefly	<i>clothianidin</i> Belay 2.13 SC	4A	✓	✓	9-12 fl oz	0.15-0.2	12 H/ See Remarks	Apply at planting or at ground cracking.
	<i>cyantraniliprole</i> Verimark 1.67SC	28	See Remarks	See Remarks	6.75-13.5 fl oz Rate varies with pest targeted		4 H/ at planting	Labeled for Aphids, Whiteflies and Caterpillars.
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	See Remarks	5.7-8.7 fl oz	0.2-0.312	12 H/ Irish Potato = 21 D Sweet Potato = 125 D	Rate for sweet potato 4.4-10.5 fl oz.
	<i>dinotefuran</i> Venom 70SG	4A	✓	Not Labeled	6.5-7.5 oz	0.28-0.33	12 H/ See Remarks	One application preplant, pre-emergence or ground cracking.
	<i>thiamethoxam</i> Platinum 75SG	4A	✓	✓	1.66-2.67 oz	0.078-0.125	12 H/ See Remarks	Apply at planting, plant emergence, or last hilling.
wireworms	<i>fipronil</i> Regent 4SC	2B	✓	Not Labeled	See label. Rate varies with row spacing.		0 H/ 90 D	In-furrow only.

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POTATO (Irish and Sweet)

PEST	INSECTICIDE	MOA	Irish	Sweet	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS								
Pre-mix for multiple pests	<i>bifenthrin</i> 0.76 lb/gal + <i>avermectin</i> 0.11 lb/gal Athena SC	3 6	✓	✓	7-17 fl oz	0.04-0.1 0.006-0.015	12 H/ 21 D	
	<i>imidacloprid</i> 2 lb/gal + <i>beta-cyfluthrin</i> 1 lb/gal Leverage 360 SC	4A 3	✓	See Remarks	2.8 fl oz	0.044 + 0.022	12 H/ 7 D	Rate on sweet potato is 2.4-2.8 fl oz.
	<i>lambda-cyhalothrin</i> 0.417 lb/gal + <i>chlorantraniliprole</i> 0.835 lb/gal Besiege SC	3 28	✓	✓	5-9 fl oz Rate varies with pest targeted.		24 H/ 14 D	
	<i>lambda-cyhalothrin</i> 0.88 lb/gal + <i>thiamethoxam</i> 1.18 lb/gal Endigo ZC	3 4A	✓	✓	3.5-4.5 fl oz Rate varies with pest targeted.		24 H/ 14 D	
	<i>thiamethoxam</i> 0.2 lb/lb + <i>chlorantraniliprole</i> 0.2 lb/lb Voliam Flexi WDG	4A 28	✓	✓	4 oz	0.05 + 0.05	12 H/ 14 D	
	<i>zeta-cypermethrin</i> 0.31 lb/gal + <i>bifenthrin</i> 0.93 lb/gal Hero EC	3 3	✓	✓	4-10.3 fl oz	0.01-0.025 + 0.03-0.075	12 H/ 21 D	
aphid	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	2.5-4 oz	0.047-0.075	12 H/ 7 D	
	<i>clothianidin</i> Belay 2.13 SC	4A	✓	✓	2-3 fl oz	0.033-0.05	12 H/ 14 D	
	<i>dimethoate</i> 4EC 2.67EC	1B	✓	Not Labeled	0.5-1 pt 0.75-1.5 pt	0.25-0.5 0.25-0.5	48 H/ 0 D	Also available as Cygon 3.35EC.
	<i>dinotefuran</i> Venom 70SG	4A	✓	Not Labeled	1-1.5 oz	0.05-0.066	12 H/ 7 D	
	<i>flonicamid</i> Beleaf 50SG	9C	✓	✓	2-2.8 oz	0.062-0.089	12 H/ 7 D	
	<i>flupyradifurone</i> Sivanto 1.67SL	4D	✓	✓	7-10.5 fl oz	0.09-0.136	4 H/ 7 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	See Remarks	1.3 fl oz	0.047	12 H/ 7 D	Also in a pre-mix for multiple pests. Sweet potato rate is 1.2 fl oz.
	<i>malathion</i> 5EC 8EC	1B	✓	See Remarks	See Label	See Label	12 H/ 0-3 D	Rate, PHI, REI varies with product selection.
	<i>pymetrozine</i> Fulfill 50WDG	9B	✓	✓	2.75-5.5 oz	0.086-0.172	12 H/ 14 D	

COMMERCIAL VEGETABLE INSECT CONTROL

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POTATO (Irish and Sweet)

PEST	INSECTICIDE	MOA	Irish	Sweet	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS								
aphid (continued)	<i>spirotetramat</i> Movento 2SC	23	✓	✓	4-5 fl oz	0.0625-0.078	24 H/ 7 D	Use of an adjuvant is necessary.
	<i>sulfoxaflor</i> Closer 2SC	4C	Not Labeled	✓	1.5-2 fl oz	0.023-0.031	12 H/ 7 D	
	<i>thiamethoxam</i> Actara 25WDG	4A	✓	✓	3 oz	0.047	12 H/ 14 D	Also in a pre-mix for multiple pests.
beet armyworm, fall army worm	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ Irish = 14 D Sweet = 1 D	Also in a pre-mix for multiple pests.
	<i>methomyl</i> Lannate 2.4LV	1A	See Remarks	Not Labeled	1.5-3 pt	0.45-0.9	48 H/ 6 D	90 SP formulation also registered. Not recommended for beet armyworm.
	<i>methoxyfenozide</i> Intrepid 2F	18	Not Labeled	✓	6-10 fl oz	0.09-0.16	4 H/ 7 D	
	<i>novaluron</i> Rimon 0.83EC	15	✓	✓	6-12 fl oz	0.039-0.078	12 H/ 14 D	
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	6-8 fl oz	0.047-0.063	4 H/ 7 D	
	<i>spinosad</i> Blackhawk 36WDG	5	✓	✓	2.25-3.5 oz	0.05-0.079	4 H/ 7 D	
cabbage looper, other foliage feeding caterpillars	<i>Bacillus thuringiensis</i> "Bt" various names	11B	✓	✓	Follow label		4 H/ 0 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	1.6-2.8 fl oz	0.0125-0.022	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ Irish = 14 D Sweet = 1 D	Adjuvants have been shown to increase efficacy. Also in a pre-mix for multiple pests.
	<i>cyfluthrin</i> Tombstone 2EC	3	✓	✓	1.6-2.8 fl oz	0.025-0.044	12 H/ 0 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	Not Labeled	5.8-9.6 fl oz	0.03-0.05	12 H/ 7 D	
	<i>indoxacarb</i> Avaunt 30 WDG	22	✓	✓	2.5-6 fl oz	0.045-0.11	12 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>malathion</i> 5EC 8EC	1B	✓	✓	See Label	See Label	12 H/ 0-3 D	Rate, REI, PHI varies with product selection.
	<i>methoxyfenozide</i> Intrepid 2F	18	Not Labeled	✓	6-10 fl oz	0.09-0.16	4 H/ 7 D	

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POTATO (Irish and Sweet)

PEST	INSECTICIDE	MOA	Irish	Sweet	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS								
cabbage looper, other foliage feeding caterpillars (continued)	<i>methomyl</i> Lannate 2.4LV	1A	✓	Not Labeled	1.5-3 pt	0.45-0.9	48 H/ 6 D	90 SP formulation also registered.
	<i>novaluron</i> Rimon 0.83EC	15	✓	✓	6-12 fl oz	0.039-0.078	12 H/ 14 D	
	<i>permethrin</i> Permethrin 3.2EC	3	✓	Not Labeled	4-8 fl oz	0.1-0.2	12 H/ 14 D	Also available as 25WP formulation.
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	6-8 fl oz	0.047-0.063	4 H/ 7 D	
	<i>spinosad</i> Blackhawk 36WDG	5	✓	✓	2.25-3.5 oz	0.05-0.079	4 H/ 7 D	
	<i>zeta-cypermethrin</i> Mustang Max 0.8 EC	3	✓	✓	1.76-4 fl oz	0.011-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
Colorado potato beetle	<i>abamectin</i> Agri-Mek 0.15 EC 0.7SC	6	✓	✓	8-16 fl oz 1.75-3.5 fl oz	0.01-0.02 0.01-0.02	12 H/ 14 D	Also in a pre-mix for multiple pests.
	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	1.5-4 oz	0.028-0.075	12 H/ 7 D	
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	1-2 qt	1-2	12 H/ 7 D	
	<i>clothianidin</i> Belay 2.13 SC	4A	✓	✓	2-3 fl oz	0.033-0.05	12 H/ 14 D	
	<i>dinotefuran</i> Venom 70SG	4A	✓	Not Labeled	1-1.5 oz	0.05-0.066	12 H/ 7 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	See Remarks	1.3 fl oz	0.047	12 H/ 7 D	Also in a pre-mix for multiple pests. Rate on sweet potatoes is 1.2 fl oz.
	<i>novaluron</i> Rimon 0.83EC	15	✓	✓	6-12 fl oz	0.039-0.078	12 H/ 14 D	
	<i>spinetoram</i> Radiant 1SC	5	✓	✓	4.5-8 fl oz	0.035-0.063	4 H/ 7 D	
	<i>thiamethoxam</i> Actara 25WDG	4A	✓	✓	1.5-3 oz	0.023-0.047	12 H/ 14 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
NOTE: Thimet as applied for soil insects will help reduce early season infestations.								
false chinch bug	<i>malathion</i> 5EC 8EC	1B	✓	✓	See Label	See Label	12 H/ 0-3 D	Rate, REI, PHI varies with product selection.

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POTATO (Irish and Sweet)

PEST	INSECTICIDE	MOA	Irish	Sweet	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS								
flea beetles	<i>acetamiprid</i> Assail 30SG	4A	✓	✓	1.5-2.5 oz	0.028-0.047	12 H/ 7 D	
	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	1.6-2.8 fl oz	0.0125-0.022	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ 21 D	Also in a pre-mix for multiple pest
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	0.5-1 qt	0.5-1	12 H/ 7 D	
	<i>clothianidin</i> Belay 2.13 SC	4A	✓	✓	2-3 fl oz	0.03-0.05	12 H/ 14 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	✓	✓	1.6-2.8 fl oz	0.025-0.044	12 H/ 0 D	
	<i>dinotefuran</i> Venom 70SG	4A	✓	Not Labeled	1-1.5 oz	0.05-0.066	12 H/ 7 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	Not Labeled	5.8-9.6 fl oz	0.03-0.05	12 H/ 7 D	
	<i>imidacloprid</i> Admire Pro 4.6F	4A	✓	See Remarks	1.3 fl oz	0.047	12 H/ 7 D	Also in a pre-mix for multiple pests. Rate on sweet potato is 1.2 fl oz.
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>thiamethoxam</i> Actara 25WDG	4A	✓	✓	1.5-3 oz	0.023-0.047	12 H/ 14 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	1.76-4 fl oz	0.011-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
leafhoppers, potato	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	0.8-1.6 fl oz	0.0065-0.0125	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>carbaryl</i> Sevin 4F	1A	✓	✓	0.5-1 qt	0.5-1	12 H/ 7 D	Labeled up to 2 qt for aster leafhopper.
	<i>clothianidin</i> Belay 2.13 SC	4A	✓	✓	2-3 fl oz	0.033-0.05	12 H/ 14 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	✓	✓	0.8-1.6 fl oz	0.013-0.025	12 H/ 0 D	
	<i>dimethoate</i> 4EC 2.67EC	1B	✓	Not Labeled	0.5-1 pt 0.75-1.5 pt	0.25-0.5 0.25-0.5	48 H/ 0 D	Also available as Cygon 3.35EC.
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	Not Labeled	5.8-9.6 fl oz	0.03-0.05	12 H/ 7 D	

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POTATO (Irish and Sweet)

PEST	INSECTICIDE	MOA	Irish	Sweet	AMOUNT OF PRODUCT PER ACRE	POUNDS ACTIVE PER ACRE	REI/PHI (Hours or Days)	REMARKS
FOLIAR TREATMENTS								
leafhoppers, potato (continued)	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>malathion</i> 5EC 8EC	1B	✓	✓	See Label	See Label	12 H/ 0-3 D	Rate, REI, PHI varies with product selection.
	<i>methomyl</i> Lannate 2.4LV	1A	✓	Not Labeled	1.5-3 pt	0.45-0.9	48 H/ 6 D	90 SP formulation also registered.
	<i>thiamethoxam</i> Actara 25WDG	4A	✓	✓	1.5-3 oz	0.023-0.047	12 H/ 14 D	Also in a pre-mix for multiple pests.
	<i>zeta-cypermethrin</i> Mustang Max 0.8EC	3	✓	✓	3.2-4 fl oz	0.02-0.025	12 H/ 1 D	Also in a pre-mix for multiple pests.
tuberworm, potato	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	1.6-2.8 fl oz	0.0125-0.022	12 H/ 0 D	Also in a pre-mix for multiple pests.
	<i>chlorantraniliprole</i> Coragen 1.67SC	28	✓	✓	3.5-5 fl oz	0.045-0.065	4 H/ Irish = 14 D Sweet = 1 D	
	<i>cyfluthrin</i> Tombstone 2EC	3	✓	✓	1.6-2.8 fl oz	0.025-0.044	12 H/ 0 D	
	<i>esfenvalerate</i> Asana 0.66EC	3	✓	Not Labeled	2.9-9.6 fl oz	0.015-0.03	12 H/ 7 D	
	<i>lambda-cyhalothrin</i> Karate 2.08CS	3	✓	✓	1.28-1.92 fl oz	0.02-0.03	24 H/ 7 D	Also in a pre-mix for multiple pests.
	<i>methomyl</i> Lannate 2.4LV	1A	✓	Not Labeled	1.5-3 pt	0.45-0.9	48 H/ 6 D	90 SP formulation also registered.
	<i>novaluron</i> Rimon 0.83EC	15	✓	✓	6-12 fl oz	0.039-0.078	12 H/ 14 D	
sweet potato weevil	<i>beta-cyfluthrin</i> Baythroid XL 1EC	3	✓	✓	1.6-2.8 fl oz	0.0125-0.022	12 H/ 0 D	
	<i>bifenthrin</i> Brigade 2EC	3	✓	✓	2.1-6.4 fl oz	0.033-0.1	12 H/ 21 D	Also in a pre-mix for multiple pests.
	<i>cyfluthrin</i> Tombstone 2EC	3	✓	✓	1.6-2.8 fl oz	0.025-0.044	12 H/ 0 D	
	<i>phosmet</i> Imidan 70WP	1B	✓	✓	1.33 lb	1	5 D/ 7 D	Crop must be mechanically harvested.
	<i>phosmet</i> Imidan 5 Dust	1B	Not Labeled	See Remarks	2-4 oz/50 lb bushel		See Remarks	Post-harvest storage treatment only.

VEGETABLE DISEASE CONTROL

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

ASPARAGUS

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Rust, Cercospora, Leaf spot	Quadris	6-15.5 fl oz	11	4 H/100 D	Apply to ferns after harvest; spray at first appearance, 7-10-day intervals.
	Tebuconazole 3.6 F	4-6 fl oz	3	12 H/180 D	
	Nova or Rally	5 fl oz	3	24 H/180 D	
	Bravo Weather Stik	2-4 pt	M	12 H/190 D	
	Dithane M 45	2 lb	M	24 H/180 D	
	Dithane F 45	1.6 qt	M	24 H/180 D	
	Dithane Rain Shield	2 lb	M	24 H/180 D	
	Dithane DF	2 lb	M	24 H/180 D	
	Manzate 75 DF	2 lb	M	24 H/180 D	
	Penncozeb 75 DF	2 lb	M	24 H/180 D	
	Penncozeb 80 WP	2 lb	M	24 H/180 D	
	Sulfur W	See label	M		
Fusarium Root Rot	Clorox 5.25%	1 pt/8 pt water			Wash seed for 40 minutes in solution with continuous agitation; air dry promptly. Use 1.0 gal of solution/lb seed.
Crown Rot	Manzate75 DF	1 lb/100 gal	M	24 H/180 D	Preplant root and crop dip. Dip loosely packed crowns for 5 minutes. Drain and plant as soon as possible. See label.
	Dithane DF	1 lb/100 gal	M	24 H/180 D	
	Dithane M 45	1 lb/100 gal	M	24 H/180 D	
	Dithane F 45	1.6 pt/100 gal	M	24 H/180 D	
Phytophthora, Crown Rot, Spear Rot	Ridomil Gold EC	1 pt	4		Broadcast application with a minimum of 10 gal of water over beds. See labels. Apply 30-60 days before first cutting. For additional control, make another application just before the beginning of harvest.
	Ridomil Gold SL	1 pt	4		
	MetaStar	2 qt	4		

BEANS (Snap and Pole)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Bacterial Blight	Basic Copper Sulfate	2-4 lb	M	48 H/0 D	See label
	Nordox 75WG	2/3-2.5 lb	M	12 H/0 D	See label
	KOP-Hydroxide	1-3 lb	M	48 H/0 D	See label
	Blue Shield DF	1-3 lb	M	48 H/0 D	Apply on 7-14 day schedule, depending on conditions.
	Citcop 4E (H)	2 qt	M	48 H/0 D	

VEGETABLE DISEASE CONTROL

BEANS (Snap and Pole)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Bacterial Blight (continued)	Champ DP	0.6-2 lb	M	48 H/0 D	Apply when disease threatens followed by 5-10 day intervals. Use western grown seed and rotate every 3 years. Do not work in fields when vines are wet.
	Kocide 101 (H)	1-3 lb	M	48 H/0 D	
	Kocide 4.5 LF	0.6-2 pt	M	48 H/0 D	
	Kocide LF	1.3-4 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Kocide DF	1-3 lb	M	48 H/0 D	
	Nu-Cop 3L	0.6-4 pt	M	48 H/0 D	
	Cuprofix Disperss	1.5-3.5 lb	M	48 H/0 D	
Seedling Disease and Stem Rot Rhizoctonia	Quadris	0.4-0.8 fl oz/1000 row ft			Applied in-furrow or banded. See label.
	Blocker 4F	2-3 pt	14	NA	Apply as a directed spray in the seed furrow.
Pythium & Rhizoctonia Seedling Rots	Ridomil Gold PC GR	10 lb/13,000 linear ft at planting. See Label. 0.34 fl oz/1000 row ft, 4/11			Adjust the application equipment so the granules are mixed with the soil surrounding the seed.
	Uniform				Use as an in-furrow spray.
Pythium Damping-Off	Ridomil Gold PC GR	10 lb/13,000 linear ft of row in a 7" band at the time of planting	4		Adjust the application equipment so the granules are mixed with the soil surrounding the seed.
	Ridomil Gold EC	0.5-1 pt	4		Incorporate in the top 2" of soil pre-plant or on surface after planting.
	Ridomil Gold SL	0.5-1 pt	4		
	MetaStar	2-4 pt	4		
Rust Common and Asian Soybean	Quadris	6.2 fl oz	11	4 H/0 D	Use every 7-14 days. See label.
	Endura	8-11 fl oz	7	12 H/7 D	See label.
	Fontelis	14-30 fl oz	7	12 H/0 D	Do not exceed 72 fl oz per season.
	Tebuconazole 3.6 F	4-6 fl oz	3	12 H/14 D	Use every 7-14 days. See label.
	Priaxor	4-8 fl oz	7 + 11	12 H/14 D	Spray prior to disease development.
	Ziram	2 pt/100 gal	M	48 H/7 D	Apply at disease onset and on 4-7 day intervals as needed.
	Headline	6-9 fl oz	11	12 H/7 D	
	Bravo 500 or	2-4 ¼ pt	M	12 H/7 D	See label.
	Bravo Weather Stik	1-3 pt	M	12 H/7 D	
	Equus 720	1.37-2 pt	M	12 H/7 D	Use at first sign of disease and weekly until disease is under control.
	Echo 720	1.37-3 pt	M	12 H/7 D	

VEGETABLE DISEASE CONTROL

BEANS (Snap and Pole)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Rust Common and Asian Soybean (continued)	Bravo S	4-8 pt	M	12 H/7 D	
	Nova or Rally	4-5 fl oz	3	24 H/0 D	Begin applications when rust is first observed.
Southern Blight	Quadris (Amistar)	6.2-15.4 fl oz (2-5 oz)			Apply at beginning flower. Plant behind corn or some other grass crop. Deep plow to cover old crop debris.
	Blocker 4F	4 pt	14	12 H/0 D	Apply as an in-row band over the seed just after planting. Do not apply to emerged plants.
Stem Anthracnose	Quadris	6.2-15.4 fl oz	11	4 H/0 D	Use every 7-14 days. See label. Plant disease-free seed and rotate with other crops.
	Fontelis	14-30 fl oz	7	12 H/4 D	Do not exceed 72 fl oz per season.
	Headline	6-9 fl oz	11	12 H/0 D	Rotate with non-strobilurins.
	Topsin M	1-1.5 lb	1	24 H/7 D	See label.
	Topsin 4.5 L	20-30 fl oz	1	24 H/14 D	
	T-Methyl 70WSB	1-1.5 lb	1	24 H/14 D	
	T-Methyl 4.5F	20-30 fl oz	1	24 H/14 D	
	Ziram	2 pt/100 gal	M	48 H/14 D	Apply at disease onset and on 4-7 day intervals as needed
White Mold (Sclerotinia) Botrytis	Endura	8-11 fl oz	7	12 H/7 D	Apply at beginning flower or disease onset.
	Topsin-M 70W	1-2 lb	1	Lima = 24 H/28 D Snap = 24 H/14 D	Apply Topsin at 25-50% bloom and repeat at peak bloom.
	Topsin 4.5L	30-40 fl oz	1	Lima = 24 H/14 D	
	T-Methyl 70WSB	1-2 lb	1	24 H/14 D	See label.
	T-Methyl 4.5F	30-40 fl oz	1	24 H/14 D	
	Botran 75-W	2.25 lb (bush) 4 lb (pole)	14	12 H/2 D 12 H/2 D	Apply when disease is anticipated; repeat at 7-day intervals during disease favorable periods.
	Fontelis	14-30 fl oz	7	12 H/0 D	Do not exceed 72 fl oz per season.
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Rovral 4F	1.5-2 pt	2	24 H/10 D	Apply Rovral as foliar spray at early bloom (1-10%) bloom. Repeat on 7-day intervals if conditions are favorable for disease.
	Priaxor	6-8 fl oz	7 + 11	12 H/14 D	Suppression only.
	Omega 500	0.5-0.85 pt	29	12 H/14 D	
	Iprodione 4L	1.5-2 pt	2	24 H/10 D	
	Bravo 500	4 ¼ pt	M	12 H/7 D	Begin application during early bloom stage.
	Bravo Weather Stik	2-4.25 pt	M	12 H/7 D	Applications to be made to pods harvested dry with pods removed.
	Equus 720	3 pt	M	12 H/7 D	
Echo 720	3 pt	M	12 H/7 D		

VEGETABLE DISEASE CONTROL

BEANS (Snap and Pole)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Pythium Rhizoctonia Web blight, Pod/Tip Rot	Quadris	6.2-15.4 fl oz	11	4 H/0 D	Apply at beginning flower.
	Nova or Rally	4-5 fl oz	3	24 H/0 D	Begin applications when pods begin to develop. Continue applications on a 7-10-day schedule during periods favorable for disease development.
Pythium Cottony Leak	Ridomil Gold Copper	1 pk/2.5 A	4 + M	48 H/3 D	Use at disease onset and every 7-10 days.

BEETS

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew, Leaf spots, Blights	Quadris	6.2-15.4 fl oz	11	4 H/0 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after two sequential sprays of Quadris or Cabrio.
	Fontelis	14-30 fl oz	7	12 H/28 D	Do not apply more than 61 fl oz to beets per season.
	Cabrio	8-12 fl oz	11	12 H/0 D	
	Tebuconazole 3.6 F	3-7.2 fl oz	3	12 H/7 D	Use every 14 days.
	Basic Copper Sulfate	2-3 lb	M	48 H/0 D	Begin when disease appears and repeat every 7-10 days.
	Nordox 75WG	2/3-2.5 lb	M	12 H/0 D	
Pythium and <i>Phytophthora</i> spp.	Ridomil Gold EC	1-2 pt	4		Apply as a pre-plant broadcast spray prior to planting.
	Ridomil Gold SL	1-2 pt	4		
	Reason	8.2 fl oz	11	12 H/14 D	Rotate with mefenoxam-containing products.
	MetaStar	4-8 pt	4		

BROCCOLI, CABBAGE, BRUSSELS SPROUTS

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Wire Stem	Blocker 4F	2.8-3.75 gal/A in 80 gal of water	14	N/A	Apply as a pre-plant broadcast spray prior to planting. Spray as an 8" band centered on the row at or just prior to planting.
		1.9-2.8 gal/A in 35 gal of water on a 40" row spacing	14	N/A	
Pythium and <i>Phytophthora</i> spp.	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See Labels.
	Ridomil Gold SL	1-2 pt	4		
	MetaStar	4-8 pt	4		

VEGETABLE DISEASE CONTROL

BROCCOLI, CABBAGE, BRUSSELS SPROUTS

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Black Leg	Rovral 4F	2 pt	2	24 H/0 D	Apply to base of plants at 2-4 leaf stage.
	Iprodione 4L (broccoli only)	2 pt	2	24 H/0 D	
Alternaria Leaf spot & Downy mildew	Actigard	0.5-1 fl oz	P	12 H/7 D	Use no more than 4 oz Actigard/season.
	Cabrio	12-16 fl oz	11	12 H/0 D	Rotate for resistance management.
	Fontelis	14-30 fl oz	7	12 H/0 D	Do not exceed 72 fl oz of product per season.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Ridomil Gold Bravo	1.5 lb	4/M	48 H/7 D	Begin application after plants are set in the field or after emergence for direct seeded.
	Reason	5.5-8.2 fl oz	11	12 H/2 D	
	Micora/Revus	8 fl oz	40	4 H/1 D	
	Quadris Top	14 fl oz	11 + 3	4 H/0 D	Rotate to other chemistry after 1 application.
	Kocide DF	1-2 lb	M	48 H/0 D	See Label.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with protectant fungicides.
	Procure	6-8 fl oz	3	12 H/1 D	
	Reason	5.5-8.2 fl oz	40	12 H/ 2 D	Apply when conditions favor disease development.
	Revus	8 fl oz	11	4 H/1 D	Use surfactants.
	Switch	11-14 fl oz	9 + 12	12 H/0 D	
	Zampro	14 fl oz	40 + 45	12 H/7 D	Apply when conditions are favorable for disease, but before disease is present.
	Nordox 75WG	2/3-2.5 lb	M	12 H/0 D	
	Kocide LF	2.6 pt	M	48 H/0 D	
	Kocide 4.5LF	0.6-1.3 pt	M	48 H/0 D	
	Kocide 101	1-2 lb	M	24 H/0 D	
	Kocide 3000	0.5-0.75 lb	M	48 H/0 D	
	Champ DP	0.3-0.6 lb	M	48 H/0 D	
	Nu-Cop 3L	0.3-1.3 pt	M	48 H/0 D	
	Cuprofix Disperss	1.5-2.5 lb	M	48 H/0 D	
Bravo Weather Stik	1.5 pt	M	12 H/7 D		
Echo 720	1.5 pt	M	12 H/7 D		
Equus 720	1.5 pt	M	12 H/7 D		
Bravo S	4.5 pt	M	12 H/7 D		
Catamaran	4 pt	M/33	12 H/7 D		

VEGETABLE DISEASE CONTROL

BROCCOLI, CABBAGE, BRUSSELS SPROUTS

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Powdery mildew	Procure	6-8 fl oz	3	12 H/1 D	
	Switch	11-14 fl oz	9 + 12	12 H/0 D	
Black Rot	Actigard	0.5-1 fl oz	P	12 H/7 D	Suppression only. See label. Use no more than 4 oz/season. Primary method for reducing losses to Black rot is to use certified, non-infected seed.
	Nordox 75WG	2/3-2.5 lb	M	12 H/0 D	
	Kocide DF	1-2 lb	M	48 H/0 D	
	Kocide LF	2.6 pt	M	48 H/0 D	
	Kocide 4.5LF	0.6-1.3 pt	M	48 H/0 D	
	Kocide 101	1-2 lb	M	24 H/0 D	
	Kocide 3000	0.5-0.75 lb	M	48 H/0 D	
	Champ DP	0.3-0.6 lb	M	48 H/0 D	
	Nu-Cop 3L	0.3-1.3 pt	M	48 H/0 D	
Cuprofix Disperss	1.5-2.5 lb	M	48 H/0 D		

CABBAGE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Alternaria Leaf spot	Cabrio	12-16 fl oz	11	12 H/0 D	Rotate for resistance management.
	Manzate	1.6-2.1 lb	M	24 H/7 D	Spray preventively.
	Switch	11-14 fl oz	9 + 12	12 H/7 D	Begin application after plants are set in the field or after emergence for direct seeded.
	Fontelis	14-30 fl oz	7	12 H/0 D	Do not apply more than 72 fl oz/A per season.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Ridomil Gold Bravo	1.5 lb	4 + M	48 H/7 D	
	Quadris Top	14	11 + 3	4 H/1 D	Rotate to other chemistry after 1 application.
	Procure	6-8 fl oz	3	12 H/ 1 D	
	Nordox	2/3-2.5 lb	M	12 H/0 D	
	Kocide DF	1-2 lb	M	48 H/0 D	See label.
	Kocide LF	2.6 pt	M	48 H/0 D	See label.
	Kocide 4.5LF	0.6-1.3 pt	M	48 H/0 D	
	Kocide 101	1-2 lb	M	24 H/0 D	
	Kocide 3000	0.5-0.75 lb	M	48 H/0 D	
	Champ DP	0.3-0.6 lb	M	48 H/0 D	

VEGETABLE DISEASE CONTROL

CABBAGE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS	
	MATERIAL	FORMULATED	MOA			
Alternaria Leaf spot (continued)	Nu-Cop 3L	0.3-1.3 pt	M	48 H/0 D		
	Cuprofix Disperss	1.5-2.5 lb	M	48 H/0 D		
	Bravo Weather Stik	1.5 pt	M	12 H/0 D		
	Echo 720	1.5 pt	M	12 H/0 D		
	Equus 720	1.5 pt	M	12 H/0 D		Do not apply to Chinese cabbage or Chinese broccoli within 7 days of harvest.
	Bravo S	4.5 pt	M	12 H/0 D		
	Omega 500	6.45 fl oz/100 gal		12 H/0 D		
Club Root	Blocker 4F	3 pt/100 gal of water	14		Use in transplant water.	
		5.67 gal/A/ 25 gal of water	14		Apply in a 12" band directly over the row prior to planting.	
		7.5 gal in 30 gal of water	14		This is the broadcast application that should be incorporated into the soil just prior to planting	
Pythium Damping-Off	Ridomil Gold EC	½-1 pt/13,000 linear ft of row or incorporate 1-2 pt/A			See label.	
	Ridomil Gold SL					
	Metastar	4-8 pt		48 H/7 D		
Downy Mildew	Actigard	0.5-1 fl oz	P	12 H/7 D	Use no more than 4 oz of Actigard/season.	
	Cabrio	12-16 fl oz	11	12 H/0 D	Rotate for resistance management.	
	Bravo 500	2 ¼ pt	M	12 H/0 D	Begin application after plants are set in the field or after emergence for direct seeded.	
	Manzate	1.6-2.1 lb	M	24 H/7 D	Spray preventively.	
	Ridomil Gold Bravo	1.5 lb	4 + M	48 H/7 D		
	Kocide DF	1-2 lb	M	48 H/0 D		
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with protectant fungicides.	
	Micora/Revus	8 fl oz	40	4 H/1 D	Use surfactants.	
	Nordox 75WG	2/3-2.5 lb	M	12 H/0 D		
	Kocide LF	2.6 pt	M	48 H/0 D		
	Kocide 4.5LF	0.6-1.3 pt	M	48 H/0 D		
	Kocide 101	1-2 lb	M	24 H/0 D		
	Kocide 3000	0.5-0.75 lb	M	48 H/0 D		
	Champ DP	0.3-0.6 lb	M	48 H/0 D		
	Nu-Cop 3L	0.3-1.3 pt	M	48 H/0 D		
Cuprofix Disperss	1.5-2.5 lb	M	48 H/0 D			

VEGETABLE DISEASE CONTROL

CABBAGE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew (continued)	Bravo Weather Stik	1.5 pt	M	12 H/0 D	
	Echo	1.5 pt	M	12 H/0 D	
	Equus 720	1.5 pt	M	12 H/0 D	
	Bravo S	4.5 pt	M	12 H/0 D	
	Aliette	2-5 lb	33	12 H/3 D	Do not mix with Copper fungicide. See label.
	Zampro	14 fl oz, 40/45	40 + 45	12 H/7 D	Spray preventively.
	Catamaran	4 pt	M + 33	12 H/7 D	
Sclerotinia (Raisin Head)	Endura	6-9 fl oz	7	12 H/0 D	See label.

CHINESE CABBAGE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
(tight headed varieties only)	Cabrio	12-16 oz	11	12 H/0 D	Rotate for resistance management.
	Bravo Weather Stik	1-1.5 pt	M	12 H/0 D	Repeat at 7-10 day intervals.
	Equus 720	1.5 pt	M	12 H/7 D	Do not apply to Chinese cabbage or Chinese broccoli within 7 days of harvest.
	Echo 720	1-1.5 pt	M	12 H/0 D	

CANTALOUPE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Alternaria Leafspot	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Fontelis	12-16 fl oz	7	12 H/1 D	Do not exceed 67 fl oz per season.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Merivon	4-5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Cabrio	12-16 fl oz	11	12 H/0 D	

VEGETABLE DISEASE CONTROL

CANTALOUPE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Alternaria Leafspot (continued)	Quadris Top	10-14 fl oz	11 + 3	12 H/0 D	Rotate after 1 application.
	Reason	5.5 fl oz	11	12 H/14 D	Rotate with non-strobilurins.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank-mix with mancozeb or chlorothalonil.
	Manzate 75DF	2-3 lb	M	24 H/5 D	
	Penncozeb80WP	2-3 lb	M	24 H/5 D	Greenhouse approved. See label.
	Penncozeb 75DF	2-3 lb	M	24 H/5 D	Greenhouse approved. See label.
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved. See label.
	Dithane M-45	2-3 lb	M	24 H/5 D	
	Dithane DF	2-3 lb	M	24 H/5 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/0 D	
	Flouronil	2-3 lb	4 + M	48 H/0 D	
	Bravo Weather Stik	1 ½ pt	M	12 H/0 D	
	Echo 720	1 ½ pt	M	12 H/0 D	
	Bravo 500	2 ¼ - 2 ¾ pt	M	12 H/0 D	
	Equus 720	2-3 pt	M	12 H/0 D	
	ManKocide	2-3 lb	M	48 H/5 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
Champ DP	1.3 lb	M	48 H/0 D		
Champ 2F	1.3 pt	M	48 H/0 D		
Cuprofix Disperss	2.5 lb	M	48 H/0 D		
Catamaran	4 pt	M + 33	12 H/7 D		
Anthracnose	Pristine	18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.

VEGETABLE DISEASE CONTROL

CANTALOUPE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Anthracnose (continued)	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Cabrio	12-16 fl oz	11	12 H/0 D	
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank mix with mancozeb or chlorothalonil.
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	See label.
	Topsin M 70W	¼ - ½ lb	1	24 H/0 D	
	T-Methyl 70WSB		1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	Use western-grown seed. Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	T-Methyl 4.5	10 fl oz	1	24 H/0 D	
	Pristine	18.5 fl oz	11 + 27	12 H/0 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Quadris (Amistar)	11-15.4 fl oz	11	4 H/1 D	
	Cabrio	3.5-5 fl oz	11	12 H/0 D	Tank mix with mancozeb or chlorothalonil. See label.
	Quadris Opti	12-16 fl oz	11 + M	12 H/1 D	
	Tanos	3.2 pt	11 + 17	12 H/3 D	
	Topsin M 70W	8 fl oz	1	24 H/0 D	
	T-Methyl 70WSB	¼ - ½ lb	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5	10 fl oz	M	24 H/5 D	Use western-grown seed. Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Manzate 75DF	2-3 lb	M	24 H/5 D	
	Penncozeb80WP	2-3 lb	M	24 H/5 D	
	Penncozeb 75DF	2-3 lb	M	24 H/5 D	
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved.
	Dithane M-45	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
Ridomil Gold Bravo	2-3 lb	4 + M	48 H/0 D		
Flouronil	2-3 lb	4 + M	48 H/0 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.	

VEGETABLE DISEASE CONTROL

CANTALOUPE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Anthracnose (continued)	Bravo Weather Stik	1.5-2 pt	M	12 H/0 D	
	Echo 720	1.5-2 pt	M	12 H/0 D	
	Bravo 500	2 ¼ - 2 ¾ pt	M	12 H/0 D	
	Equus 720	1.5-2 pt	M	12 H/0 D	
	ManKocide	2-3 lb	M	48 H/5 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Nu-Cop 50DF	2 lb	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Champ F	2.6 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
Downy Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris, Cabrio or Flint.
	Zampro	14 fl oz	40 + 45	12 H/0 D	Spray preventively.
	Quadris Opti	3.2 fl oz	11 + M	12 H/0 D	
	Cabrio	8-12 fl oz	11	12 H/0 D	
	Flint	4 oz/A	11	12 H/14 D	Rotate with non-strobilurins.
	Reason	5.5 fl oz	11	12 H/0 D	Tank mix with organosilicone surfactant.
	Ranman	2.1-2.75 fl oz	21	12 H/3 D	Tank mix with mancozeb or chlorothalonil.
	Curzate	3.2 fl oz	27	12 H/2 D	See label.
	Ariston	1.9-3 pt	M + 27	12 H/5 D	
	Previcur Flex	1.2 pt	28	12 H/3 D	Tank mix with mancozeb or chlorothalonil.
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank mix with mancozeb or chlorothalonil.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank mix with mancozeb or chlorothalonil.
Revus	8 fl oz	40	4 H/0 D	Use w/ protectant fungicides & surfactants.	

VEGETABLE DISEASE CONTROL

CANTALOUPE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew (continued)	Actigard	0.5-1 fl oz	P	12 H/0 D	Apply on less than or equal to 7-day interval.
	Manzate 75DF	2-3 lb	M	24 H/5 D	
	Penncozeb 80WP	2-3 lb	M	24 H/5 D	
	Penncozeb 75DF	2-3 lb	M	24 H/5 D	
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved.
	Dithane M-45	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF	2-3 lb	M	24 H/5 D	Must be tank-mixed with another fungicide.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
	Ridomil Gold MZ	2.5 lb	4 + M	48 H/5 D	
	Forum	6 fl oz	40	12 H/5 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Gavel	2 lb	22 + M	48 H/0 D	
	Ridomil Gold Bravo	2 lb	4 + M	48 H/0 D	
	Flouronil	2 lb	4 + M	48 H/0 D	
	Bravo Weather Stik	1.5-2 pt	M	12 H/0 D	
	Echo 720	1.5-2 pt	M	12 H/0 D	
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/0 D	
	Equus 720	1.5-2 pt	M	12 H/0 D	
	Aliette	4 lb	33	12 H/5 D	
	ManKocide	2-3 lb	M	48 H/0 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide DF	2 lb	M	48 H/0 D	
	Kocide LF	2.6 pt	M	48 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Nu-Cop 50DF	2 lb	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Champ F	2.6 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
Catamaran	4 pt	M	12 H/7 D		

VEGETABLE DISEASE CONTROL

CANTALOUPE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
<i>Pythium</i> spp. Damping-off Cottony leak <i>Phytophthora</i>	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See label.
	Ridomil Gold Sc	1-2 pt	4		
	Ultra Flourish	2-4 pt	4		
	MetaStar	4-8 pt	4		
	Previcur Flex	1:1000 stock sol	21	12 H/3 D	Apply pre-plant to greenhouse media.
	Previcur Flex	1:1000 stock sol	21	12 H/3 D	Apply pre-plant to greenhouse media.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with copper.
	Revus	8 fl oz	40	4 H/0 D	Tank-mix w/ copper + use surfactant.
	Ranman	2.1-2.75 fl oz	21	12 H/0 D	Tank mix with organosilicone surfactant.
	Tanos	8-10 fl oz	11 + 27	12 H/0 D	Foliar and fruit phase suppression only.
Gummy Stem Blight	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Cabrio	12-16 fl oz	11	12 H/0 D	
	Proline	5.7 fl oz	3	12 H/7 D	Limit application up to a total of 17 fl oz/year. Apply up to one soil application and two foliar applications of Proline 480 SC per year. Repeat application as needed using a 5-10-day spray interval if conditions remain favorable for disease development.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	
	Tebuconazole 3.6 F	8 fl oz	3	12 H/7 D	Rotate with other fungicide chemistries.
	Topsin M 70W	4-8 fl oz	1	24 H/0 D	
	T-Methyl 70WP	4-8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	Use western-grown seed. Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	Rotate to another chemistry after 1 application.
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Fontelis	12-16 fl oz	7	12 H/1 D	Make no more than two sequential applications of Fontelis before switching to a different mode of action.
	T-Methyl 4.5F	10 fl oz	1	24 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
Manzate 75DF	2-3 lb	M	24 H/5 D		
Penncozeb 80WP	2-3 lb	M	24 H/5 D		

VEGETABLE DISEASE CONTROL

CANTALOUPE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Gummy Stem Blight (continued)	Penncozeb 75DF	2-3 lb	M	24 H/5 D	
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved.
	Dithane M-45	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/0 D	
	Flouronil	2-3 lb	4 + M	48 H/0 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Echo 720	2-3 pt	M	12 H/0 D	
	Bravo 500	2 ¼ - 2 ¾ pt	M	12 H/0 D	
	Equus 720	2-3 pt	M	12 H/0 D	
	ManKocide	2-3 lb	M	48 H/5 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
	Catamaran	4 pt	M + 33	12 H/7 D	
Powdery Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Fontelis	12-16 fl oz	7	12 H/1 D	Make no more than two sequential applications of Fontelis before switching to a different mode of action.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris, Cabrio or Flint.
	Torino	3.4 fl oz	U6	4 H/0 D	Make no more than 2 applications per crop per year.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Cabrio	12-16 fl oz	11	12 H/0 D	
	Merivon	4-5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Flint	1.5-2 fl oz/A	11	12 H/0 D	Spray preventively when conditions are favorable for disease and repeat every 7-10 days.
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	Rotate to other chemistry after 1 application.

VEGETABLE DISEASE CONTROL

CANTALOUPE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Powdery Mildew (continued)	Proline	5.7 fl oz	3	12 H/7 D	Limit application up to a total of 17 fl oz/year. Apply up to one soil application and two foliar applications of Proline 480 SC per year. Repeat application as needed using a 5-10-day spray interval if conditions remain favorable for disease development.
	Quintec	4-6 fl oz	13	12 H/3 D	See label.
	Nova or Rally	2.5-5 fl oz	3	24 H/0 D	Apply at first sign of disease and continue every 7-10 days. Rotate with other fungicides.
	Procure	4-8 fl oz	3	12 H/0 D	Tank-mix w/ protectants.
	Tebuconazole 3.6 F	4-6 fl oz	3	12 H/7 D	Tank-mix with protectants.
	Topsin M	4-8 fl oz	1	24 H/0 D	Don't rotate with Nova or Rally or Rally.
	T-Methyl 70 WP	4-8 fl oz	1	24 H/0 D	Apply when disease threatens and alternate
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	Topsin with chlorothalonil products or other mode of action. Continue every 7-14 days until disease is no longer a problem.
	T-Methyl 4.5F	10 fl oz	1	24 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/0 D	
	Equus 720	2-3 pt	M	12 H/0 D	Apply every 10-14 days.
Actigard	0.5-1 fl oz	P	12 H/0 D	Apply at least every 7 days.	

CARROTS

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Alternaria Blight	Endura	4.5 fl oz	7	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Fontelis	16-30 fl oz	7	12 H/0 D	Make no more than two sequential applications of Fontelis before switching to a different mode of action.
	Pristine	8-10.5 fl oz	7 + 11	12 H/0 D	
	Quadris (Amistar)	9.2-20.3 fl oz (3-5 oz)	11	4 H/0 D	Apply no more than two sequential applications of Quadris or Cabrio before rotating to a fungicide with a different mode of action.
	Quilt Xcel	14 fl oz	3 + 11	12 H/14 D	
	Omega 500	1 pt	29	12 H/45 D	Use 30-40 gallons of water per acre for soilborne diseases
	Quadris Opti		11 + M	12 H/0 D	
	Quadris Top	12-14 fl oz	3 + 11	12 H/7 D	Use 14 fl oz rate for southern blight.

VEGETABLE DISEASE CONTROL

CARROTS

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Alternaria Blight (continued)	Cabrio	8-12 fl oz	11	12 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/7 D	
	Rovral 4F	1-2 pt	2	24 H/0 D	Apply every 7-14 days as needed.
	Ridomil Gold Bravo	1 ½-2 lb	4 + M	48 H/7 D	See label.
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/7 D	Apply when disease threatens and every 7-10 days until disease is no longer present.
	Bravo Weather Stik	1 ½-2 pt	M	12 H/7 D	
	Echo 720	1 ½-2 pt	M	12 H/7 D	
	Echo 720	0.75-2 pt	M	12 H/14 D	
	Bravo 500	1.125-2.75 lb	M	12 H/14 D	
	Equus 720	0.75-2 pt	M	12 H/14 D	
	Catamaran,	4 pt	M + 33	12 H/7 D	
	Equus 720	1.5-2 pt	M	12 H/7 D	
	Nordox 75WG	1.25-2.5 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.75-1.5 lb	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	Apply every 7-10 days as needed.
	Catamaran	4 pt	M + 33	12 H/7 D	
Cercospora Leaf Blight	Pristine	8-10.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Quadris	9.2-20.3 fl oz	11	4 H/0 D	Apply no more than two sequential applications of Quadris or Cabrio before rotating to a fungicide with a different mode of action.
	Cabrio	8-12 fl oz	11	12 H/0 D	
	Fontelis	16-30 fl oz	7	12 H/0 D	Make no more than two sequential applications of Fontelis before switching to a different mode of action.
	Tilt	4 fl oz	3	12 H/14 D	
	Chlorothalonil same as for Alternaria blight.	1.3 pt 1.5 lb	M	12 H/7 D	Apply every 7-10 days as needed. See label.
	Nordox 75WG	1.25-2.5 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 lb	M	48 H/0 D	
	Kocide 2000	1.3 pt	M	48 H/0 D	
	Champ DP	2.6 pt	M	48 H/0 D	
	Champ 2F	2 lb	M	48 H/0 D	

VEGETABLE DISEASE CONTROL

CARROTS

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Cercospora Leaf Blight (continued)	Champ F	2.6 pt	M	48 H/0 D	
	Kocide DF	2 lb	M	48 H/0 D	
	Kocide LF	1.3-2.6 pt	M	48 H/0 D	
	Kocide 101	2 lb	M	24 H/0 D	
	Nu-Cop 3L	2.5 lb	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
Bacterial leaf blight					Plant disease-free seed.
Foliar oomycetes	Ridomil Gold/Copper	2 lb	4 + M	48 H/7 D	See label.
	Ridomil Gold Bravo	1.5-2 lb	4 + M	48 H/7 D	
	Flouronil	1.5-2 lb	4 + M	48 H/7 D	
Pythium and <i>Phytophthora</i> spp.	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See label.
	Ridomil Gold SC	1-2 pt	4		
	MetaStar	4-8 pt	4		
	Ultraflourish	2-4 pt	4		
	Ranman	8.2 fl oz	7	12 H/14 D	Alternate with mefenoxam-containing products. Do not use a spreader/sticker.
Southern blight (Quadris for Rhizoctonia only)	Quadris	9.2-20.3 fl oz	11	4 H/0 D	See label.
	Quadris Top	14 fl oz	3 + 11	12 H/7 D	Use 14.0 fl oz/acre for southern blight.
	Pristine	8-10.5 fl oz	7 + 11	12 H/0 D	See label.

CORN (SWEET)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Leaf Blights and Rust	Quadris	6.2-9.2 fl oz (Rust) 9.2-15.4 fl oz (Leaf Blight)	11	4 H/7 D	Apply no more than three sequential applications of Quadris before rotating to a fungicide with a different mode of action.
	Quilt Xcel	10.5-14 fl oz	3 + 11	12 H/14 D	
	Headline	6-9 fl oz	11	12 H/7 D	Spray at 7-14 day intervals.
	Headline AMP	10-14.5 fl oz	3 + 11	12 H/7 D	
	Tebuconazole 3.6 F	4-6 fl oz	3	12 H/7 D	
	Priaxor	4-8 fl oz	7 + 11	12 H/7 D	
	Stratego	10 fl oz	3 + 11	12 H/14 D	
	Stratego YLD	4-5 fl oz	3 + 11	12 H/0 D	

VEGETABLE DISEASE CONTROL

CORN (SWEET)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Leaf Blights and Rust (continued)	Tilt	2-4 fl oz	3	12 H/14 D	Apply when disease threatens and every 3-7 days. Plant early enough to miss build up of disease late in season. Do not apply to seed corn to be processed. (Rust)
	Manzate 75DF	1.5 lb	M	24 H/7 D	
	Penncozeb80WP	1-1.5 lb	M	24 H/7 D	
	Penncozeb 75DF	1-1.5 lb	M	24 H/7 D	
	Dithane F-45	1.2 qt	M	24 H/7 D	
	Dithane M-45	1.5 lb	M	24 H/7 D	
	Dithane DF	1.5 lb	M	24 H/7 D	
	Dithane DF Rain Shield	1.5 lb	M	24 H/7 D	
	Bravo Weather Stik	0.75-2 pt	M	12 H/14 D	
	Echo 720	0.75-2 pt	M	12 H/14 D	
	Bravo 500	1.125-2.75 lb	M	12 H/14 D	
	Equus 720	0.75-2 pt	M	12 H/14 D	
	Catamaran	4 pt	M + 33	12 H/7 D	

CUCUMBER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Angular Leafspot	Actigard	0.5-1 fl oz	P	12 H/0 D	Apply at least every 7 days.
	ManKocide	2-2.5 lb	M	48 H/5 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Basic Copper Sulfate (H)	2 lb	M	48 H/0 D	
	Kocide DF	1.5-2 lb	M	48 H/0 D	
	Kocide LF	2-2.6 pt	M	48 H/0 D	
	Kocide 4.5 LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Champ F	2-2.3 pt	M	48 H/0 D	
	Nu-Cop 50DF	1.5-2 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	

VEGETABLE DISEASE CONTROL

CUCUMBER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Pythium spp. Damping-off Cottony leak Phytophthora	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See label.
	Ridomil Gold SC	1-2 pt	4		
	Ultra Flourish	2-4 pt	4		
	MetaStar	4-8 pt	4		
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with copper.
	Revus	8 fl oz	40	4 H/0 D	Tank-mix w/ copper + use surfactant.
	Previcur Flex	1:1000 stock sol	28	12 H/3 D	Apply pre-plant to greenhouse media.
	Ranman	2.1-2.75 fl oz	21	12 H/0 D	Tank mix with organosilicone surfactant.
	Tanos	8-10 fl oz	11 + 27	12 H/0 D	Foliar and fruit phase suppression only.
Zampro	14 fl oz	40 + 45	12 H/0 D	Spray prior to symptom expression. Use of an organosilicone surfactant may help performance.	
Anthracnose	Pristine	18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio. Use western-grown seed. Apply fungicides when first three leaves fully expand and alternate Topsin M with Bravo. Continue every 7-14 days until harvest.
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	Rotate to other chemistry after 1 application.
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	
	Cabrio	12-16 fl oz	11	12 H/0 D	
	Topsin M 70W	4-8 fl oz	1	24 H/0 D	
	T-Methyl 70WP	4-8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5F	10 fl oz	1	24 H/0 D	
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank mix with mancozeb or chlorothalonil.
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved. See label.
	Manzate 75DF	2-3 lb	M	24 H/5 D	
	Dithane M-45	2-3 lb	M	24 H/5 D	Greenhouse approved. See label.
	Dithane DF	2-3 lb	M	24 H/5 D	Greenhouse approved. See label.
Dithane DF Rain Shield	2-3 lb	M	24 H/5 D		
Penncozeb 75DF	1.5-3 lb	M	24 H/5 D		

VEGETABLE DISEASE CONTROL

CUCUMBER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Anthracnose (continued)	Penncozeb 80WP	1.5-3 lb	M	24 H/5 D	
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/0 D	
	Flouronil	2-3 lb	4 + M	48 H/0 D	
	Equus 720	1.5-2 pt	M	12 H/0 D	
	Echo 720	1.5-2 pt	M	12 H/0 D	
	Bravo Weather Stik	1.5-2 pt	M	12 H/0 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	Apply every 7-10 days as needed.
	ManKocide	2-2.5 lb	M	48 H/5 D	
Alternaria Leafspot	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Merivon	4-5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Fontelis	16-30 fl oz	7	12 H/0 D	
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Cabrio	12-16 fl oz	11	12 H/0 D	
	Reason	5.5 fl oz	11	12 H/14 D	Rotate with non-strobilurins.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	Rotate to other chemistry after 1 application.
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank mix with mancozeb or chlorothalonil.
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	
	Dithane M-45	2-3 lb	M	24 H/5 D	
	Dithane DF	2-3 lb	M	24 H/5 D	
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
Penncozeb 75DF	1.5-3 lb	M	24 H/5 D		

VEGETABLE DISEASE CONTROL

CUCUMBER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Alternaria Leafspot (continued)	Penncozeb 80WP	1.5-3 lb	M	24 H/5 D	
	Equus 720	2-3 pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
	Catamaran	4 pt	M + 11	12 H/0 D	
Corynespora Leafspot	Cabrio	12-16 fl oz	11	12 H/0 D	Alternate to another fungicide class after one spray of Quadris or Cabrio.
	Topsin M 70W	4-8 fl oz	1	24 H/0 D	Apply when disease appears or when runners form. Repeat at 7-14 day intervals.
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	T-Methyl 70WP	4-8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5F	10 fl oz	1	24 H/0 D	
	Equus 720	1.5-2 pt	M	12 H/0 D	
	Echo 720	1.5-2 pt	M	12 H/0 D	
	Bravo Weather Stik	1.5-2 pt	M	12 H/0 D	
Bacterial Wilt					No control. Eliminate cucumber beetles.
Downy Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Quadris	11-15.4 fl oz	11	4 H/1 D	
	Cabrio	8-12 fl oz	11	12 H/0 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Ariston	1.9-3 pt	M + 27	12 H/5 D	
	Zampro	14 fl oz	40 + 45	12 H/0 D	Rotate with non-strobilurins.

VEGETABLE DISEASE CONTROL

CUCUMBER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew (continued)	Previcur	1.2 pt	28	12 H/2 D	See label.
	Flint	4	11	12 H/0 D	Rotate similar to Quadris and Cabrio.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	See label.
	Ranman	2.1-2.75 fl oz	21	12 H/0 D	Tank mix with organosilicone surfactant.
	Reason	5.5 fl oz	11	12 H/14 D	Rotate with non-strobilurins.
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank mix with mancozeb or chlorothalonil.
	Curzate	3.2 fl oz	27	12 H/3 D	Tank mix with mancozeb or chlorothalonil.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank mix w/ protectant + surfactant..
	Revus	8 fl oz	40	4 H/0 D	Tank mix with mancozeb or chlorothalonil.
	Manzate 75DF	2-3 lb	M	24 H/5 D	
	Penncozeb80WP	1.5-3 lb	M	24 H/5 D	
	Penncozeb 75DF	1.5-3 lb	M	24 H/5 D	
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved. See label.
	Dithane M-45	2-3 lb	M	24 H/5 D	Greenhouse approved. See label.
	Dithane DF	2-3 lb	M	24 H/5 D	Greenhouse approved. See label.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
	Ridomil Gold MZ	2.5 lb	4 + M	48 H/5 D	
	Forum	6 fl oz	40	12 H/0 D	Must be tank-mixed with other fungicides.
	Gavel	2 lb	22 + M	48 H/5 D	
	Ridomil Gold Bravo	2 lb	4 + M	48 H/0 D	See label.
	Flouronil	2 lb	4 + M	48 H/0 D	See label.
	Bravo Weather Stik	1.5-2 pt	M	12 H/0 D	See label.
	Echo 720		M	12 H/0 D	
	Bravo 500 (H)		M	12 H/0 D	
	Equus 720		M	12 H/0 D	
	Aliette		33	12 H/0 D	
	Actigard		P	12 H/0 D	Apply at least every 7 days.
	ManKocide		M	48 H/5 D	
	Nordox 75WG		M	12 H/0 D	
	Kocide DF		M	48 H/0 D	
Kocide LF		M	48 H/0 D		
Kocide 4.5LF		M	48 H/0 D		
Kocide 3000		M	48 H/0 D		

VEGETABLE DISEASE CONTROL

CUCUMBER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew (continued)	Nu-Cop 3L		M	48 H/0 D	
	Nu-Cop 50DF		M	48 H/0 D	
	Champ DP		M	48 H/0 D	
	Champ 2F		M	48 H/0 D	
	Champ F	2-2.3 pt		48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
	Catamaran	4 pt	M + 33	12 H/7 D	
Fruit & Belly Rot (Rhizoctonia)	Quadris	11-15.4 fl oz	11	4 H/1 D	Make first application of Quadris at the 1.0-3.0 leaf stage with second application just prior to vines running or 10-14 days later, whichever comes first.
	Topsin M 70W	8 fl oz	1	24 H/0 D	Apply Topsin in enough water for foliar run-off.
	T-Methyl 70WP	8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5F	10 fl oz	1	24 H/0 D	
Gummy Stem Blight	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Fontelis	16-30 fl oz	7	12 H/0 D	
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Cabrio	12-16 fl oz	11	12 H/0 D	See label.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	No more than 2 sequential applications.
	Proline	5.7 fl oz	3	12 H/7 D	Limit application up to a total of 17 fl oz/year. Apply up to one soil application and two foliar applications of Proline 480 SC per year. Repeat application as needed using a 5-10-day spray interval if conditions remain favorable for disease development.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	Use every 10-14 days in rotation.
	Tebuconazole 3.6 F	8 fl oz	3	12 H/7 D	Rotate to other chemistry after 1 application.
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	
	Topsin M 70W	4-8 fl oz	1	24 H/0 D	
	T-Methyl 70WP	4-8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5F	10 fl oz	1	24 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	Use western-grown seed. Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.

VEGETABLE DISEASE CONTROL

CUCUMBER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Gummy Stem Blight (continued)	Manzate 75DF	2-3 lb	M	24 H/5 D	
	Penncozeb80WP	1.5-3 lb	M	24 H/5 D	
	Penncozeb 75DF	1.5-3 lb	M	24 H/5 D	
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved.
	Dithane M-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved.
	Dithane DF	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/0 D	
	Flouronil	2-3 lb	4 + M	48 H/0 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Bravo Weather Stik	2-3 pt	M	12 H/ 0 D	
	Echo 720	2-3 pt	M	12 H/ 0 D	
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/ 0 D	
	Equus 720	2-3 pt	M	12 H/ 0 D	
	ManKocide	2-2.5 lb	M	48 H/5 D	
	Nordox 75WG	1-1.25 lb	M	48 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
Cuprofix Disperss	2.5 lb	M	48 H/0 D	Apply every 7-10 days as needed.	
Catamaran,	4 pt	M + 33	12 H/0 D		
Powdery Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris, Cabrio or Flint.
	Merivon	4-5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon to any crops in the cucurbit vegetable group as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Proline	5.7 fl oz	3	12 H/7 D	Limit application up to a total of 17 fl oz/year. Apply up to one soil application and two foliar applications of Proline 480 SC per year. Repeat application as needed using a 5-10-day spray interval if conditions remain favorable for disease development.
	Fontelis	16-30 fl oz	7	12 H/0 D	Make no more than two sequential applications of Fontelis before switching to a different mode of action.

VEGETABLE DISEASE CONTROL

CUCUMBER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Powdery Mildew (continued)	Cabrio	12-16 fl oz	11	12 H/0 D	
	Flint	1.5-2 oz/A	11	12 H/0 D	Spray preventively when conditions are favorable for disease and repeat every 7-10 days.
	Torino	3.4 fl oz	U6	4 H/0 D	
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Nova or Rally	2.5-5 fl oz	3	24 H/0 D	Apply at first sign of disease and continue every 7-10 days. Rotate with other fungicides.
	Procure	4-8 fl oz	3	12 H/0 D	
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	Rotate to other chemistry after 1 application.
	Tebuconazole 3.6 F	4-6 fl oz	3	12 H/7 D	Do not rotate with Procure or Rally.
	Topsin M 70WP	4-8 fl oz	1	24 H/0 D	Apply when disease threatens and alternate Topsin with chlorothalonil products or other mode of action. Continue every 7-14 days until disease is no longer a problem. Apply every 10-14 days.
	T-Methyl 70WP	4-8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5F	10 fl oz	1	24 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/0 D	
	Equus 720	2-3 pt	M	12 H/0 D	Apply every 7-10 days as needed.
	Actigard	0.5-1 fl oz	P	12 H/0 D	Apply at least every 7 days.
Cuprofix Disperss	2.5 lb	M	48 H/0 D		
Scab	Bravo 500	2 ¾ - 4 ¼ pt	M	12 H/0 D	Apply when disease threatens and every 7-10 days.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	Greenhouse approved. See label.
	Dithane M-45	2-3 lb	M	24 H/5 D	Greenhouse approved. See label.
	Dithane DF	2-3 lb	M	24 H/5 D	Greenhouse approved. See label.
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved. See label.
	Manzate 75DF	2-3 lb	M	24 H/5 D	See label.
	Penncozeb75DF	1.5-3 lb	M	24 H/5 D	
	Penncozeb80WP	1.5-3 lb	M	24 H/5 D	
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/5 D	
	Flouronil	2-3 lb	4 + M	48 H/5 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	
	Equus 720	2-3 pt	M	12 H/0 D	

VEGETABLE DISEASE CONTROL

EGGPLANT

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS	
	MATERIAL	FORMULATED	MOA			
<i>Pythium</i> and <i>Phytophthora</i> spp.	Ridomil Gold EC	1-2 pt	4		Apply in sufficient water (20-50 gal) to provide adequate coverage. See label.	
	Ridomil Gold SL	1-2 pt	4			
	Ultraflourish	2-4 pt	4			
	MetaStar	4-8 pt	4			
	Zampro	14 fl oz	40 + 45	12 H/4 D	Spray prior to disease onset.	
Phomopsis, Alternaria, Anthracnose, Fruit Rots & Leaf Blights	Endura	2.5-3.5 oz/A/100 gal	7	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after two sprays.	
	Quadris	6.2-15.4 fl oz	11	4 H/0 D	Quadris and Cabrio are primarily for Anthracnose and Alternaria. No more than one application of either of these fungicides should be made before rotating to different fungicide chemistry.	
	Ariston	2-2.44 pt	M + 27	12 H/3 D		
	Fontelis	10-24 fl oz	7	12 H/0 D	Make no more than two sequential applications of Fontelis before switching to a different mode of action.	
	Priaxor	4-8 fl oz	7 + 11	12 H/7 D	Spray prior to disease onset.	
	Quadris Top	10-14 fl oz	11 + 3	12 H/14 D	Rotate to other chemistry after 1 application.	
	Cabrio	8-12 fl oz	11	12 H/0 D		
	Evito	3.8-5.7 fl oz	11	12 H/3 D		
	Flint	1.5-2 fl oz	11	12 H/0 D		
	Bravo Weather Stik	1.5 pt	M	12 H/3 D		
	Nordox 75WG	1.25-2.5 lb	M	12 H/0 D		
	Kocide 101	2 lb	M	24 H/0 D		
	Kocide DF	2 lb	M	48 H/0 D		
	Kocide LF	2.6 pt	M	48 H/0 D		
	Kocide 4.5 LF	1.3 pt	M	48 H/0 D		
	Kocide 3000	0.75 lb	M	48 H/0 D		
	Champ DP	1.3 lb	M	48 H/0 D		
	Champ 2F	1.3 pt	M	48 H/0 D		
	Champ F	2.6 pt	M	48 H/0 D		
	Nu-Cop 50DF	2 lb	M	48 H/0 D		
	Nu-Cop 3L	1.3 pt	M	48 H/0 D		
	Blue Shield	2 lb	M	48 H/0 D		
	Forum	6 fl oz	40	12 H/0 D		Forum is labeled for suppression of Phytophthora fruit and crown rot.
	Cuprofix Disperss	2.5 lb	M	48 H/0 D		
	Catamaran	4 pt	M + 33	12 H/7 D		

VEGETABLE DISEASE CONTROL

IRISH POTATO

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Black Leg	Streptomycin sulfate 21.2 WP	½ lb/100 gal	1 tsp		Soak cut seed pieces for 30 minutes and plant. Eradicate seedcorn maggots.
Black Scurf	Terraclor 10G (H)	180 to 250 lb broadcast or 100 lb/ 12,400 ft row	14		Apply according to label directions.
	Terraclor 75 WP (H)	24 to 33 lb broadcast or 13 ½ lb/ 12,400 ft or row	14		
Early Blight and Late Blight	Endura	2.5-4.5 fl oz	7	12 H/30 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after two sprays.
	Priaxor	4-8 fl oz	7 + 11	12 H/7 D	Spray prior to disease onset. Use higher rates and a shorter spray interval (7 instead of 14 days) when disease is found in the area.
	Scala	7 fl oz	9	12 H/7 D	Alternate with protectant fungicides.
	Omega 500	5.5-8 fl oz	29	12 H/14 D	Begin when plants are 6-8" high or when disease pressure increases.
	Quadris	6.2-15.4 fl oz	11	4 H/14 D	Use only in combination with protectant fungicide.
	Quadris Opti	1.6 pt	11 + M	12 H/14 D	Surfactant recommended.
	Revus Top	5.5-7 fl oz	3 + 40	12 H/14 D	Rotate with non-strobilurins.
	Reason	5.5-8.2 fl oz	11	12 H/14 D	Tank-mix with mancozeb or chlorothalonil.
	Tanos	6-8 fl oz	11 + 27	12 H/14 D	See label.
	Curzate 60DF	3.3 fl oz	27	12 H/14 D	
	Evito	3.8 fl oz	11	12 H/7 D	
	Quadris Top	8-14 fl oz	11 + 3	12 H/14 D	Rotate to other chemistry after 1 application.
	Bravo 500	1 ½ c pt	M	12 H/0 D	
	Polyram 80DF	1.5-2 lb	M	24 H/0 D	
	Dithane DF Rain Shield	0.5-2 lb	M	24 H/14 D	Spray every week beginning when plants are 4-6" high, and continue weekly until harvest.
	Ariston	2 pt	M + 27	12 H/14 D	
	Dithane M-45	0.5-2 lb	M	24 H/14 D	
	Dithane DF	0.5-2 lb	M	24 H/14 D	
	Dithane F-45	0.4-1.6 qt	M	24 H/14 D	
	Manzate 75DF	1-2 lb	M	24 H/14 D	
	Penncozeb75DF	0.5-2 lb	M	24 H/14 D	
Penncozeb80WP	0.5-2 lb	M	24 H/14 D		
ManKocide	1.5-2 lb	M	48 H/14 D	Mix with organosilicone surfactant. Forum for late blight only.	
Ranman	2.1-2.75 fl oz	21	12 H/14 D	Tank mix with chlorothalonil or mancozeb.	

VEGETABLE DISEASE CONTROL

IRISH POTATO

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Early Blight and Late Blight (continued)	Forum	6 fl oz	40	12 H/7 D	
	Gavel 75DF	1.5-2 lb	22 + M	48 H/14 D	
	Previcur	1.2 pt	28	12 H/14 D	
	Ridomil Gold Bravo	2 lb	4 + M	48 H/14 D	
	Ridomil Gold MZ	2.5 lb	4 + M	48 H/14 D	
	Ridomil Gold/Copper	2 lb	4 + M	48 H/14 D	Add 0.8 lb a.i./A of EBDC or chlorothalonil to Ridomil Gold/Copper.
	Flouronil	2 lb	4 + M	48 H/14 D	Begins sprays prior to disease development.
	Zampro	14 fl oz	40 + 45	12 H/4 D	
	Bravo Weather Stik	1-1.5 pt	M	12 H/0 D	
	Echo 720	1-1.5 pt	M	12 H/0 D	
	Equus 720	1-1.5 pt	M	12 H/0 D	
	Bravo S	3-4.5 pt	M	12 H/0 D	See label.
	Super Tin	2.5-3.75 lb	M	48 H/21 D	Rovral for early blight only.
	Rovral 4F	1-2 pt	2	24 H/14 D	
	Catamaran	4-5 pt	M + 33	12 H/7 D	See labels.
Most CuOH (copper hydroxide) & CuSO4 (copper sulfate) cmpds	See labels		See labels		
Seed Piece Rot	Dithane M-45	1.25 lb/50 gal	M		
	Dithane DF	1.25 lb/50 gal	M		
	Dithane F-45	1 qt/50 gal	M		
	Penncozeb 75DF	1.25 lb/50 gal	M		
	Penncozeb80WP	1.25 lb/50 gal	M		Use according to manufacturer's directions.
	Manzate 75DF	1.25 lb/50 gal	M		Do not use treated seed for food or feed purposes.
	Manzate 80WP	1.25 lb/50 gal	M		
	Mertect 340F	0.42 oz/2000 lb	1		
	Tops 2.5 Dust	1 lb/100 lb seed			

VEGETABLE DISEASE CONTROL

LETTUCE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Pythium Damping-off	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See label.
	Ridomil Gold GR	20-40 lb	4		
	Ridomil Gold SL	1-2 pt	4		
	Metastar	4-8 pt	4		
Sclerotinia Bottom Rot/ Drop	Endura	8-11 fl oz	7	12 H/14 D	Apply prior to disease onset.
	Botran 75WP	2.7 lb	14	12 H/14 D	Spray at first appearance and continue at 7-10 day intervals.
	Rovral 4F	1.5-2 pt	2	24 H/14 D	Apply at 3-leaf stage. See label.
	Iprodione 4L	1.5-2 pt	2	24 H/14 D	
Downy Mildew	Quadris	12.3-15.4 fl oz	11	4 H/0 D	Apply no more than three sequential applications of Quadris before rotating to a fungicide with a different mode of action. Apply under favorable disease conditions. Apply at first appearance of disease and every 7-10 days.
	Merivon	4-11 fl oz	7 + 11	12 H/1 D	Suppression only. Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Zampro	14 fl oz	40 + 45	12 H/0 D	Begin sprays prior to disease development.
	Reason	5.5-82 fl oz	11	12 H/14 D	Rotate with non-strobilurins.
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank-mix Tanos with other fungicides.
	Forum	6 fl oz	40	12 H/0 D	Tank-mix Forum with other fungicides.
	Previcur Flex	2 pt	28	12 H/2 D	See label.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with protectants.
	Revus	8 fl oz	40	4 H/1 D	Surfactant recommended.
Aliette	2-5 lb	33	12 H/3 D		

LIMA BEAN

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Anthracnose	Quadris	6.2-15.4 fl oz	11	4 H/1 D	Apply prior to disease onset on a 7-14 day interval.
	Headline	6-9 fl oz	11	12 H/7 D	Rotate with non-strobilurins.
	Topsin M 70W	1-2 lb	1	24 H/14 D	Apply at 10-30% bloom or when conditions are favorable for disease and repeat at 7-day intervals.
	Fontelis	14-30 fl oz	7	12 H/0 D	Use prior to disease development.
	T-Methyl 70WP	1 2 lb	1	24 H/14 D	

VEGETABLE DISEASE CONTROL

LIMA BEAN

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Anthracnose	Topsin 4.5L	20-30 fl oz	1	24 H/14 D	
	T-Methyl 4.5L	20-30 fl oz	1	24 H/14 D	
Anthracnose, Downy Mildew	Headline	6-9 fl oz	11	24 H/14 D	Rotate with non-strobilurins.
Powdery Mildew	Headline	6-9 fl oz	11	24 H/14 D	Rotate with non-strobilurins.
Botrytis (Gray Mold), Sclerotinia (White Mold)	Topsin M 70W	1-2 lb	1	24 H/14 D	Apply at 10-30% bloom or when conditions are favorable for disease and repeat 7-day intervals. See label.
	T-Methyl 70WP	1-2 lb	1	24 H/14 D	
	Topsin 4.5L	30-40 fl oz	1	24 H/14 D	
	T-Methyl 4.5L	30-40 fl oz	1	24 H/14 D	
	Rovral 4F	1.5-2 pt	2	24 H/14 D	Apply Rovral as foliar spray at early bloom (1-10%) bloom. Repeat on 7-day intervals if conditions are favorable for disease. See label.
	Fontelis	14-30 fl oz	7	24 H/14 D	Use prior to disease development.
Rhizoctonia & Pythium, Damping-off, Root Rots	Ridomil Gold EC	½-1 pt.	4	24 H/14 D	Incorporate into soil. See Label.
	Ridomil Gold SL	0.5-1 pt	4	24 H/14 D	
	Quadris (Amistar)	0.4-0.8 fl oz/ 1000 row feet (0.125-0.25 fl oz/ 1000 row feet)	11	24 H/14 D 12 H/7 D	Applied in-furrow.
	Uniform	0.34 fl oz/1000 row ft	4 + 11	24 H/14 D	Use as an in-furrow spray.

OKRA

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Foliar diseases	Quadris	6.2-15.4 fl oz		4 H/0 D	See comments on eggplant.

VEGETABLE DISEASE CONTROL

ONION (DRY)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Pythium Damping-Off	Ridomil Gold EC	½-1 pt			Incorporate into soil. See label.
Purple Blotch ¹ , Bacterial Leaf Blight ² , Botrytis Leaf Blight ³ , Downy Mildew ⁴	Pristine ^{1,3,4}	10.5-18.5 fl oz ¹ 14.5-18.5 fl oz ³ 18.5 fl oz ³	7 + 11	12 H/7 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after two sprays. Pristine only suppresses downy mildew.
	Fontelis ^{1,3}	16-24 fl oz	7	12 H/3 D	
	Scala ^{1,3}	9-12 fl oz	9	12 H/7 D	Use low rate of Scala with tank-mix only.
	Quadris ^{1,4}	6.2-15.4 fl oz	11	4 H/0 D	Apply no more than two sequential applications of Quadris or Cabrio before rotating to a fungicide with a different mode of action.
	Zampro ⁴ ,	14 fl oz	40 + 45	12 H/0 D	Spray prior to disease development.
	Inspire Super ^{1,3}	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Quadris Opti	2.4-3.6 pt	11 + M	12 H/14 D	
	Cabrio ^{1,4}	8-12 fl oz	11	12 H/0 D	
	Omega 500 ¹⁻⁴	1 pt	29	12 H/7 D	
	Tebuconazole 3.6 F ¹	4-6 fl oz	3	12 H/7 D	Tank-mix to broaden activity spectrum.
	Merivon	4-11 fl oz	7 + 11	12 H/7 D	Purple Blotch —Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon more than 33 fl oz/A/season.
	Merivon	8-11 fl oz	7 + 11	12 H/7 D	Botrytis Leaf Blight —Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon more than 33 fl oz/A/season.
	Merivon	8-11 fl oz	7 + 11	12 H/7 D	Downy Mildew—Suppression only. Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon more than 33 fl oz/A/season.
	Ridomil Gold MZ ⁴	2.5 lb	4 + M	48 H/7 D	Spray on a 7-14 day schedule depending on weather and disease pressure.
	Viathon	2-3 pt	3 + 33	12 H/7 D	
	Quilt Xcel ^{1,3}	14-26 fl oz	3 + 11	12 H/14 D	
	Quadris Top ^{1,3}	14 fl oz	11 + 3	12 H/14 D	Rotate to other chemistry after 1 application.
	Ridomil Gold/Copper ⁴	2 lb	4 + M	48 H/7 D	
	Ridomil Gold Bravo ^{1,3,4}	2 lb	4 + M	48 H/10 D	
	Bravo Weather Stik ^{1,3,4}	1-2 pt	M	12 H/7 D	
Echo 720 ^{1,3,4}	1-2 pt	M	12 H/7 D		
Equus 720 ^{1,3,4}	1-2 pt	M	12 H/7 D		
Switch 62.5 WG ^{1,3}	11-14 fl oz	9 + 12	12 H/7 D	12 month rotational restriction to crops other than onions or strawberries with Switch.	
Dithane DF ^{1,3,4}	3 lb	M	24 H/7 D		
Dithane M-45 ^{1,3,4}	3 lb	M	24 H/7 D		

VEGETABLE DISEASE CONTROL

ONION (DRY)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Purple Blotch ¹ , Bacterial Leaf Blight ² , Botrytis Leaf Blight ³ , Downy Mildew ⁴ (continued)	Dithane F-45 ^{1,3,4}	2.4 qt	M	24 H/7 D	
	Manzate 75DF ^{1,3,4}	3 lb	M	24 H/7 D	
	Penncozeb75DF ^{1,3,4}	2-3 lb	M	24 H/7 D	
	Penncozeb80WP ^{1,3,4}	2-3 lb	M	24 H/7 D	
	ManKocide ^{1,2,3,4}	2.5 lb	M	48 H/7 D	
	Forum	6 fl oz	40	12 H/7 D	Tank-mix Forum with other fungicides.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with protectants.
	Revus	8 fl oz	40	12 H/2 D	Tank-mix w/ protectants + surfactant.
	Nordox 75WG	1.25-2.5 lb	M	12 H/2 D	
	Kocide 101 ^{1,4}	2 lb	M	12 H/2 D	
	Kocide DF ^{1,4}	2 lb	M	12 H/2 D	Application of copper compounds may be phytotoxic to leaves.
	Kocide LF ^{1,4}	2.6 pt	M	12 H/2 D	
	Kocide 4.5 LF ^{1,2,4}	1.3 pt	M	12 H/2 D	
	Kocide 3000 ^{1,2,4}	0.75 lb	M	12 H/2 D	
	Champ DP ^{1,2,4}	1.3 lb	M	12 H/2 D	
	Champ 2F ^{1,2,4}	1.3 pt	M	12 H/2 D	
	Champ F ^{1,4}	2.6 pt	M	12 H/2 D	
	Nu-Cop 50DF ^{1,4}	2 lb	M	12 H/2 D	
	Nu-Cop 3L ^{1,4}	1.3-2.6 pt	M	12 H/2 D	
	Cuprofix Disperss ^{1,4}	2.5-6 lb	M	12 H/2 D	
	Rovral 4F ^{1,3}	1.5 pt	2	12 H/2 D	Rotate with non-strobilurins.
	Aliette ⁴	2-3 lb	33	12 H/2 D	
	Actigard ⁴	0.75-1 fl oz	P	12 H/2 D	Apply prior to disease onset.
Reason	5.5 fl oz	11	12 H/2 D	If disease pressure high spray every 14 days.	
Catamaran	4-7 pt	M + 33	12 H/2 D		
Bacterial Streak and Bulb Rot	Follow recommended cultural practices and disease prevention practices. Copper compounds tank-mixed with EBDC fungicides may reduce disease spread.				
Pantoea	Actigard	0.75-1 fl oz	P	12 H/7 D	Apply prior to disease onset.

VEGETABLE DISEASE CONTROL

ONION (Green & Green Bunching)-Garlic, Leek, Shallot, Onion Grown For Seed

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Botrytis Leaf Blight, Downy Mildew, Neck Rot, Purple Blotch	Quadris Opti	2.4-3.6 pt	11 + M	12 H/14 D	
	Fontelis ^{1,3}	16-24 fl oz	7	12 H/3 D	
	Inspire Super	16-20 fl oz	3/9	12 H/14 D	No more than 2 sequential applications.
	Merivon	4-11 fl oz	7 + 11	12 H/7 D	Purple Blotch —Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon more than 33 fl oz/A/season.
	Merivon	8-11 fl oz	7 + 11	12 H/7 D	Botrytis Leaf Blight —Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon more than 33 fl oz/A/season.
	Merivon	8-11 fl oz	7 + 11	12 H/7 D	Downy Mildew—Suppression only. Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon more than 33 fl oz/A/season.
	Zampro ⁴	14 fl oz	40 + 45	12 H/0 D	Spray prior to disease development.
	Ridomil Gold Bravo	2 lb	4 + M	48 H/14 D	See label.
	Ridomil Gold /Copper	2 lb	4 + M	48 H/21 D	See label.
	Bravo Weather Stik	1 ½-3 pt	M	12 H/14 D	See label.
	Echo 720	1 ½-3 pt	M	12 H/14 D	See label.
	Equus 720	1.5-3 pt	M	12 H/14 D	See label.
	Quadris Top	14 fl oz	11 + 3	12 H/7 D	Rotate to other chemistry after 1 application.
	Reason	5.5 fl oz	11	12 H/7 D	Rotate with non-strobilurins.
	Catamaran	4 pt	M + 33	12 H/7 D	
Viathon	2-3 pt	3 + 33	12 H/7 D		

PEAS (English)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Rhizoctonia & Pythium, Damping-off	Ridomil Gold EC	½-1 pt	4		Incorporate into soil. See label.
	Ridomil Gold SL	0.5-1 pt	4		
	Quadris (Amistar)	0.4-0.8 fl oz/ 1000 row ft (0.125-0.25 oz/ 1000 row ft)	11		Applied in-furrow.
	Uniform	0.34 fl oz/1000 row ft	4 + 11		Use as an in-furrow spray.

VEGETABLE DISEASE CONTROL

PEAS (English)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Powdery Mildew & other foliar fungal diseases.	Sulfur (spray or dust)(H)	See label	M	24 H/0 D	Start application at first sign of disease and repeat every 7-10 days. Do not apply when temperature is above 90 degrees or when plants are wet.
	Cuprofix Disperss	2-4	M	48 H/0 D	
	Quadris (Amistar)	6.2-15.4 fl oz (2-5 oz)	11	4 H/1 D	Apply at or prior to disease onset.
	Headline	6-9 fl oz	11	12 H/7 D	Rotate with non-strobilurins.

BLACKEYE PEAS (Southern)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Rhizoctonia & Pythium, Damping-off	Ridomil Gold EC	½-1 pt	4		Incorporate into soil. See label.
	Ridomil Gold SL	0.5-1 pt	4		
	MetaStar	2-4 pt	4		
	Quadris	0.4-0.8 fl oz/ 1000 row ft	11		Applied in-furrow
	Uniform	0.34 fl oz/1000 row ft	4 + 11		Use as an in-furrow spray.
Scab, Anthracnose, Mildew, Rust	Quadris	6.2-15.4 fl oz	11	4 H/1 D	Apply at or prior to disease onset.
	Headline	6 -9 fl oz	11	12 H/7 D	Rotate with non-strobilurins.

BLACKEYE PEAS (Dry)

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Pythium Damping-off, Rust, Anthracnose, Downy Mildew, Cercospora Leafspot	Ridomil Gold EC	½-1 pt	4		Incorporate into soil. See label.
	Ridomil Gold SL	0.5-1 pt	4		
	MetaStar	2-4 pt	4		
	Quadris	6.2-15.4 fl oz	11	4 H/1 D	Apply at or prior to disease onset.
	Bravo 500	2-3 pt	M	12 H/42 D	See label.
	Bravo Weather StiK	1-2 pt	M	12 H/42 D	See label.
	Echo 720	1-2 pt	M	12 H/42 D	See label.
	Equus 720	1.6-2 pt	M	12 H/42 D	See label.
	Headline	6-9 fl oz	M	12 H/21 D	Rotate with non-strobilurins.

VEGETABLE DISEASE CONTROL

PEPPER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Cercospora, Alternaria, Anthracnose, Phytophthora blight Fruit Rots, Bacterial Spot	Endura	2.5-3.5 oz/A/100 gal	7	12 H/0 D	Endura is primarily for diseases caused by Alternaria and Cercospora on this group of crops.
	Aftershock	2-5.7 fl oz	11	12 H/3 D	
	Quadris	6.2-15.4 fl oz	11	4 H/0 D	Quadris and Cabrio are primarily for Anthracnose and Alternaria. No more than one application of Quadris or Cabrio should be made before rotating to different fungicide chemistry.
	Ariston	2-2.44 pt	M + 27	12 H/3 D	
	Fontelis	10-24 fl oz	7	12 H/0 D	Spray prior to disease symptoms.
	Priaxor	4-8 fl oz	7 + 11	12 H/7 D	Spray prior to disease symptoms.
	Quadris Top	12-14 fl oz	11 + 3	12 H/14 D	Rotate to other chemistry after 1 application
	Cabrio	8-12 fl oz	11	12 H/0 D	
	Evito	3.8-5.7 fl oz	11	12 H/3 D	
	Flint	1.5-2 fl oz	11	12 H/0 D	Flint is for powdery mildew.
	Tanos	8-10 fl oz	11 + 27	12 H/3 D	Tank mix Tanos with copper or maneb.
	Forum	6 fl fl oz	40	12 H/0 D	Tank mix Forum with copper or maneb.
	Manzate	1.6-3.2 lb	M	24 H/7 D	
	Bravo Weather Stik	1.5 pt	M	12 H/3 D	Spray on a 7-10 day interval. Shorten interval under high disease pressure or when weather is favorable for disease.
	Top Cop Tri-Basic (H)	1-2 qt	M	24 H/0 D	
	Nordox 75WG	1.25-2.5 lb	M	12 H/0 D	
	Kocide 101	2-3 lb	M	24 H/0 D	Begin field application immediately following transplanting and continue at 5-10 day intervals depending on the weather and disease pressure. Plant certified seed or transplants.
	Kocide DF	2-3 lb	M	48 H/0 D	
	Kocide LF	2.6-4 pt	M	48 H/0 D	
	Actigard	0.3-0.75 fl oz	P	12 H/14 D	Apply 0.75 oz within one week of transplanting. Use 0.33 oz every 7 days until bloom.
	Kocide 4.5 LF	1.3-2 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Champ DP	1.3-2 lb	M	48 H/0 D	
	Champ 2F	1.3-2 pt	M	48 H/0 D	
Champ F	2.6-4 pt	M	48 H/0 D		
Nu-Cop 50DF	2-3 lb	M	48 H/0 D		
Nu-Cop 3L	1.3-4 pt	M	48 H/0 D		
Cuprofix Ultra 40	1.25-3 lb	M	48 H/0 D		
Catamaran	4 pt	M + 33	12 H/7 D		

VEGETABLE DISEASE CONTROL

PEPPER

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
<i>Pythium</i> and <i>Phytophthora</i> spp.	Ridomil Gold EC	1 pt	4		Apply Ridomil Gold EC at planting and again in 30 days. Make 3-4 applications of Ridomil Gold/Copper every 10-14 days.
	Ridomil Gold SL	1 pt	4		
	MetaStar	4 pt	4		
	Presidio	3-4 fl oz	43	12 H/2 D	Use copper with Presidio and Revus.
	Revus	8 fl oz	40	4 H/1 D	Use surfactant with Revus.
	Ridomil Gold /Copper	2.5 lb	4 + M	48 H/7 D	Rotate Presidio and Revus w/ Ridomil Gold Copper.
	Zampro	14 fl oz	40 + 45	12 H/0 D	Apply pre-plant to greenhouse media. Apply at planting. See label.
	Previcur Flex	1:1000 stock sol 1.2 pt	28	12 H/0 D	
	Tanos	8-10 fl oz	11 + 27	12 H/3 D	Foliar and fruit phase suppression only.
Southern Blight	Blocker	4.5-7.5 pt in 100 gal of transplant water	14	NA	Use 8.0 fl oz of solution per plant.

PUMPKIN

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Zampro	14 fl oz	40 + 45	12 H/0 D	Spray prior to disease symptoms.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris, Cabrio or Flint.
	Ariston	1.9-3 pt	M + 27	12 H/5 D	
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Suppression only. Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Cabrio	8-12 fl oz	11	12 H/0 D	
	Flint	3.8-5.7 fl oz	11	12 H/0 D	Apply when disease threatens and every 7 days.
	Ridomil Gold MZ	2.5 lb	4 + M	48 H/5 D	
	Ranman	2.1-2.75 fl oz	21	12 H/0 D	Apply when disease threatens and every 7 days.
	Reason	5.5 fl oz	11	12 H/14 D	Tank mix with organosilicone surfactant.
	Forum	6 fl oz	40	12 H/0 D	Rotate with non-strobilurins.
	Gavel	2 lb	22 + M	48 H/5 D	Forum must be tank-mixed with other fungicides.

VEGETABLE DISEASE CONTROL

PUMPKIN

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew (continued)	Tanos	8 fl oz	11 + 27	12 H/3 D	See label.
	Previcur Flex	1.2 pt	28	12 H/2 D	Tank mix with mancozeb or chlorothalonil.
	Curzate	3.2 fl oz	27	12 H/3 D	
	Presidio	3-4 fl oz	43	12 H/43 D	
	Revus	8	40	4 H/0 D	Tank-mix with protectant fungicides.
	Ridomil Gold Bravo	2 lb	4 + M	48 H/5 D	Tank-mix w/ protectants & surfactant.
	Flouronil	2 lb	4 + M	48 H/5 D	
	Bravo Weather Stik	1.5-2 pt	M	48 H/5 D	
	Echo 720	1.5-2 pt	M	48 H/5 D	
	Bravo 500	2 ¼-2 ¾ pt	M	48 H/5 D	
	Equus 720	1.5-2 pt	M	48 H/5 D	
	Aliette	2-5 lb	33	12 H/33 D	
	ManKocide	2-3 lb	M	48 H/5 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide DF	2 lb	M	48 H/0 D	
	Kocide LF	2.6 pt	M	48 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	Apply every 7-10 days as needed.
Champ 2F	1.3 pt	M	48 H/0 D		
Cuprofix Disperss	2.5 lb	M	48 H/0 D		
Actigard	0.5-1 fl oz	P	12 H/0 D	Apply at least every 7 days.	
Catamaran	4 pt	M + 33	12 H/33 D		
Anthracnose	Pristine	18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	Rotate to another chemistry after 1 application.

VEGETABLE DISEASE CONTROL

PUMPKIN

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Anthracnose (continued)	Cabrio	12-16 fl oz	11	12 H/0 D	
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank mix Tanos with mancozeb or chlorothalonil.
	Topsin M 70W	4-8 fl oz	1	24 H/0 D	See label.
	T-Methyl 70WP	4-8 fl oz	1	24 H/0 D	Use western-grown seed. Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5L	10 fl oz	1	24 H/0 D	
	Manex	1.2-1.6 qt	M	24 H/7 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/5 D	
	Flouronil	2-3 lb	4 + M	48 H/5 D	
	Bravo Weather Stik	1.5-2 pt	M	12 H/0 D	
	Echo 720	1.5-2 pt	M	12 H/0 D	
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/0 D	
	Equus 720	1.5-2 pt	M	12 H/0 D	
	ManKocide	2-3 lb	M	48 H/0 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/5 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	Apply every 7-10 days as needed.
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
Cuprofix Disperss	2.5 lb	M	48 H/0 D		
Catamaran	4 pt	M + 33	12 H/7 D		
Gummy Stem Blight	Pristine	12.5-18.5 fl oz	11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Fontelis	12-16 fl oz	7	12 H/1 D	Spray prior to disease development.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Proline	5.7 fl oz	3	12 H/7 D	Limit application up to a total of 17 fl oz/year. Apply up to one soil application and two foliar applications of Proline 480 SC per year. Repeat application as needed using a 5-to 10- day spray interval if conditions remain favorable for disease development.
	Cabrio	12-16 fl oz	11	12 H/0 D	

VEGETABLE DISEASE CONTROL

PUMPKIN

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Gummy Stem Blight (continued)	Quadri Opti	3.2 pt	11 + M	4 H/1 D	
	Tebuconazole 3.6 F	8 fl oz	3	12 H/7 D	Tank-mix with protectants.
	Topsin M 70W	4-8 fl oz	1	24 H/0 D	See label.
	T-Methyl 70WP	4-8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5L	10 fl oz	1	24 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/0 D	
	Flouronil	2-3 lb	4 + M	48 H/0 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Bravo 500	2 ¼ - 2 ¾ pt	M	12 H/0 D	
	Equus 720	2-3 pt	M	12 H/0 D	
	ManKocide	2-3 lb	M	48 H/5 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 2000	1.5 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
Cuprofix Disperss	2.5 lb	M	48 H/0 D		
Catamaran	4 pt	M + 33	12 H/7 D		
Powdery Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Fontelis	12-16 fl oz	7	12 H/1 D	Spray prior to disease development.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris, Cabrio, or Flint.
	Torino	3.4 fl oz	U6	4 H/0 D	Make no more than 2 applications per year.
	Merivon	4-5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Inspire Super	16-20 fl oz	3 + 9	12 H/0 D	No more than 2 sequential applications.
	Proline	5.7 fl oz	3	12 H/7 D	Limit application up to a total of 17 fl oz/year. Apply up to one soil application and two foliar applications of Proline 480 SC per year. Repeat application as needed using a 5-to 10- day spray interval if conditions remain favorable for disease development.

VEGETABLE DISEASE CONTROL

PUMPKIN

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Powdery Mildew (continued)	Cabrio	12-16 fl oz	11	12 H/0 D	
	Flint	1.5-2 fl oz/A	11	12 H/0 D	Spray preventively when conditions are favorable for disease and repeat every 7-10 days.
	Nova or Rally	2.5-5 fl oz	3	24 H/0 D	Apply at first sign of disease and continue every 7-10 days. Rotate with other fungicides.
	Quintec	4-6 fl oz	13	12 H/0 D	See label.
	Procure	4-8 fl oz	3	12 H/0 D	
	Tebuconazole 3.6 F	4-6 fl oz	3	12 H/7 D	Tank-mix with protectants.
	Topsin M 70WP	4-8 fl oz	1	24 H/0 D	See label.
	T-Methyl 70WP	4-8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	12 H/0 D	
	T-Methyl 4.5L	10 fl oz	1	12 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	Apply every 7-10 days as needed.
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/0 D	
	Equus 720	2-3 pt	M	12 H/0 D	Apply at least every 7 days.
	Actigard	0.5-1 fl oz	P	12 H/0 D	
Cuprofix Disperss	2.5 lb	M	48 H/0 D		
Alternaria Leafspot	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Fontelis	12-16 fl oz	7	12 H/1 D	Spray prior to disease development.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	Rotate to other chemistry after 1 application.
	Cabrio	12-16 fl oz	11	12 H/0 D	
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank mix Tanos with mancozeb or chlorothalonil.
	Merivon	4-5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/0 D	Apply every 7-14 days.
	Flouronil	2-3 lb	4 + M	48 H/0 D	Begin application after plants are set in the field or after emergence for direct seeded.
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Bravo Weather Stik	1 ½ pt	M	12 H/0 D	
Echo 720	1 ½ pt	M	12 H/0 D		

VEGETABLE DISEASE CONTROL

PUMPKIN

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Alternaria Leafspot (continued)	Bravo 500	2 ¼ - 2 ¾ pt	M	12 H/0 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Equus 720	2-3 pt	M	12 H/0 D	
	Reason	5.5 fl oz	11	12 H/0 D	Rotate with non-strobilurins.
	ManKocide	2-3 lb	M	48 H/14 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/5 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	Apply every 7-10 days as needed.
	Champ 2F	1.3 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
	Catamaran	4 pt	M + 33	12 H/7 D	
<i>Pythium</i> spp. Damping-off Cottony leak <i>Phytophthora</i>	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See label.
	Ridomil Gold SL	1-2 pt	4		
	Ultra Flourish	2-4 pt	4		
	MetaStar	4-8 pt	4		
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with copper.
	Revus	8 fl oz	40	4 H/7 D	Tank-mix with copper + surfactant.
	Ranman	2.1-2.75 fl oz	21	12 H/3 D	Tank mix with organosilicone surfactant.
	Tanos	8-10 fl oz	11 + 27	12 H/0 D	Foliar and fruit phase suppression only.
	Zampro	14 fl oz	40 + 45	12 H/0 D	Spray prior to Phytophthora development.

RADISH

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	FRAC CODE		
<i>Pythium</i> and <i>Phytophthora</i>	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See label.
	Ridomil Gold SL	1-2 pt	4		
	Presidio	3-4 fl oz	43	12 H/7 D	Tank-mix with non-group 43 fungicides.
Alternaria Leafspot	Quadris	6.2-15.4 fl oz	11	4 H/0 D	Apply no more than two sequential applications of Quadris or Cabrio before rotating to a fungicide with a different mode of action.
	Cabrio	8-12 fl oz	11	12 H/0 D	

VEGETABLE DISEASE CONTROL

RADISH

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Alternaria Leafspot (continued)	Merivon	4-5.5 fl oz	7 + 11	12 H/7 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Top Cop with Sulfur(H)	2 qt	M	24 H/0 D	Begin application as soon as disease threatens and repeat at 7-10 day intervals. Use 3 day interval in plant beds. See label.
	Top Cop Tri Basic (H)	1-2 qt	M	24 H/0 D	
Foliar oomycetes & White Rust	Quadris	6.2-15.4 fl oz	11	4 H/0 D	Apply no more than two sequential applications of Quadris or Cabrio before rotating to a fungicide with a different mode of action.
	Cabrio	8-12 fl oz	11	12 H/7 D	
	Ridomil Gold/Copper	2 lb	4 + M	48 H/7 D	See label.

SPINACH

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Pythium Damping-off	Ridomil Gold EC	1-2 pt	4	48 H/0 D	Incorporate into soil. See label.
	Ridomil Gold GR	20-40 lb	4	48 H/0 D	
	Ridomil Gold SL	1-2 pt	4	48 H/0 D	
Anthracnose & Cercospora Leafspot	Cabrio	12-16 fl oz	11	12 H/0 D	Rotate for resistance management. Apply no more than three sequential applications of Quadris before using another fungicide chemistry.
	Fontelis	14-24 fl oz	7	12 H/3 D	Spray prior to disease development.
	Quadris	12.3-15.4 fl oz	11	4 H/0 D	
	Merivon	4-11 fl oz	7 + 11	12 H/1 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Cuprofix Disperss	2.5-4 lb	M	48 H/0 D	Spray at 7-10 day intervals.
Downy Mildew & White Rust	Cabrio	16 fl oz	11	12 H/0 D	Rotate for resistance management.
	Quadris	12.3-15.4 fl oz	11	4 H/0 D	Apply no more than three sequential applications of Quadris before using another fungicide chemistry.
	Reason	5.5-8.2 fl oz	11	12 H/2 D	
	Merivon	4-11 fl oz	7 + 11	12 H/1 D	Suppression only to Downy Mildew. No effect on White Rust. Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Aliette	2-5 lb	33	12 H/3 D	Begin application as soon as disease threatens and repeat at 7-10 day intervals.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with protectants.

VEGETABLE DISEASE CONTROL

SPINACH

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew & White Rust (continued)	Revus	8 fl oz	40	4 H/1 D	Tank-mix w/ protectants and surfactant.
	Ridomil Gold/Copper	2.5 lb	4 + M	48 H/21 D	
	Cuprofix Disperss	2.5-4 lb	M	48 H/0 D	See label.
Angular Leafspot	Actigard	0.5-1 fl oz	P	12 H/0 D	Apply at least every 7 days.
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	Repeat applications of copper may cause yellowing. Begin at first sign of disease and repeat every 7-10 days as necessary.
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Cuprofix Disperss	4 lb	M	48 H/0 D	
<i>Pythium</i> spp. Damping-off Cottony leak <i>Phytophthora</i>	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See label.
	Ridomil Gold SL	1-2 pt	4		
	Ultra Flourish	2-4 pt	4		
	MetaStar	4-8 pt	4		
	Previcur Flex	1:1000 stock sol	28	12 H/3 D	Apply pre-plant to greenhouse media.
	Ranman	2.1-2.75 fl oz	21	12 H/3 D	Tank mix with organosilicone surfactant.
	Tanos	8-10 fl oz	11 + 27	12 H/2 D	Foliar and fruit phase suppression only.
	Presidio	3-4 fl oz	43	12 H/0 D	Tank-mix with copper.
	Revus	8 fl oz	40	4 H/1 D	Tank-mix w/ copper + surfactant.
	Zampro	14	40 + 45	12 H/0 D	Use prior to disease development.

VEGETABLE DISEASE CONTROL

SQUASH

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Zampro	14	40 + 45	12 H/0 D	Use prior to disease development.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris, Cabrio or Flint.
	Ariston	1.9-3 pt	M + 27	12 H/5 D	
	Quadris Opti	3.2 pt	11 + M	12 H/0 D	
	Cabrio	8-12 fl oz	11	12 H/0 D	
	Flint	4 fl oz/A	11	12 H/0 D	
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Suppression only. Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Manzate 75DF	2-3 lb	M	24 H/5 D	
	Penncozeb 80WP	2-3 lb	M	24 H/5 D	
	Penncozeb 75DF	2-3 lb	M	24 H/5 D	
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved.
	Dithane M-45	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
	Ridomil Gold MZ	2.5 lb	4 + M	48 H/0 D	
	Ranman	2.1-2.75 fl oz	21	12 H/0 D	Tank mix with organosilicone surfactant.
	Reason	5.5 fl oz	11	12 H/14 D	Rotate with non-strobilurins.
	Forum	6 fl oz	40	12 H/0 D	Tank-mix Forum with other fungicides.
	Gavel	2 lb	22 + M	48 H/5 D	See label.
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank mix with mancozeb or chlorothalonil.
	Previcur Flex	1.2 pt	28	12 H/2 D	Tank mix with mancozeb or chlorothalonil.
	Curzate	3.2 fl oz	27	12 H/3 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with protectants.
	Revus	8 fl oz	40	4 H/0 D	Tank-mix w/ protectants and surfactant.
	Ridomil Gold Bravo	2 lb	4 + M	48 H/0 D	
	Flouronil	2 lb	4 + M	48 H/0 D	
	Actigard	0.5-1 fl oz	P	12 H/1 D	Apply at least every 7 days.
Bravo Weather Stik	1.5-2 pt	M	12 H/0 D		
Echo 720	1.5-2 pt	M	12 H/0 D		

VEGETABLE DISEASE CONTROL

SQUASH

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew (continued)	Bravo 500	2 ¼ - 2 ¾ pt	M	12 H/0 D	Apply every 7-10 days as needed.
	Equus 720	1.5-2 pt	M	12 H/0 D	
	Aliette	2-5 lb	33	12 H/0 D	
	ManKocide	2-3 lb	M	48 H/5 D	
	Noreox 75WG	1-1.25 lb	M	48 H/0 D	
	Kocide DF	2 lb	M	48 H/0 D	
	Kocide LF	2.6 pt	M	48 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F]	1.3 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
	Catamaran	4 pt	M + 33	12 H/0 D	
Powdery Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Torino	3.4 fl oz	U6	4 H/0 D	No more than 2 applications of Torino per season.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris, Cabrio or Flint.
	Merivon	4-5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Fontelis	12-16 fl oz	7	12 H/1 D	Use prior to disease development.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Proline	5.7 fl oz	3	12 H/7 D	Limit application up to a total of 17 fl oz. per year. Apply up to one soil application and two foliar applications of Proline 480 SC per year. Repeat application as needed using a 5-to 10- day spray interval if conditions remain favorable for disease development.
	Cabrio	12-16 fl oz	11	12 H/0 D	
	Flint	1.5-2 fl oz/A	11	12 H/0 D	Spray preventively when conditions are favorable for disease and repeat every 7-10 days.
	Nova or Rally	2.5-5 fl oz	3	24 H/0 D	Apply at first sign of disease and continue every 7-10 days. Rotate with other fungicides.
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	Rotate to other chemistry after 1 application.
	Procure	4-8 fl oz	3	12 H/0 D	
	Tebuconazole 3.6 F	4-6 fl oz	3	12 H/7 D	Tank-mix to broaden control spectrum.
	Topsin M 70WP	4-8 fl oz	1	24 H/0 D	Apply when disease threatens and alternate Topsin with chlorothalonil products or other mode of action. Continue every 7-14 days until disease is no longer a problem. Apply every 10-14 days.
T-Methyl 70WP	4-8 fl oz	1	24 H/0 D		

VEGETABLE DISEASE CONTROL

SQUASH

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Powdery Mildew (continued)	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5L	10 fl oz	1	24 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	Apply every 7-10 days as needed.
	Echo 720	2-3 pt	M	12 H/0 D	Do not apply when temperatures exceed 95°F.
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/0 D	
	Equus 720	2-3 pt	M	12 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
	Actigard	0.5-1 fl oz	P	12 H/0 D	Apply at least every 7 days.
	Microthiol Disperss	5-10 lb	M	24 H/0 D	
Scab	Bravo 500	2 ¾-4 ¼ pt	M	12 H/0 D	Begin when first blooms appear and continue every 3-5 days until 7 days before harvest. Use disease-free treated seed. Practice crop rotation.
	Equus 720	2-3 pt	M	12 H/0 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	
Viruses	JMS Stylet Oil	See label			See White Fly Control.
Silver Leaf	Safe-T-Side	See label			See label.

SWEET POTATO

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Black Rot & Root Rot Scurf	Mertect 340-F	8 fl oz/7.5 gal	1		Use certified seed. Use new land for bed or treat old bed with methyl bromide. Follow a 3 or 4 year rotation where black rot has been a problem. Treat seed in Mertect 340-F for 1-2 minutes and plant immediately. Do not use treated roots for food or feed.
	Botran 75-W	1 lb/7.5 gal (seed dip) 3-3.75 lb/ 14 gal/1000 sq ft	14		Botran may be applied as a seed dip (10-15 sec.) or as a plantbed spray.
Sclerotial Blight, Circular Spot, Soft Rot	Botran 75-W	1 lb/7.5 gal (seed dip)		12 H/14 D	Dip seed in chlorine then dip in Botran suspension. Dip seed 10-15 seconds in well agitated suspension. Drain and bed promptly. Prepare fresh suspension daily. Spray or sprinkle over bedded sweet potatoes before covering.
<i>Pythium</i> & <i>Phytophthora</i> spp.	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See label.
	Ridomil Gold SL	1-2 pt	4		
	Presidio	3-4 fl oz	43	12 H/7 D	Tank-mix with protectant fungicides.

VEGETABLE DISEASE CONTROL

SWEET POTATO

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Bacterial Soft Rot (Erwinia)					Use clean seed potatoes or clean transplants. Practice good rotation.
Rhizopus Soft Rot	Botran 75-W	1 lb/100 gal	14	12 H/14 D	Spray immediately after washing or dip. See label.
Streptomyces (Soil Pox)	Telone C-17	10.5 gal		fumigant	Rates are for 36-42" rows w/ one chisel/row. Treatment is more effective if pH is under 5.5. Do not lime or plant back to heavily infested fields.
	chloropicrin	1.8 gal		fumigant	
Foliar Diseases	Quadris	6.2-15.4 fl oz	11	4 H/14 D	Apply no more than three sequential applications of Quadris before rotating to a fungicide with a different mode of action.
	Quadris Top	8-14 fl oz	11 + 3	12 H/14 D	
	Reason	5.5-8.2 fl oz	11	12 H/14 D	Rotate with non-strobilurins.

TOMATO

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS	
	MATERIAL	FORMULATED	MOA			
Anthracnose ¹ , Early Blight ² , Gray Leaf Spot ³ , Gray Leaf Mold ⁴ , Late Blight ⁵ , Septoria Leaf Spot ⁶	Endura	2.5-3.5 fl oz ¹ 9-12.5 fl oz ⁴	7	12 H/0 D	See label.	
	Scala ²	7 fl oz	9	12 H/7 D	Always tank-mix Scala with protectants. Alternate with protectant fungicides after one application of Cabrio or Quadris.	
	Priaxor ^{1,2,3,6}	4-8 fl oz	7 + 11	12 H/7 D		
	Quadris ^{1,2,5,6}	5-6.2 fl oz	11	4 H/0 D		
	Ariston	1.9-3 pt	M + 27	12 H/3 D		
	Fontelis	14-24 fl oz	7	12 H/3 D		
	Inspire Super ^{1,2,3,4,6}	16-20 fl oz	3 + 9	12 H/0 D		No more than 2 consecutive applications.
	Cabrio ^{1,2,5,6}	8-12 fl oz	11	12 H/0 D		
	Quadris Top ¹⁻⁶	8 fl oz	11 + 3	12 H/0 D	Rotate to other chemistries after 1 application.	
	Evito ^{1,5}	3.8-5.7 fl oz	11	12 H/0 D		
	Tanos ^{1,2,3,5,6}	6-8 fl oz	11 + 27	12 H/0 D		
	Revus Top ¹⁻⁶	5.5-7 fl oz	3 + 40	12 H/1 D	Tank-mix with mancozeb or chlorothalonil.	
	Bravo 500 ¹⁻⁶	1 ½ 2 1/8 pt	M	12 H/3 D	Surfactant recommended.	
	DithaneRainShield ¹⁻⁶	1.5-3 lb	M	24 H/5 D		
	Dithane M-45 ¹⁻⁶	1.5-3 lb	M	24 H/5 D	Spray every week beginning when plants are 4 to 6 inches high, and continue every 7-14 days depending on disease pressure.	
	Dithane DF ¹⁻⁶	1.5-3 lb	M	24 H/5 D		
Dithane F-45 ¹⁻⁶	1.2-2.4 qt	M	24 H/5 D			
Manzate 75DF ¹⁻⁶	1.5-3 lb	M	24 H/5 D			

VEGETABLE DISEASE CONTROL

TOMATO

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Anthracnose ¹ , Early Blight ² , Gray Leaf Spot ³ , Gray Leaf Mold ⁴ , Late Blight ⁵ , Septoria Leaf Spot ⁶	Penncozeb75DF ¹⁻⁶	1.5-3 lb	M	24 H/5 D	
	Penncozeb80WP ¹⁻⁶	1.5-3 lb	M	24 H/5 D	
	Ranman ⁵	2.1-2.75 fl oz	21	12 H/0 D	Tank mix with organosilicone surfactant.
	Reason ⁵	5.5-8.2 fl oz	11	12 H/14 D	Rotate with non-strobilurins.
	Forum ⁵	6 fl oz	40	12 H/0 D	Tank mix Forum with other fungicides except mefenoxam. See label.
	Zampro ⁵	14 fl oz	40 + 45	12 H/4 D	Spray prior to late blight development.
	Previcur Flex ⁵	0.7-1.5 pt	28	12 H/5 D	
	ManKocide ¹⁻⁶	2.5-5 lb	M	48 H/0 D	
	Nordox 75WG	1.25-2.5 lb	M	12 H/0 D	
	Cuprofix Dispers ¹⁻⁶	2.5-6 lb	M	48 H/5 D	
	Ridomil Gold Bravo ¹⁻⁶	2-3 lb	4 + M	48 H/14 D	Add 0.8 lb. a.i./A of EBDC or chlorothalonil to Ridomil Gold/Copper.
	Ridomil Gold MZ ⁵	2.5 lb	4 + M	48 H/5 D	Increase rate of chlorothalonil products from 1.35-2 pt/A in early season to 2-2.88 pt/A at fruit set. Higher rates are recommended for Anthracnose, Alternaria fruit rot, Botrytis gray mold, late blight, and Rhizoctonia fruit rot.
	Switch ^{1,4}	11-14 fl oz	9 + 12	12 H/0 D	
	Ridomil Gold/Copper ⁵	2 lb	4 + M	48 H/14 D	
	Flouronil ¹⁻⁶	2-3 lb	4 + M		
	Bravo Weather Stik ¹⁻⁶	1.375-3 pt	M	12 H/0 D	
	Echo 720 ¹⁻⁶	1.35-3 pt	M	12 H/0 D	
	Equus 720 ¹⁻⁶	1.35-2.88 pt	M	12 H/0 D	
Bravo S	4.5-8.5 pt	M	12 H/0 D		
Most CuOH (copper hydroxide) & CuSO ₄ (copper sulfate) compounds ^{1,2,4,5,6}	Several rates and formulations. See labels.				
Catamaran	4.5-7 pt	M + 33	12 H/0 D	M + 33	
Powdery Mildew	Nova or Rally	2.5-4 fl oz	3	24 H/0 D	Nova or Rally for powdery mildew only.
	Inspire Super	16-20 fl oz	3 + 9	12 H/0 D	No more than 2 consecutive applications.
	Sulfur	See label	3	24 H/0 D	
Bacterial Spot, Bacterial Speck, Bacterial Canker	Actigard	0.3-0.75 fl oz	P	12 H/14 D	Begin applications within 1-week of transplanting or emergence; apply only with ground equipment. Make up to 6 weekly sequential applications. Use 0.3 oz/A in 30-50 GPA at 0-2 weeks after transplanting; 0.5 oz/A in 60-70 GPA at 3-4 weeks after transplanting; and 0.75 oz/A in 70-100 GPA at 5-8 weeks after transplanting.
	Tanos	8 fl oz	11 + 27	12 H/3 D	Tank-mix with mancozeb or chlorothalonil.
	Streptomycin SO ₄	200 ppm	25		Begin at 2-leaf stage and repeat every 4-5 days <u>until</u> transplanting.

VEGETABLE DISEASE CONTROL

TOMATO

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Bacterial Spot, Bacterial Speck, Bacterial Canker (continued)	ManKocide	2-5 lb	M	48 H/0 D	Use hot water treated disease-free seed. Apply spray at first sign of disease and repeat at 5-10 day intervals. Plant certified seeds or transplants. Copper may be mixed with maned or mancozeb products to increase activity on copper tolerant bacteria and to broaden control on foliar fungal pathogens.
	Basicop	2-4 lb	M	24 H/0 D	
	Nordox 75WG	1.25-2.5 lb	M	12 H/0 D	
	Kocide DF	2-4 lb	M	48 H/0 D	
	Kocide LF	2.6-5.3 pt	M	48 H/0 D	
	Kocide 4.5LF	1.3-2.6 pt	M	48 H/0 D	
	Kocide 101	2-4 lb	M	24 H/0 D	
	Kocide 3000	0.75-1.75 lb	M	48 H/0 D	
	Nu-Cop 3L	1.3-5.3 pt	M	48 H/0 D	
	Nu-Cop 50DF	2-4 lb	M	48 H/0 D	
	Champ DP	1.3-2.6 lb	M	48 H/0 D	
	Champ 2F	1.3-2.6 pt	M	48 H/0 D	
	Champ F	2.6-5.3 pt	M	48 H/0 D	
Cuprofix Ultra 40	1.25-3 lb	M	48 H/0 D		
Botrytis Gray Mold	Endura	9-12.5 fl oz	7	12 H/0 D	See label.
	Scala	7 fl oz	9	12 H/1 D	Always tank-mix Scala with protectants.
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/14 D	See label.
	Bravo 500	2-3 lb	M	12 H/14 D	Apply at first sign of disease and continue at 7 day intervals.
	Bravo Weather Stik	2 ¾-4 ¼ pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	
	Equus 720	2-2.8 pt	M	12 H/0 D	Primarily a problem in greenhouses.
Ziram 4L	2 pt./100 gal	M	48 H/0 D	Greenhouse use.	
Pythium Damping-off	Ridomil Gold EC	1-2 pt	4		Incorporate into soil. See label.
	Ridomil Gold SL	1-2 pt	4		
	Ridomil Gold GR	20 lb	4		
	Ultra Flourish	2-4 pt	4		
	Aliette	2-5 lb	33		
	Previcur Flex	1:1000 stock sol	28		Apply pre-plant to greenhouse media.
	Terramaster 4EC	6.5 fl oz/500 gal	14		Greenhouse production only. See label.
Southern Blight	Blocker	4.5-7.5 pt in 100 gal of transplant water	14	N/A	Use 8 fl oz of solution per plant.

VEGETABLE DISEASE CONTROL

TURNIPS, MUSTARD, COLLARDS & KALE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Cercospora, Cercospora, & Alternaria Leafspots Downy Mildew	Quadris	6.2-15.4 fl oz	11	4 H/0 D	Quadris and Cabrio suppress most foliar fungal diseases. No more than 2 sequential applications of Quadris or Cabrio should be made before rotating to different fungicide chemistry.
	Cabrio	8-12 fl oz	11	12 H/0 D	
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 consecutive applications.
	Switch	11-12 fl oz	9 + 12	12 H/7 D	
	Tebuconazole 3.6 F	3-4 fl oz	3	12 H/7 D	Tank-mix with Maneb. Up to 7.2 fl oz on turnips.
	Quadris Top	14 fl oz	11 + 3	12 H/1 D	Rotate to other chemistry after 1 application.
	Forum	6 fl oz	40	12 H/0 D	Tank-mix for downy mildew.
	Revus	8 fl oz	40	4 H/1 D	Tank-mix for downy.
	Nordox 75WG	2/3-2 lb	M	12 H/10 D	
	Top Cop Tri-Basic (H)	2 qt		24 H/0 D	
	Top Cop with Sulfur (H)	2 qt		24 H/0 D	
	Kocide DF	1-2 lb	M	48 H/0 D	Apply every 7 days when disease threatens. Use higher rates if disease pressure increases
	Kocide 4.5 LF	0.6-1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-0.75 lb	M	48 H/0 D	
	Champ DP	0.3-0.6 lb	M	48 H/0 D	
	Champ DF	0.3-0.6 pt	M	48 H/0 D	
	Merivon	4-5.5 fl oz	7 + 11	12 H/7 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Nu-Cop 50DF	1-2 lb	M	48 H/0 D	
Cuprofix Disperss	1.5-2.5 lb	M	48 H/0 D		
Powdery Mildew	Cabrio	8-12 fl oz	11	12 H/0 D	No more than 2 sequential applications of Cabrio should be made before rotating to different fungicide chemistry.
	Procure	6 – 8 fl oz	3	12 H/0 D	
	Merivon	4-5.5 fl oz	7 + 11	12 H/7 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Microthiol Disperss	3-10 lb	M	24 H/0 D	
Clubroot (Not on turnips)	Blocker 4F	3 pints per 100 gal of water	14		Use in transplant water.
	Blocker 4F	5.67 gal per A/ 25 gal of water	14		Apply in a 12" band directly over the row prior to planting.
	Blocker 4F	7.5 gal in 30 gal of water	14		This is the broadcast application that should be incorporated into the soil just prior to planting.

VEGETABLE DISEASE CONTROL

TURNIPS, MUSTARD, COLLARDS & KALE

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Wirestem (Not on turnips)	Blocker 4F	2.8-3.75 gal/A in 80 gal of water	14		Apply as a pre-plant broadcast spray.
	Blocker 4F	1.9-2.8 gal/A in 35 gal of water on a 40" row spacing 10.4-0.8 fl oz	14		Spray as an 8" band centered on the row at or just prior to planting.
	Quadris (Amistar)	(0.125-0.25 fl oz) rates/1000 row ft	11		Use in-furrow or as a soil-applied band. See label for specific recommendations.
Downy Mildew	Cabrio	12-16 fl oz	11	12 H/3 D	Rotate for resistance management.
	Aliette (not turnip)	2-5 lb	33	12 H/3 D	Do not mix Aliette with copper fungicides. Apply every 7 days when disease threatens. Use higher rates if disease pressure increases.
	Nordox 75WG	2/3-2 lb	M	12 H/0 D	
	Kocide DF	1-2 lb	M	48 H/0 D	
	Kocide 4.5 LF	0.6-1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-0.75 lb	M	48 H/0 D	
	Champ DP	0.3-0.6 lb	M	48 H/0 D	
	Champ DF	0.3-0.6 pt	M	48 H/0 D	
	Nu-Cop 50DF	1-2 lb	M	48 H/0 D	
	Cuprofix Disperss	1.5-2.5 lb	M	48 H/0 D	
	Forum	6 fl oz	40	12 H/0 D	
	Revus	8 fl oz	40	4 H/1 D	Tank-mix plus use surfactant.

WATERMELON

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Anthracnose	Pristine	18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Luna Experience	10 -17 fl oz	3 + 7	12 H/7 D	
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrio.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	Rotate to other chemistry after 1 application.
	Cabrio	12-16 fl oz	11	12 H/0 D	Tank mix with mancozeb or chlorothalonil.
	Tanos	8 fl oz	11 + 27	12 H/3 D	See label.
	Topsin M 70W	¼ - ½ lb	1	24 H/0 D	Use western-grown seed. Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.

VEGETABLE DISEASE CONTROL

WATERMELON

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Anthracnose (continued)	T-Methyl 70WP	0.25-0.5 lb	1	24 H/0 D	
	Merivon	4-5.5 fl oz	7 + 11	12 H/7 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5L	10 fl oz	1	24 H/0 D	
	Manzate 75DF	2-3 lb	M	24 H/5 D	
	Penncozeb80WP	2-3 lb	M	24 H/5 D	
	Penncozeb 75DF	2-3 lb	M	24 H/5 D	
	Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved.
	Dithane M-45	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF	5-2 pt	M	24 H/5 D	Greenhouse approved.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
	Ridomil Gold Bravo	2-3 lb	M	48 H/0 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Flouronil	2-3 lb	4 + M	48 H/0 D	
	Bravo Weather Stik	1.5-2 pt	4 + M	12 H/0 D	
	Echo 720	1.5-2 pt	M	12 H/0 D	
	Bravo 500	2 ¼ - 2 ¾ pt	M	12 H/0 D	
	Equus 720	1.5-2 pt	M	12 H/0 D	
	ManKocide	2-3 lb	M	48 H/5 D	
	Kocide DF	2 lb	M	48 H/0 D	
	Nordox 75WG	2/3-2 lb	M	12 H/0 D	
	Kocide LF	2.6 pt	M	48 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 101	2 lb	M	24 H/0 D	
	Nu-Cop 3L	1.5 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Nu-Cop 50DF	2 lb	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Champ F	2.6 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	Apply every 7-10 days as needed.
	Catamaran	4 pt	M + 33	12 H/7 D	

VEGETABLE DISEASE CONTROL

WATERMELON

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
<i>Pythium</i> Damping-off Cottony leak <i>Phytophthora</i>	Ridomil Gold EC	1-2 pt	28	48 H/4 D	Incorporate into soil. See label.
	Ridomil Gold SL	1-2 pt	21	48 H/4 D	
	Ultra Flourish	2-4 pt	11 + 27	48 H/4 D	
	MetaStar	4-8 pt	43	48 H/4 D	
	Previcur Flex	1:1000 stock sol	28	48 H/4 D	Apply pre-plant to greenhouse media.
	Ranman	2.1-2.75 fl oz	21	12 H/0 D	Tank mix with organosilicone surfactant.
	Tanos	8-10 fl oz	11 + 27	12 H/2 D	Foliar and fruit phase suppression only.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with copper.
	Zampro	14 fl oz	40 + 45	12 H/0 D	Spray developing fruit prior to disease development.
	Revus	8 fl oz	40	4 H/0 D	Tank-mix w/ copper + surfactant.
Bacterial Fruit Blotch	Actigard	0.5-1 fl oz	P	12 H/0 D	Apply at least every 7 days.
	ManKocide	2.5 lb	M	48 H/5 D	Use disease-free seed and transplants. Most copper containing fungicides can reduce the spread of fruit blotch. Begin sprays prior to bloom and continue until fruit are mature.
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Champ 2F	1.3 pt	M	48 H/5 D	Tank mix copper fungicides with mancozeb product (EBDC's) to broaden foliar disease control spectrum and to increase copper activity against bacteria. Studies have shown that ½ rate of copper materials applied weekly is as effective as applying the full rate on a 14 day schedule.
	Champ DP	1.3 lb	M	48 H/5 D	
	Nu-Cop 3L	1-4 pt	M	48 H/5 D	
	Kocide DF	2 lb	M	48 H/5 D	
	Kocide 4.5LF	1.3 pt	M	48 H/5 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/5 D	
	Cuprofix Disperss	2.5 lb	M	48 H/5 D	
Tanos	8-10 fl oz	11 + 27	12 H/3 D	Suppression only. Tank mix with copper.	
Downy Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Zampro	14 fl oz	40 + 45	12 H/0 D	Spray prior to disease development.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadri, Cabrio, or Flint.
	Ariston	1.9-3 pt	M + 27	12 H/5 D	
	Quadris Opti	3.2 pt	11 + M	12 H/1 D	
	Quadris Top	10-14 fl oz	11/3	12 H/1 D	Rotate to other chemistry after 1 application.
	Cabrio	8-12 oz	11	12 H/0 D	
	Flint	4 fl oz/A	11	12 H/0 D	See label.
Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.	

VEGETABLE DISEASE CONTROL

WATERMELON

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew (continued)	Manzate 75DF	2-3 lb	M	12 H/5 D	
	Penncozeb 80WP	2-3 lb	M	12 H/5 D	
	Penncozeb 75DF	2-3 lb	M	12 H/5 D	
	Dithane F-45	1.6-2.4 qt	M	12 H/5 D	Greenhouse approved.
	Dithane M-45	2-3 lb	M	12 H/5 D	Greenhouse approved.
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Suppression only. Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Dithane DF	2-3 lb	M	12 H/5 D	Greenhouse approved.
	Dithane DF Rain Shield	2-3 lb	M	12 H/5 D	
	Ridomil Gold MZ	2.5 lb	4 + M	48 H/5 D	
	Ranman	2.1-2.75 fl oz	M	12 H/0 D	Tank mix with organosilicone surfactant.
	Reason	5.5 fl oz	11	12 H/14 D	Rotate with non-strobilurins.
	Forum	6 fl oz	40	12 H/0 D	Tank-mix Forum with other fungicides.
	Presidio	3-4 fl oz	43	12 H/2 D	Tank-mix with protectant fungicides.
	Revus	8 fl oz	40	4 H/0 D	Tank-mix w/ protectants + surfactants.
	Gavel	1.5-2 lb	22 + M	48 H/0 D	
	Tanos	8 oz	11 + 27	12 H/5 D	Tank-mix with mancozeb or chlorothalonil.
	Previcur Flex	1.2 pt	28	12 H/3 D	See label.
	Curzate	3.2 fl oz	27	12 H/2 D	Tank mix with mancozeb or chlorothalonil.
	Ridomil Gold Bravo	2 lb	4 + M	48 H/3 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Flouronil	2 lb	4 + M	48 H/0 D	
	Actigard	0.5-1 fl oz	P	12 H/1 D	Apply at least every 7 days.
	Bravo Weather Stik	1.5-2 pt	M	12 H/0 D	
	Echo 720	1.5-2 pt	M	12 H/0 D	
	Bravo 500	2 ¼ - 2 ¾ pt	M	12 H/0 D	
	Equus 720	1.5-2 pt	M	12 H/0 D	
	Aliette	2-5 lb	33	12 H/0 D	
	ManKocide	2-3 lb	M	48 H/0 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
Kocide DF	2 lb	M	48 H/0 D		
Kocide LF	2.6 pt	M	48 H/0 D		
Kocide 4.5LF	1.3 pt	M	48 H/0 D		

VEGETABLE DISEASE CONTROL

WATERMELON

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Downy Mildew (continued)	Kocide 2000	1.5 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Nu-Cop 50DF	1.5-3 lb	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Champ F	2.6 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
	Catamaran	4 pt	M + 33	12 H/7 D	
Gummy Stem Blight	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Luna Experience	10-17 fl oz	3 + 7	12 H/7 D	
	Fontelis	12-16 fl oz	7	12 H/1 D	Spray prior to disease symptoms.
	Tebuconazole 3.6 F	8 fl oz	3	12 H/7 D	Rotate with non-group 3 fungicides.
	Merivon	5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Proline	5.7 fl oz	3	12 H/7 D	Limit application up to a total of 17 fl oz/year. Apply up to one soil application and two foliar applications of Proline 480 SC per year. Repeat application as needed using a 5-10- day spray interval if conditions remain favorable for disease development.
	Quadris	11-15.4 fl oz	11	4 H/7 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris or Cabrwo.
	Viathon	4 pt	3 + 33	12 H/7 D	
	Inspire Super	16-20 fl oz	3 + 9	12 H/0 D	No more than 2 consecutive applications.
	Cabrio	12-16 fl oz	11	12 H/1 D	
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	Rotate to other chemistry after 1 application.
	Quadris Opti	3.2 pt	11 + M	12 H/0 D	
	Topsin M 70W	4-8 fl oz	1	24 H/0 D	Use western-grown seed. Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	T-Methyl 70W	4-8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5L	10 fl oz	1	24 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Manzate 75DF	2-3 lb	M	24 H/5 D	
	Penncozeb 80WP	2-3 lb	M	24 H/5 D	
	Penncozeb 75DF	2-3 lb	M	24 H/5 D	
Dithane F-45	1.6-2.4 qt	M	24 H/5 D	Greenhouse approved.	

VEGETABLE DISEASE CONTROL

WATERMELON

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Gummy Stem Blight (continued)	Dithane M-45	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF	2-3 lb	M	24 H/5 D	Greenhouse approved.
	Dithane DF Rain Shield	2-3 lb	M	24 H/5 D	
	Ridomil Gold Bravo	2-3 lb	4 + M	48 H/0 D	
	Flouronil	2-3 lb	4 + M	48 H/0 D	Apply fungicides when true leaves fully expand. Continue every 7-14 days until harvest.
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/0 D	
	Nordox 75WG	1-1.25 lb	M	12 H/0 D	
	Kocide 4.5LF	1.3 pt	M	48 H/0 D	
	Kocide 3000	0.5-1.25 lb	M	48 H/0 D	
	Nu-Cop 3L	1-4 pt	M	48 H/0 D	
	Champ DP	1.3 lb	M	48 H/0 D	
	Champ 2F	1.3 pt	M	48 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	Apply every 7-10 days as needed.
Catamaran	4 pt	M + 33	12 H/7 D		
Powdery Mildew	Pristine	12.5-18.5 fl oz	7 + 11	12 H/0 D	Apply prior to disease onset and on a 7-14 day schedule. Alternate to a fungicide with a different mode of action after one spray.
	Luna Experience	10 -17 fl oz	3 + 7	12 H/7 D	
	Merivon	4-5.5 fl oz	7 + 11	12 H/0 D	Begin application prior to disease development and continue on 7-14 day interval if conditions are favorable for disease development. Do not apply Merivon as a tank mix with any other pesticide products, adjuvants, liquid fertilizers, nutrients, any other additives, or anything other than water.
	Proline	5.7 fl oz	3	12 H/7 D	Limit application up to a total of 17 fl oz/year. Apply up to one soil application and two foliar applications of Proline 480 SC/year. Repeat application as needed using a 5-10-day spray interval if conditions remain favorable for disease development.
	Fontelis	12-16 fl oz	7	12 H/1 D	Spray prior to disease symptoms.
	Inspire Super	16-20 fl oz	3 + 9	12 H/7 D	No more than 2 sequential applications.
	Quadris	11-15.4 fl oz	11	4 H/1 D	Apply every 7-14 days. Alternate to a fungicide with a different mode of action after one spray of Quadris, Cabrio, or Flint
	Quadris Top	10-14 fl oz	11 + 3	12 H/1 D	
	Cabrio	12-16 fl oz	11	12 H/0 D	
	Flint	1.5-2 fl oz/A	11	12 H/0 D	Spray preventively when conditions are favorable for disease and repeat every 7-10 days.
	Torino	3.4 fl oz	U6	4 H/0 D	Only spray Torino twice in one season.
	Nova or Rally	2.5-5 fl oz	3	24 H/0 D	Apply at first sign of disease and continue every 7-10 days. Rotate with non-group 3 fungicides.

VEGETABLE DISEASE CONTROL

WATERMELON

COMMODITY DISEASE	RATE OF MATERIAL TO USE			REI/PHI (Hours or Days)	METHOD, SCHEDULE REMARKS
	MATERIAL	FORMULATED	MOA		
Powdery Mildew (continued)	Procure	4-8 fl oz	3	12 H/0 D	Apply at first sign of disease and continue every 7-10 days. Rotate with non-group 3 fungicides.
	Tebuconazole 3.6 F	4-6 fl oz	3	12 H/7 D	Apply at first sign of disease and continue every 7-10 days. Rotate with non-group 3 fungicides.
	Quintec	4-6 fl oz	13	12 H/3 D	See label.
	Topsin M 70WP	4-8 fl oz	1	24 H/0 D	Apply when disease threatens and alternate Topsin with chlorothalonil products or other mode of action. Continue every 7-14 days until disease is no longer a problem. Apply every 10 -14 days.
	T-Methyl 70WP	4-8 fl oz	1	24 H/0 D	
	Topsin 4.5L	10 fl oz	1	24 H/0 D	
	T-Methyl 4.5L	10 fl oz	1	24 H/0 D	
	Switch	11-14 fl oz	9 + 12	12 H/1 D	
	Bravo Weather Stik	2-3 pt	M	12 H/0 D	
	Echo 720	2-3 pt	M	12 H/0 D	
	Bravo 500	2 ¼-2 ¾ pt	M	12 H/0 D	Do not apply when temperatures exceed 95°F.
	Equus 720	2-3 pt	M	12 H/0 D	
	Cuprofix Disperss	2.5 lb	M	48 H/0 D	
	Actigard	0.5-1 fl oz	P	12 H/1 D	Apply at least every 7 days.

Always check label for proper rates.
FRAC CODE = Fungicide Resistance Action Committee fungicide code used for rotating fungicides based on mode of action
 (www.frac.info/frac/content.htm).
(H)-Homeowner.

EFFICACY OF FUNGICIDES/BACTERICIDES FOR CONTROLLING FOLIAR DISEASES OF BEANS¹

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

REGISTERED FUNGICIDES ²	DISEASES													
	Common rust	Asian soybean rust	Anthraxnose	Cercospora	Downy mildew	Powdery mildew	Foliar bacterial diseases	White mold (Sclerotinia)	Southern stem rot (<i>S. rolfsii</i>)	Pythium damping-off	Pythium cottony leak	Rhizoctonia sore shin	Aerial Rhizoctonia	Fusarium crown rot
Endura (<i>boscalid</i>)	U	U	U	U	N	U	N	E	P	N	N	U	U	N
Headline (Pyraclostrobin)	E	E	G	E	U	U	N	N	G-F	N	F-V	F	G	N
Quadris/Amistar (<i>azoxystrobin</i>)	E	E	G	G	U	U	N	N	E	N	F-V	G	E	N
Switch (<i>cyprodinil + fludioxinil</i>)	U	U	U	G	N	U	N	F	N	N	N	U	U	N
Ridomil Gold Copper (<i>mefenoxam + cupric hydroxide</i>)	P	P	P	P	G-F	N	G-F	N	N	P	G-V	N	N	N
Rildomil Gold SC (<i>mefenoxam</i>)	N	N	N	N	N	N	N	N	N	G	P	N	N	N
Rovral (<i>iprodione</i>)	N	N	N	N	N	N	N	G	N	N	N	F	P	N
Blocker	N	N	N	N	N	N	N	N	G-F	N	N	G	N	N
Fixed copper ³	P	P	P	P	N	P	G	N	N	N	P	N	N	N
Bravo/Equus (<i>chlorothalonil</i>)	G	F	F	G	G	P	N	N	N	N	N	N	P	N
Tebuconazole/Tebuzol (<i>tebuconazole</i>)	G	G	P	G	N	G-F	N	P	G	N	N	U	F	N
Rally (<i>myclobutanil</i>)	E	E	N	G-F	N	G	N	N	N	N	N	U	F	N
Topsin (<i>thiophanate methyl</i>)	U	U	G-F	G	N	U	N	F	N	N	N	P	P	P
Omega 500	U	U	U	U	G	N	N	E	F	P	P	P	P	N
Fontelis (<i>penthiopyrad</i>)	U	U	U	G	N	U	N	E	G	N	N	U	U	N
Uniform (<i>mefenoxam + azoxystrobin</i>)	N	N	N	N	N	N	N	F	F	G	P	E	N	N

¹ Ratings for products were conducted at the 2005 Southeast Extension Vegetable Workers Conference in Fletcher, NC. Efficacy ratings do not necessarily indicate a labeled use.

V = Variable levels of control.
R = Pathogen resistance (insensitivity) may be present at some locations.
E = Excellent disease suppression, G = Good disease suppression,
F = Fair disease suppression,
P = Poor to no disease suppression
U = Unknown efficacy
N = No efficacy

EFFICACY OF FUNGICIDES/BACTERICIDES FOR CONTROLLING FOLIAR DISEASES OF BRASSICA VEGETABLES¹

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

REGISTERED FUNGICIDES ²	DISEASES										
	Black rot	Bacterial soft rot	Black leg	Club root	Downy mildew	Powdery mildew	Cercospora/Cercoporella	Alternaria leaf spot	Raisin head (Sclerotinia)	Pythium damping-off	Wirestem & Bottom rot (Rhizoc.)
Endura (<i>boscalid</i>)	N	N	G	N	N	G	E	E	G	N	U
Cabrio (Pyraclostrobin)	N	N	U	N	P	F	E	E	N	N	U
Quadris/Amistar (<i>azoxystrobin</i>)	N	N	U	N	P	F	G	E	N	N	G
Presidio (<i>fluopicolide</i>)	N	N	N	N	G-C	N	N	N	N	N	N
Revus (<i>mandipropamid</i>)	N	N	N	N	G-C	N	N	N	N	N	N
Aliette (<i>fosetyl – Al</i>)	N	N	N	N	F-P	N	N	N	N	N	N
Forum (<i>dimethomorph</i>)	N	N	N	N	GC	N	N	N	N	N	N
Reason (<i>fenamidone</i>)	N	N	N	N	G	N	G	F	N	U	N
Switch (<i>cyprodinil + fludioxinil</i>)	N	N	N	N	N	G	F	E	P	N	N
Ridomil Gold Bravo (<i>mefenoxam + chlorothalonil</i>)	N	N	N	N	G	N	G	G	N	F	N
Rildomil Gold SC (<i>mefenoxam</i>)	N	N	N	N	N	N	N	N	N	G	N
Rovral (<i>iprodione</i>)	N	N	G*	G-F	N	N	N	G*	G*	N	F
Blocker	N	N	N	N	N	N	N	N	N	N	F
Fixed copper ³	F	N	N	N	F	N	N	P	N	N	N

¹ Ratings for products were conducted at the 2009 Southeast Extension Vegetable Workers Conference in Fletcher, NC. Efficacy ratings do not necessarily indicate a labeled use.

² Fungicides registered specifically on cole crops (cabbage, cauliflower, broccoli) include chlorothalonil, iprodione, and mefenoxam + chlorothalonil. Aliette is not labeled on turnips. Please refer to the appropriate sections of the Pest Management Handbook for details on product labeling.

³ Phytotoxicity observed when Aliette is tank-mixed with copper.

C = When used in combination with Aliette or maneb

V = Variable levels of control

R = Pathogen resistance (insensitivity) may be present at some locations

E = Excellent disease suppression

G = Good disease suppression

F = Fair disease suppression

P = Poor to no disease suppression, **U** = Unknown efficacy

N = No efficacy

* = Applications of iprodione (Rovral) made for black leg may suppress Alternaria, Sclerotinia, and wirestem on broccoli only.

EFFICACY OF FUNGICIDES/BACTERICIDES FOR CONTROLLING FOLIAR DISEASES OF **BRASSICA VEGETABLES**¹ (continued)

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

REGISTERED FUNGICIDES ²	DISEASES										
	Black rot	Bacterial soft rot	Black leg	Club root	Downy mildew	Powdery mildew	Cercospora/Cercoporella	Alternaria leaf spot	Raisin head (Sclerotinia)	Pythium damping-off	Wirestem & Bottom rot (Rhizoc.)
Actigard (<i>acibenzolar-S-methyl</i>)	F-P	N	N	N	F	P	U	U	N	U	U
Manzate (<i>mancozeb</i>)	N	N	N	N	F	N	P	P	N	N	N
Bravo/Equus (<i>chlorothalonil</i>)	N	N	N	N	G-F	N	G	G	N	N	N
Tebuconazole/Tebuzol (<i>tebuconazole</i>)	N	N	N	N	N	U	E-G	F	N	N	F
Procure (<i>triflumizole</i>)	N	N	N	N	N	G	U	N	N	N	N
Inspire Super	N	N	U	N	N	G	G	E	F	N	U
Quadris Top	N	N	U	N	U	G	G	E	F	N	G
Zampro (<i>amectocetradin + dimethomorph</i>)	N	N	N	N	E	N	N	N	N	U	N
Fontelis (<i>penthiopyrad</i>)	N	N	U	N	N	U	F	E	G	N	U
Omega 500 (<i>fluzinam</i>)	N	N	U	G	N	N	N	N	U	N	U
Inspire Super (<i>difenoconazole + cyprodinil</i>)	N	N	U	N	N	F	G	E	F	N	U

¹ Ratings for products were conducted at the 2009 Southeast Extension Vegetable Workers Conference in Fletcher, NC. Efficacy ratings do not necessarily indicate a labeled use.

² Fungicides registered specifically on cole crops (cabbage, cauliflower, broccoli) include chlorothalonil, iprodione, and mfenoxam + chlorothalonil. Aliette is not labeled on turnips. Please refer to the appropriate sections of the Pest Management Handbook for details on product labeling.

³ Phytotoxicity observed when Aliette is tank-mixed with copper.

C = When used in combination with Aliette or maneb

V = Variable levels of control

R = Pathogen resistance (insensitivity) may be present at some locations

E = Excellent disease suppression

G = Good disease suppression

F = Fair disease suppression

P = Poor to no disease suppression, **U** = Unknown efficacy

N = No efficacy

* = Applications of iprodione (Rovral) made for black leg may suppress Alternaria, Sclerotinia, and wirestem on broccoli only.

EFFICACY OF FUNGICIDES/BACTERICIDES AGAINST FOLIAR DISEASES OF CUCURBITS¹

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

REGISTERED FUNGICIDES ²	DISEASES												
	Anthracnose	Alternaria leaf spot and blight	Gummy Stem Blight	Target Spot	Plectosporium blight	Powdery mildew	Downy mildew	Bacterial fruit blotch	Angular leaf spot	Phytophthora fruit and crown rot	Pythium cottony leak	Rhizoctonia belly rot	Southern stem blight (<i>S. roffisii</i>)
Pristine (<i>boscalid + pyraclostrobin</i>)	E-G	E	E-R	G	G	E-R	P-R	N	N	N	N	P	P
Cabrio (<i>pyraclostrobin</i>)	E-G	E	E-R	G	G	F-R	P-R	N	N	N	N	P	P
Quadris/Amistar (<i>azoxystrobin</i>)	E-G	E	E-R	G	G	F-R	P-R	N	N	N	N	E	G
Flint (<i>trifloxystrobin</i>)	G	E	E-R	G	G	F-R	P-R	N	N	N	N	P	P
Ranman (<i>cyazofamid</i>)	N	N	N	N	N	N	E	N	N	N	U	N	N
Presidio (<i>fluopicolide</i>)	N	N	N	N	N	N	E	N	N	G	P	N	N
Revus (<i>mandipropamid</i>)	N	N	N	N	N	N	P	N	N	G-F	U	N	N
Aliette (<i>fosetyl – Al</i>)	P	P	N	P	P	P	P	N	N	N	P	N	N
Forum (<i>dimethomorph</i>)	N	N	N	N	N	N	P	N	N	F	U	N	N
Gavel (<i>zoxamide + mancozeb</i>)	G-F	P	P	G-F	N	N	G	N	N	U	U	N	N
Tanos (<i>famoxate + cymoxanil</i>)	P	G	P	P	U	N	E-G	P	N	P	P	N	N
Reason (<i>fenamidone</i>)	N	N	N	N	N	N	R	N	N	P	P	N	N
Previcur Flex (<i>propamocarb</i>)	N	N	N	N	N	N	G-F	N	N	N	P	N	N
Switch (<i>cyprodinil + fludioxinil</i>)	G	E	G	U	U	G	N	N	N	N	N	N	N
Ridomil Gold Bravo (<i>mefenoxam + chlorothalonil</i>)	G-F	G-F	G-F	G	G	F	G-R	N	N	G-R	F	P	P
Ridomil Gold MZ (<i>mefenoxam + mancozeb</i>)	G	P	P	F	F	N	G-R	N	N	G-R	F	P	P
Ridomil Gold Copper (<i>mefenoxam + Cu hydroxide</i>)	N	N	N	N	N	N	G-R	G	G	G-R	F	P	P
Rildomil Gold SC (<i>mefenoxam</i>)	N	N	N	N	N	N	N	N	N	G-R	P	N	N

¹ Information in this table was mostly taken from ratings developed at the 2009 Southeast Vegetable Workers Conference in Fletcher, NC. Ratings for products do not necessarily indicate a labeled use.

² Copper can be phytotoxic to most cucurbits, especially if applied at a tank PH below 6/

³ Phytotoxicity observed. (some western-grown cantaloupe varieties are sulfur tolerant).

C = When used in combination with other fungicides/bactericides such as chlorothalonil and mancozeb.
V = Variable levels of control
R = Pathogen resistance (insensitivity) may be present at some locations.
E = Excellent disease suppression,
G = Good disease suppression,
F = Fair disease suppression,
P = Poor to no a suppression,
U = Unknown efficacy.

EFFICACY OF FUNGICIDES/BACTERICIDES AGAINST FOLIAR DISEASES OF CUCURBITS¹ (continued)

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

	DISEASES												
	Anthracnose	Alternaria leaf spot and blight	Gummy Stem Blight	Target Spot	Plectosporium blight	Powdery mildew	Downy mildew	Bacterial fruit blotch	Angular leaf spot	Phytophthora fruit and crown rot	Pythium cottony leak	Rhizoctonia belly rot	Southern stem blight (<i>S. roffisii</i>)
REGISTERED FUNGICIDES²													
Rally (<i>myclobutanil</i>)	N	N	N	N	N	G-F	N	N	N	N	N	N	N
Quintec (<i>quinoxifen</i>)	N	N	N	N	N	E	N	N	N	N	N	N	N
Fixed copper ³	P	P	P	P	P	P	F-P	G	G	F-P	P	N	N
Actigard (<i>acibenzolar-S-methyl</i>)	U	U	U	U	U	F	F	G	G	U	U	N	N
Manzate (<i>mancozeb</i>)	G	P	P	G-F	F	P	G	P	P	P	P	N	N
Bravo/Equus (<i>chlorothalonil</i>)	G	G	G	G	G	F	G	N	N	P	P	P	N
Topsin (<i>thiophanate methyl</i>)	G-C	F-P	GR	G-F	U	FR	N	N	N	N	N	P	N
Tebuconazole/Tebuzol (<i>tebuconazole</i>)	P	F	G	U	U	F	N	N	N	N	N	F	F
Procure (<i>triflumizole</i>)	N	N	N	N	N	G	N	N	N	N	N	N	N
Inspire Super (<i>difenoconazole + cyprodinil</i>)	G	E	E	G	U	G	N	N	N	N	N	N	N
Quadris Top (<i>azoxystrobin + difenoconazole</i>)	E	E	E	G	U	G	N	N	N	N	N	N	N
Fontelis (<i>penthiopyrad</i>)	F	E	E-R	U	U	E-R	N	N	N	N	N	U	G
Luna Experience (<i>fluopyram + tebuconazole</i>)	F	E	E	U	U	E-R	N	N	N	N	N	N	U
Zampro (<i>amectotradin + dimethomorph</i>)	N	N	N	N	N	N	E-G	N	N	G	U	N	N
Torino (<i>cyflufenamid</i>)	N	N	N	N	N	N	N	N	N	N	N	N	N
Ariston (<i>cymoxanil + chlorothalonil</i>)	G	G-F	G-F	G	G	F	G	N	N	F	N	P	N
Proline (<i>prothioconazole</i>)	G	U	E-G	U	U	E	N	N	N	N	N	U	E
Merivon (<i>pyraclostrobin + fluxapyroxad</i>)	E-G	E	F-P	G	G	E-R	U	N	N	N	N	U	U
Viathon (<i>potassium phosphite + tebuconazole</i>)	F	F	G	U	U	F	G-F	N	N	N	N	F	F
¹ Information in this table was mostly taken from ratings developed at the 2009 Southeast Vegetable Workers Conference in Fletcher, NC. Ratings for products do not necessarily indicate a labeled use.						C = When used in combination with other fungicides/bactericides such as chlorothalonil and mancozeb. V = Variable levels of control R = Pathogen resistance (insensitivity) may be present at some locations. E = Excellent disease suppression, G = Good disease suppression, F = Fair disease suppression, P = Poor to no a suppression, U = Unknown efficacy.							
² Copper can be phytotoxic to most cucurbits, especially if applied at a tank PH below 6.													
³ Phytotoxicity observed. (some western-grown cantaloupe varieties are sulfur tolerant).													

EFFICACY OF FUNGICIDES/BACTERICIDES ON ONION DISEASES¹

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

REGISTERED FUNGICIDES ²	DISEASES												
	Pythium damping-off	Onion smut	Botrytis leaf blight	Purple blotch	Stemphylium blight	Downy mildew	Erwinia soft rot	Fusarium basal rot	Pink root	Center rot	Bacterial streak	White rot (Sclerotium)	Twister (Anthracnose)
Pristine (<i>boscalid</i> + <i>pyraclostrobin</i>)	P	U	E	E	E-G	F	N	U	G	N	N	U	G
Cabrio (<i>pyraclostrobin</i>)	P	U	G-F	E-G	G	F	N	U	P	N	N	U	G
Quadris/Amistar (<i>azoxystrobin</i>)	P	U	G-F	E-G	G	F	N	U	P	N	N	U	G
Endura (<i>boscalid</i>)	P	U	G	E-G	G	N	N	U	G	N	N	U	P
Presidio (<i>fluopicolide</i>)	P	N	N	N	N	P	N	N	N	N	N	N	N
Revus (<i>mandipropamid</i>)	P	N	N	N	N	F	N	N	N	N	N	N	N
Aliette (<i>fosetyl – Al</i>)	P	N	N	N	N	F	N	N	N	N	N	N	N
Forum (<i>dimethomorph</i>)	P	N	N	N	N	F	N	N	N	N	N	N	N
Scala (<i>pyrimethanil</i>)	N	U	G	G	G	N	N	U	U	N	N	U	U
Rovral (<i>iprodione</i>)	N	P	G-F	G	G-F	N	N	N	N	N	N	N	N
Reason (<i>fenamidone</i>)	P	N	N	F-P	F-P	F	N	N	N	N	N	N	N
Switch (<i>cyprodinil</i> + <i>fludioxinil</i>)	N	U	G	G	G	N	N	N	U	N	N	U	G-F
Ridomil Gold Bravo (<i>mefenoxam</i> + <i>chlorothalonil</i>)	F	F-P	G-F	G-F	G-F	G-R	N	N	N	N	N	N	G-F
Ridomil Gold MZ (<i>mefenoxam</i> + <i>mancozeb</i>)	F	F-P	G-F	G-F	G-F	G-R	N	N	N	N	N	N	G-F

¹ Information in this table was partly derived from ratings given at the IR-4 Bulb Vegetable Crop Group Workshop held during the 1999 American Phytopathological Society annual meeting in Montreal, Canada. Ratings for products do not necessarily indicate a labeled use.

C = When used in combination with mancozeb.
V = Variable levels of control.
R = Pathogen resistance (insensitivity) may be present at some locations.
E = Excellent disease suppression
G = Good disease suppression
F = Fair disease suppression
P = Poor to no disease suppression
U = Unknown efficacy

EFFICACY OF FUNGICIDES/BACTERICIDES ON ONION DISEASES¹ (continued)

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

REGISTERED FUNGICIDES²	DISEASES												
	Pythium damping-off	Onion smut	Botrytis leaf blight	Purple blotch	Stemphylium blight	Downy mildew	Erwinia soft rot	Fusarium basal rot	Pink root	Center rot	Bacterial streak	White rot (Sclerotium)	Twister (Anthracnose)
Ridomil Gold Copper (<i>meneoxam + Cu hydroxide</i>)	F	P	P	P	P	P	P	N	N	F	G	N	P
Rildomil Gold SC (<i>mefenoxam</i>)	G	N	N	N	N	F-P	N	N	N	N	N	N	N
Fixed copper ³	N	P	P	P	P	P	P	N	N	F	G	N	P
Actigard (<i>acibenzolar-S-methyl</i>)	U	U	P	P	P	U-G	U	U	P	U	U	P	U
Manzate (<i>mancozeb</i>)	N	U	P	P	P	G-F	N	N	N	N	N	N	G-F
Bravo/Equus (<i>chlorothalonil</i>)	N	F-P	G-F	G-F	G-F	F	N	N	N	N	N	N	G-F
Tebuconazole/Tebuzol (<i>tebuconazole</i>)	N	U	F	G-F	G-F	N	N	N	N	N	N	G	P
Inspire Super (<i>difenoconazole + cyprodinil</i>)	N	U	G	E	E	N	N	N	U	N	N	U	G
Quadris Top (<i>azoxystrobin + difenoconazole</i>)	N	U	G	E	E	U	N	N	U	N	N	U	G
Omega 500 (<i>fluzinam</i>)	P	U	G	E	E	G	N	N	U	N	N	F	U
Fontelis (<i>penthiopyrad</i>)	N	U	E	E	E	N	N	U	F	N	N	G	U
Zampro (<i>amectoctradin + dimethomorph</i>)	N	N	N	N	N	G	N	N	N	N	N	N	N
Quilt Excel (<i>azoxystrobin + propiconazole</i>)	N	U	F	G	G-F	P	N	N	N	N	N	U	G
Merivon (<i>pyraclostrobin + fluxapyroxad</i>)	P	U	E	E	E	F	N	U	G	N	N	U	G
Viathon (<i>potassium phosphite + tebuconazole</i>)	P	U	F	F	F	F-G	N	U	N	N	N	N	F

¹ Information in this table was partly derived from ratings given at the IR-4 Bulb Vegetable Crop Group Workshop held during the 1999 American Phytopathological Society annual meeting in Montreal, Canada. Ratings for products do not necessarily indicate a labeled use.

C = When used in combination with mancozeb.
V = Variable levels of control.
R = Pathogen resistance (insensitivity) may be present at some locations.
E = Excellent disease suppression
G = Good disease suppression
F = Fair disease suppression
P = Poor to no disease suppression
U = Unknown efficacy

EFFICACY OF FUNGICIDES/BACTERICIDES AGAINST PEPPER DISEASES¹

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

	DISEASES						
	Anthracnose of fruit	Botrytis fruit rot	Bacterial spot	Phytophthora (root and crown)	Phytophthora (fruit and foliage)	Pythium crown rot	Southern blight
REGISTERED FUNGICIDES²							
Endura (<i>boscalid</i>)	N	G	N	N	N	N	N
Quadris/Amistar (<i>azoxystrobin</i>)	E	P	N	N	N	N	G
Cabrio (<i>pyraclostrobin</i>)	E	P	N	N	N	N	N
Tanos (<i>famoxate + curzate</i>)	P	P	P	N	P	N	N
Presidio (<i>fluopicolide</i>)	N	P	N	F	E-G	N	N
Revus (<i>mandipropamid</i>)	N	P	N	P	E-G	N	N
Forum (<i>dimethomorph</i>)	N	P	N	P	P	N	N
Manzate (<i>mancozeb</i>)	P	P	P	N	N	N	N
Ridomil Gold SC (<i>mefenoxam</i>)	N	P	N	E-R	N	E	N
Ridomil Gold Copper (<i>mefenoxam + Cu hydroxide</i>)	N	P	F-P-R	N	E-G	P	N
Terraclor (PCNB)	N	P	N	N	N	N	G
Previcur Flex (<i>propamocarb</i>)	N	P	N	N	N	N	N
Bravo, Echo (<i>chlorothalonil</i>)	P	F	N	N	N	N	N
fixed copper	P	P	G-F-R	N	N	N	N
Actigard (<i>acibenzolar-S-methyl</i>) ^{2,3}	U	U	G	U	U	N	N
Streptomycin sulfate ⁴	U	U	G-R	N	N	N	N
Quadris Top (<i>azoxystrobin + difenoconazole</i>)	G	N	N	N	N	N	G
Fontelis (<i>penhiothyrid</i>)	N	G	N	N	N	N	G
Zampro (<i>amectotradin + dimethomorph</i>)	N	N	N	G	G	U	N
Quintec (<i>quinoxifen</i>)	N	N	F	N	N	N	N
Ariston (<i>cymoxanil + chlorothalonil</i>)	F	P	N	P	P	N	P

¹ Information in this table was mostly taken from ratings developed at the 2009 Southeast Vegetable Workers Conference in Fletcher, NC. Ratings for products do not necessarily indicate a labeled use.

² Actigard is labeled for chili pepper only.

³ Phytotoxicity observed. Follow label carefully.

⁴ Streptomycin is labeled for transplants only. Not labeled for field use.

C = When used in combination with other fungicides/bactericides such as chlorothalonil and mancozeb
V = Variable levels of control.
R = Pathogen resistance (insensitivity) may be present at some locations
E = Excellent disease suppression
G = Good disease suppression
F = Fair disease suppression
P = Poor to no disease suppression
U = Unknown efficacy

EFFICACY OF FUNGICIDES/BACTERICIDES AGAINST TOMATO DISEASES¹

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

REGISTERED FUNGICIDES ²	DISEASES													
	Bacterial canker <i>Clavibacter michiganensis</i>	Bacterial speck <i>Pseudomonas syringae</i> pv. <i>tomato</i>	Bacterial spot <i>Xanthomonas campestris</i> pv. <i>vesicatoria</i>	Botrytis gray mold and Sclerotinia	<i>Cryptulariella</i> leaf spot	Target spot	Early blight	Late blight	Powdery mildew	Septoria leaf spot	Southern stem rot <i>Sclerotium rolfsii</i>	Pythium collar rot	Tomato Spotted Wilt Virus	
Endura (<i>boscalid</i>)	N	N	N	G	P	G	E	N	U	P	U	N	N	
Cabrio (<i>pyraclostrobin</i>)	N	N	N	P	U	U	E	G-F	E-G	E-G	G	P	N	
Quadris/Amistar (<i>azoxystrobin</i>)	N	N	N	P	U	U	E	G-F	E-G	E-G	G	P	N	
Flint (<i>trifloxystrobin</i>)	N	N	N	P	U	U	E	G-F	E-G	E-G	G	P	N	
Ranman (<i>cyazofamid</i>)	N	N	N	N	N	N	F	G	N	N	N	N	N	
Presidio (<i>fluopicolide</i>)	N	N	N	N	N	N	N	G	N	N	N	N	N	
Revus Top (<i>mandipropamid + difenoconazole</i>)	N	N	N	N	N	G	F	G	U	U	U	N	N	
Previcur Flex (<i>propamocarb</i>)	N	N	N	N	N	N	N	G-F	N	N	N	P	N	
Aliette (<i>fosetyl – Al</i>)	N	N	N	N	N	N	N	F	N	N	N	N	N	
Forum (<i>dimethomorph</i>)	N	N	N	N	N	N	N	GC	N	N	N	N	N	
Gavel (<i>zoxamide + mancozeb</i>)	N	N	N	N	N	N	G-F	G-F	N	G-F	N	N	N	
Tanos (<i>famoxate + cymoxanil</i>)	P	P	P	N	U	F	E-G	G	P	P	N	N	N	
Reason (<i>fenamidone</i>)	N	N	N	N	U	U	G	G	N	F	N	N	N	
Switch (<i>cyprodinil + fludioxinil</i>)	N	N	N	G	U	U	G	N	G	U	N	N	N	
Ridomil Gold Bravo (<i>mefenoxam + chlorothalonil</i>)	N	N	N	F	P	F	G	GR	P	G	N	F-P	N	
Ridomil Gold MZ (<i>mefenoxam + mancozeb</i>)	P	P	P	P	P	G	P	GR	P	F	N	F-P	N	

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² Streptomycin may only be used in plant beds, not registered for field use.

³ Phytotoxicity observed. Follow label carefully.

V = Variable levels of control.

R = Pathogen resistance (insensitivity) may be present at some locations,

E = Excellent disease suppression,

G = Good disease suppression,

F = Fair disease suppression,

P = Poor to no disease suppression,

U = Unknown efficacy

EFFICACY OF FUNGICIDES/BACTERICIDES AGAINST TOMATO DISEASES¹ (continued)

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

REGISTERED FUNGICIDES ²	DISEASES												
	Bacterial canker <i>Clavibacter michiganensis</i>	Bacterial speck <i>Pseudomonas syringae</i> pv. <i>tomato</i>	Bacterial spot <i>Xanthomonas campestris</i> pv. <i>vesicatoria</i>	Botrytis gray mold and Sclerotinia	Crystallaria leaf spot	Target spot	Early blight	Late blight	Powdery mildew	Septoria leaf spot	Southern stem rot <i>Sclerotium rolfsii</i>	Pythium collar rot	Tomato Spotted Wilt Virus
Ridomil Gold Copper (<i>meneoxam + Cu hydroxide</i>)	G-F	G-F	G-F	P	P	P	P	GR	P	P	N	F-P	N
Rildomil Gold SC (<i>mefenoxam</i>)	N	N	N	N	N	N	N	N	N	N	N	G	N
Rally (<i>myclobutanil</i>)	N	N	N	N	E-G	N	N	N	E	N	N	N	N
Actigard (<i>acibenzolar-S-methyl</i>) ³	U	G-F	G-F	P	P	P	P	F-P	P	P	P	P	F-P
Maneb/mancozeb	P	P	P	P	P	G	P	G-F	P	G-F	P	P	P
Bravo/Equus (<i>chlorothalonil</i>)	N	N	N	F	P	F	G	GR	P	G	N	F-P	N
Scala (<i>pyrimethanil</i>)	N	N	N	GR	U	G	G	P	P	P	N	N	N
Streptomycin sulfate ²	GR	GR	GR	N	N	N	N	N	N	N	N	N	N
Inspire Super (<i>difenoconazole + cyprodinil</i>)	N	N	N	G	U	G	G	N	G	E	U	N	N
Quadris Top (<i>azoxystrobin + difenoconazole</i>)	N	N	N	N	U	G	G	G	G	E	G	N	N
Blocker (PCNB)	N	N	N	N	N	N	N	N	N	N	G	N	N
Fontelis (<i>penhopyrad</i>)	N	N	N	G	U	G-F	E	N	G	G	G	N	N
Priaxor (<i>fluxapyrad + pyraclostrobin</i>)	N	N	N	G	U	G	E	N	G	G	G	N	N
Zampro (<i>amectotradin + dimethomorph</i>)	N	N	N	N	N	N	N	G	N	N	N	N	N
Ariston (<i>cymoxanil + chlorothalonil</i>)	N	N	N	N	P	F-P	G	G	P	G	N	N	N

¹ Information in this table was mostly taken from ratings developed at the 2009 Southeast Vegetable Workers Conference in Fletcher, NC. Ratings for products do not necessarily indicate a labeled use.

² Streptomycin may only be used in plant beds, not registered for field use.

³ Phytotoxicity observed. Follow label carefully.

V = Variable levels of control.

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VEGETABLE NEMATODE CONTROL

Bhabesh Dutta, Extension Plant Pathologists, and F. Hunt Sanders, Jr.

Follow manufacturer's label in all cases.

COMMODITY	MATERIAL	APPLICATION METHOD FOR GIVEN SOILS	PRODUCT (AMT/ACRE)	FORMULATED (OZ/100 FT ROW) (OR 100 SQ FT)	SCHEDULE AND REMARKS
Most Vegetables		Broadcast, mineral soil	9-15 gal	2.6-5.3 fl oz	Fall application usually preferred to spring application. Wait 3 weeks before planting; longer if soil is cold or very wet. Chisels should be spaced 12" and inserted 6-8" deep (8-12" deep in very sandy soils). See label for specific details for application of Telone EC.
	Dichloropropene (Telone II)	Broadcast, peat or muck soil	24-36 gal	7-10.6 fl oz	
		Row, mineral soil	5.3-10.8 gal	4.5-6 fl oz	
		Row, peat or muck soil	14.3-21.6 gal	14.2-21.2 fl oz	
Telone EC	Drip tape application	9-18 gal	--	Fall application often is preferred to spring application. Wait 3 weeks before planting or longer in cold, wet soil, or if odor persists. Read label for row application use in organic soils, chisel depth and spacing, exact rates, and special uses. Vapam and K-Pam can also be used in a sprinkling system. When used with plastic covers, all products are more effective and lower rates can be used. Terr-O-Gas fumigants are mixtures of methyl bromide and chloropicrin. Terr-O-Gas 35, 50, 57, 70, 75, and 80 formulations are also available; use amount specified in label.	
Most Vegetables (multi-purpose fumigants)	Metam-Sodium (Vapam, Sectagon)	Broadcast	37.5-75 gal	7.2-14.4 fl oz	
	Metam-Potassium (K-Pam)	Broadcast	30-60 gal	5.8-11.5 fl oz	
	Chloropicrin	Broadcast, mineral soil	37-82 gal	11-24 fl oz	
		Row	15-25 gal	4.4-7.3 fl oz	
	Telone C-17	Broadcast	12-20 gal	3.5-5.9 fl oz	
	Terr-O-Gas 67	Broadcast	270-360	--	
Inline	Drip tape application	13-20.5	--		
Broccoli, cauliflower, eggplant, cantaloupe, pepper, tomato	(methyl bromide 67%, chloropicrin 33%)	Broadcast	270-360		

(MULTIPURPOSE FUMIGANTS) (ALL VEGETABLE TRANSPLANTS)

Beans (Snap and Lima)	Methyl bromide	Broadcast	215-430	1-2 lb	Make application in a band 12-15" wide on the row. Follow label directions.
	Mocap 10% G	Row treatment 36 inches	20-30 lb	2.3-3.2 fl oz	
	Mocap EC	Broadcast Row, 36 inches	1-1 1/3 gal 1 1/2-2 qt		
Cucumber	Mocap 10%G	Row, 7 ft	20 lb		Apply a minimum of 7 days before transplanting. Do not apply more than one application per crop, and no more than 112 fl oz of product/A/year. Do not plant any crops not on this label into treated land for 365 days after application of product. Vydate is labeled on many other vegetable crops. See label for application details.
	Mocap EC	Row, 7 ft	1-1 1/3 qt		
	Nimitz	Broadcast Band or drip tape application	3.5-5 pt	56-80 fl oz	
	Vydate L	preplant broadcast	1-2 gal		
foliar		2-4 pt			

VEGETABLE NEMATODE CONTROL

Follow manufacturer's label in all cases.

COMMODITY	MATERIAL	APPLICATION METHOD FOR GIVEN SOILS	PRODUCT (AMT/ACRE)	FORMULATED (OZ/100 FT ROW) (OR 100 SQ FT)	SCHEDULE AND REMARKS
Okra	Nemacur 15% G	Band	14.7-18.4 fl oz/1,000 ft of row (or 13.4-16.7 lb/A on 36" rows)		Apply in front of planter shoe as a 12-15 inch band. Incorporate 2-6". Use low rate in 12" band. Use high rate in 15" band.
		Broadcast		40 lb	Distribute granules uniformly over the entire area to be treated and immediately incorporate to a depth of 2-6" by disking or tilling.
Melons (cantaloupes, watermelon & honeydew), squash, tomatoes, okra, eggplant, peppers (bell & non-bell)	Nimitz	Broadcast Band or drip tape application	3.5-5 pt	56-80 fl oz	Apply a minimum of 7 days before transplanting. Do not apply more than one application per crop, and no more than 112 fl oz of product/A/year. Do not plant any crops not on this label into treated land for 365 days after application of product.
Sweet Potato	Mocap 10% G	Broadcast	60-80 lb		
		Row treatment 42"	30-40 lb	4-5 fl oz	Apply on row 12-15" band, incorporate 4-8" deep, plant to 3 weeks later.
	Mocap EC	Row, 42"	2-3 2/3 qt		
		Broadcast	1-1 1/3 gal		
Sweet Corn	Mocap 10% G	Row, 40-inch	15-20 lb	1.8-2.4 fl oz	Apply on row 12 to 15-inch band for row application. Incorporate 2-4", plant immediately or 3 days later.
		Broadcast	60 lb		
	Mocap EC	Row, 40"	2/3 qt		
		Broadcast	1 gal		
Sweet and Popcorn	Counter 15G	8 oz/100 ft row	1/2 oz/1,000 ft row	0.12 fl oz	Place granules directly in the seed furrow behind planter shoe
	Furadan 4F	Row	1 qt (40-inch row spacing)		Apply at planting directly in seed furrow.
Cabbage (transplants & direct seed)	Mocap EC	Row, 36"	1-1 1/3 qt		Incorporate in soil 6" deep.
		Broadcast 3 1/3 qt			
Irish Potato	See Telone II or multipurpose fumigants				
Carrot, Cucurbits, Eggplant, Onion, Pepper (all), Potato, Sweet Potato, Tomato Nematodes only on most vegetables.	Vydate L	Preplant	2-4 gal		Broadcast in 20 gal water (carrot).
		In-furrow	1-2 gal		Apply in seed furrow (carrot)
		Pre-plant/plant	1-2 gal		Incorporate 2-4" in soil (cucurbits, eggplant)
		Foliar	2-4 pt		Apply 2-4 weeks after planting and again 2-3 weeks later (cucurbits, eggplant).
		Transplant water	2-4 pt in 40-200 gal		Transplant is for pepper only. Use in 40-200 gal water/A.
		Drip irrigation	2-4 pt		
		Foliar	2-4 pt		Can use up to 8 pt/A on large tomatoes (see label). Foliar applications for pepper & tomato.

COMMERCIAL VEGETABLES—WEED CONTROL

A. Stanley Culpepper, Extension Agronomist-Weed Science

ASPARAGUS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
ASPARAGUS: PREEMERGENCE (Seeded and New Crown Plantings)						
Contact kill of all green foliage; annual weeds should be 3" or less.	<i>paraquat</i> Firestorm, Parazone 3SL Gramoxone Inteon 2SL	22	1.7-2.7 pt 2.5-4 pt	0.64-1	24 H/ NA	Apply to emerged weeds but before crop emergence. Add 1 qt NIS or 1 gal COC/100 gal spray mix.
Most emerged weeds except for resistant pigweed, spiderwort and stale seedbed.	<i>glyphosate</i> 4 SL (3 lb ae) 5.5 SL (4.5 lb ae)	9	16-32 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ NA	Apply to emerged weeds but before crop emergence. Do not apply within a week of when spears emerge. Perennial weeds may require higher rates. The need for an adjuvant depends on brand used.
ASPARAGUS: POSTEMERGENCE (Seeded and New Crown Plantings)						
Annual grasses and small-seeded broadleaf weeds.	<i>linuron</i> Lorox DF 50WDG	7	1-2 lb	0.5-1	24 H/ 1 D	Apply when ferns are 6-18" and weeds are < 4". Do not use a surfactant or fertilizer solution in spray mixture. Use lower rate on coarse soils; not suggested for sands or loamy sands. Repeat applications may be made, but do not exceed 4 lb/A/yr.
Actively growing annual and perennial grasses.	<i>fluzifop-P-butyl</i> Fusilade DX 2EC	1	6-16 fl oz	0.1-0.25	12 H/ 1 D	With sethoxydim, add 1 qt COC/A. With fluzifop-P, add 1 qt NIS or 1 gal COC/100 gal of spray mix. Do not apply more than 48 oz/A/season fluzifop; do not apply more than 5 pt/A/season sethoxydim.
In general, clethodim and fluzifop are better on perennial weeds such as bermudagrass.	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.29	12 H/ 1 D	Do not mix with other pesticides.
	<i>clethodim</i> SelectMax 0.97EC TapOut 0.97EC	1	9-16 fl oz 9-16 fl oz	0.07-0.12	24 H/ 1 D	Add NIS at 1qt/100 gal spray mix. Do not apply more than 64 oz/A/season. Do not mix with other pesticides.
ASPARAGUS: POSTEMERGENCE (Transplant Crowns or Established Beds)						
Post control of nutsedge, ragweed, wild radish. Residual control of pigweeds and radish.	<i>halosulfuron</i> Sanda 75DG	2	0.5-1 oz	0.024-0.048	12 H/ 1 D	Apply before, during, or after harvest season. For 1st year transplants, apply no sooner than six weeks after fern emergence. Do not use an additive as injury can occur. Two application per crop cycle can be made as long as they are at least 21 days apart. Do not exceed 2 oz/A/year. Contact with fern may cause yellowing. Try on limited acreage; no GA research.
ASPARAGUS: PREEMERGENCE (Established At Least 2 Years)						
Annual grasses, including Texas millet, and small-seeded broadleaf weeds.	<i>trifluralin</i> Treflan 4EC Trifluralin 4L	3	1-3 pt 1-3 pt	0.5-1.5	12 H/ NA	Apply to dormant asparagus in winter or early spring after removing mature ferns. Do not apply after new spears begin to emerge. Do not apply more than 2 pt/A on coarse soils. Split applications (before and after harvest) may also be used. Treflan must be incorporated within 8 hours of application with 0.5" of rainfall/irrigation.
Annual grasses and small-seeded broadleaves; usually less effective than Treflan.	<i>napropamide</i> Devrinol 50DF	15	8 lb	4	24 H/ NA	Apply to the soil surface in spring before weed and spear emergence. Do not exceed 8 lb/A/year.

COMMERCIAL VEGETABLES-WEED CONTROL

ASPARAGUS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
ASPARAGUS: PREEMERGENCE (Established At Least 2 Years) (continued)						
Annual broadleaf and grass weeds.	<i>linuron</i> Lorox DF 50WDG	7	2-4 lb	1-2	24 H/ 1 D	Apply prior to spear emergence. Do not use a surfactant or fertilizer solution in spray mixture. Use the lower rate on coarse soils. Not recommended for sand or loamy sand soils. Repeat applications may be made, but do not exceed 4 lb/A/yr.
	<i>diuron</i> Karmex 80DF Karmex 80XP Direx 4L	7	1-2 lb 1-2 lb 0.8-1.6 qt	0.8-1.6	12 H/ NA	Apply in spring no earlier than 4 wk before spear emergence and no later than early cutting period. A second application may be made immediately after last harvest but do not exceed 3 lb Karmex or 2.4 qt Direx/A/season. Low rates are more suitable on most GA soils.
	<i>terbacil</i> Sinbar 80WP	5	0.25-0.5 lb	0.2-0.4	12 H/ 5 D	Apply in spring before weeds emerge and before new growth, or in the fall after plants become dormant. Rates listed are lower than those on label. Higher rates can be used on some soils, see label. Not recommended for soils containing less than 1% organic matter. Do not allow Sinbar to come into contact with exposed roots. See label about rotation restrictions.
	<i>metribuzin</i> numerous brands 75DF Metri 4F	5	1.3-2.67 lb 2-4 pt	1-2	12 H/ 14 D	Make a single application to small emerged weeds and soil surface in early spring (plantings at least 1 yr old) before spear emergence. Low rates are suggested for most GA soils; see label. Do not apply within 14 D of harvest or after spear emergence. Apply POST only after the last spears are harvested. Do not exceed 2 lb ai/A/year.
ASPARAGUS: POSTEMERGENCE (Established At Least 2 Years)						
Broadleaf weeds; often does not adequately control henbit, chickweed.	<i>2,4-D</i> Amine 4 3.8 SL	4	1.5-2 qt	1.4-1.8	48 H/ 3 D	Apply in spring before spear emergence or immediately following a clean cutting. Also may apply after last harvest but prior to emergence. Postharvest sprays should be directed under ferns, avoiding contact with ferns, stems, or emerging spears. Do not make more than 2 applications/season (2 lbs ae/A). Applications should be spaced at least 30 D apart. <u>Do not apply if sensitive crops are planted nearby or if conditions favor drift.</u>
Contact kill of emerged weeds, and contact kill of volunteer ferns.	<i>paraquat</i> Firestorm, Parazone 3SL Gramoxone Inteon 2SL	22	1.7-2.7 pt 2.5-4 pt	0.64-1	24 H/ 6 D	Apply to control emerged weeds (including volunteer ferns). Apply prior to emergence of crop or after last harvest; crop plants emerged will be killed. Add 1 qt NIS or 1 gal COC/100 gal spray mix. Do not make more than 3 applications/yr.
Most emerged weeds except for resistant pigweed and spiderwort; established volunteer ferns.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-32 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply to emerged weeds up to 1 week before spear emergence, or immediately after last cutting has removed all above-ground parts, or as a directed spray under mature ferns. Direct contact of spray with asparagus may result in serious crop injury. For spot treatment, apply immediately after cutting, but prior to emergence of new spears. The need for an adjuvant depends on brand used.

COMMERCIAL VEGETABLES-WEED CONTROL

ASAPARAGUS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
ASPARAGUS: POSTEMERGENCE (Established At Least 2 Years) (continued)						
Postemergence control of nutsedge, wild radish, and ragweed. Residual control of pigweeds and radish.	<i>halosulfuron</i> Sanda 75DG	2	0.5-1.5 oz	0.024-0.072	12 H/ 1 D	Postemergence. Apply before or during the harvesting season. Do not use a non-ionic surfactant or crop oil as unacceptable crop injury may occur. However when not including a surfactant, weed control may be reduced. Post Harvest. Apply after final harvest with drop nozzles to limit contact with crop. Contact with the fern may result in temporary yellowing. Add a NIS at 1 qt/100 gal of spray mixture. Under heavy nutsedge pressure, split applications will be more effective, see label for details. Do not exceed 2 oz/A/yr; do not make more than 2 applications/crop cycle.
Annual grasses and small-seeded broadleaf weeds.	<i>linuron</i> Lorox DF 50WDG	7	1-2 lb	0.5-1	24 H/ 1 D	Apply before weeds exceed 2" and before cutting or immediately after cutting. Do not use a surfactant or fertilizer solution in spray mixture. Not recommended for sand or loamy sand soils. Do not exceed 4 lb/A/yr, including PRE applications.
Actively growing annual and perennial grasses. In general, clethodim and fluazifop are better on perennial weeds such as bermudagrass.	<i>clethodim</i> SelectMax 0.97EC TapOut 0.97EC	1	9-16 fl oz 9-16 fl oz	0.07-0.12	24 H/ 1 D	Add NIS at 1qt/100 gal spray mix. Do not apply more than 64 oz/A/season. Do not mix with other pesticides.
	<i>fluazifop-P-butyl</i> Fusilade DX 2EC	1	8-16 fl oz	0.13-0.25	12 H/ 1 D	For fluazifop-P, add 1 qt NIS or 1 gal COC/100 gal of spray mix. For sethoxydim, add 1 qt COC/A. Do not apply more than 48 oz/A/season of fluazifop; do not apply more than 5 pt/A/season sethoxydim.
	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.29	12 H/ 1 D	Do not mix with other pesticides.

COMMERCIAL VEGETABLES-WEED CONTROL

BEANS

Recommended Herbicide Uses In Specific Bean Crops		Bean Type			
Herbicide	Application Method*	Dry	Lima	Snap	Southern Pea
<i>carfentrazone</i> Aim EC	Preplant	X	X	X	X
<i>paraquat</i> (numerous brands)	Preplant		X	X	X
<i>glyphosate</i> Roundup, others	Preplant	X	X	X	X
<i>EPTC</i> Eptam	PPI	X		X	
<i>ethalfluralin</i> Sonalan	PPI	X			
<i>pendimethalin</i> Prowl, others	PPI	X	X	X	X
<i>trifluralin</i> Treflan, others	PPI	X	X	X	X
<i>dimethenamid</i> Outlook	PPI or PRE	X			
<i>imazethapyr</i> Pursuit	PPI or PRE	X	X	X	X
<i>S-metolachlor</i> Dual Magnum	PPI or PRE	X	X	X	X
<i>fomesafen</i> Reflex	PRE	X		X	
<i>halosulfuron</i> Sandea	PRE	X	X	X	
<i>clomazone</i> Command 3 ME	PRE		X	X	X
<i>bentazon</i> Basagran	POST	X	X	X	X
<i>clethodim</i> SelectMax, TapOut	POST	X	X	X	X
<i>dimethenamid</i> Outlook	POST	X			
<i>fluzifop</i> Fusilade DX	POST	X			
<i>fomesafen</i> Reflex	POST	X		X	
<i>halosulfuron</i> Sandea	POST		X	X	
<i>imazethapyr</i> Pursuit	POST	X			X
<i>quizalofop-P-ethyl</i> Assure II, Targa	POST	X		X	X
<i>sethoxydim</i> Poast	POST	X	X	X	X
<i>s-metolachlor</i> Dual Magnum	Directed or POST		X	X	X
<i>carfentrazone</i> Aim EC	Row Middle Only	X	X	X	X
<i>glyphosate</i> Roundup, others	Row Middle Only	X	X	X	X
<i>halosulfuron</i> Sandea	Row Middle Only	X	X	X	

* PPI = preplant incorporated; PRE = Preemergence; POST = Postemergence.

COMMERCIAL VEGETABLES-WEED CONTROL

BEANS

BEAN TYPES LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
BEANS: PREPLANT (Refer to the First Column to Determine Specific Herbicide Labeled for Each Bean Type)							
Dry Bean Lima Bean Snap Bean Southern Pea	Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4 SL (3 lb ae) 5.5 SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-1.5 lb ae	4 H/ NA	Apply to emerged weeds before seeding. The need for an adjuvant depends on brand used.
	Morningglory, spiderwort, and small pigweed; little to no benefit for purslane.	<i>carfentrazone</i> Aim EC 2.0 EC	14	0.8-2 fl oz	0.013-0.03	12 H/ NA	Apply prior to or within 24 hr of planting to weeds less than 3"; pigweed less than 1 inch. Add 1.5-2 gal COC/100 gal of spray mix. Likely need to mix with glyphosate.
Lima Bean Snap Bean Southern Pea (not Dry Bean)	Contact kill of all green foliage; annual weeds should be less than 3".	paraquat Firestorm, Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Apply to emerged weeds but before crop emergence. Add 1 qt NIS or 1 gal COC/100 gal spray mix.
BEANS: PREPLANT INCORPORATED (Refer to the First Column to Determine Specific Herbicide Labeled for Each Bean Type)							
Dry Bean (not Lima, Snap or Southern Pea)	Annual grasses including Texas millet and small-seeded broadleaf weeds.	<i>ethalfuralin</i> Sonalan HFP 3EC	3	1.5-2 pt	0.6-0.75	24 H/ NA	Apply PPI 2-3" into the soil before planting in the spring. Fall applications may be made only with dry bulk fertilizer (according to the label). Use lower rates on coarse soils or when following with a Dual type product PRE.
Dry Bean Lima Bean Snap Bean Southern Pea		<i>pendimethalin</i> Prowl 3.3EC Prowl H2O 3.8AS	3	1.8-2.4 pt 1.5-2 pt	0.75-1 0.72-0.95	24 H/ NA	Incorporate 2-3" deep prior to planting. Rates lower than some products recommend (1.2-1.5 pt/A) are suggested for sandy soils with low organic matter or when Dual Magnum will follow PRE. Applying immediately after planting and then irrigating is not supported by the label because of injury concerns.
		<i>trifluralin</i> Treflan 4EC Trifluralin 4L	3	1 pt 1 pt	0.5	24 H/ NA	Incorporate 2-3" deep, within 8 hr of application, into the soil prior to SPRING (according to label) planting. Rates lower than those labeled (12 oz/A) are suggested for sandy soils with low organic matter or when following with a Dual type product PRE. Applying immediately after planting and then irrigating is not supported by the label.
Dry Bean Snap Bean (not Lima Bean or Southern Pea)	Annual grass, broadleaves, nutsedge suppression.	<i>EPTC</i> Eptam 7E	8	2.25-3.5 pt	2-3	12 H/ NA	Apply PPI 3" deep into the soil before planting. Suggest mixing with pendimethalin or trifluralin; see label for recommendations and restrictions.

COMMERCIAL VEGETABLES-WEED CONTROL

BEANS

BEAN TYPES LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
BEANS: PREPLANT INCORPORATED or PREEMERGENCE (Refer to the first column to determine specific herbicide labeled for each bean type)							
Dry Bean Lima Bean Snap Bean Southern Pea	Annual grass and broadleaf weeds including pigweed, spiderwort, and purslane; partial control of Texas millet.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	12-16 fl oz	0.7-0.95	24 H/ NA	Apply PRE after planting, but before crop emergence, or apply preplant and soil incorporate 2" deep into the soil before planting. PRE application suggested ; apply within 1 D of planting and irrigate 1 D of application (2 D after planting). Use lower rates on sandy soils with low organic matter and when in a system with pendimethalin or trifluralin.
	Wild radish, nightshade, suppression of non-ALS resistant pigweed and purslane.	<i>imazethapyr</i> Pursuit 2EC	2	See comments for rate by bean type	See comments	4 H/ See comments	Apply PPI or PRE to the soil surface immediately after planting. Suggest mixing with a grass herbicide. Dry beans include navy great northern, red kidney, black turtle, cranberry, Pinto, and small white dry beans and adzuki. Rotational restrictions are a significant concern, see label. Do not make more than 1 application Pursuit/yr. Rates by bean type: Dry bean: 2-3 fl oz; 0.03-0.047 lb ai/A; 60 day PHI Lima bean: 2-3 fl oz; 0.03-0.047 lb ai/A; 30 day PHI Snap bean: 1.5 fl oz; 0.023 lb ai/A; 30 day PHI Southern pea: 3-4 fl oz; 0.047-0.06 lb ai/A; 30 day PHI
BEANS: PREEMERGENCE (Refer to the first column to determine specific herbicide labeled for each bean type)							
Lima Bean Snap Bean Southern Pea (not for Dry Bean)	Annual grasses and broadleaf weed suppression; weak on pigweed.	<i>clomazone</i> Command 3ME	13	0.4-0.67 pt	0.15-0.25	12 H/ NA	Apply PRE to the soil surface immediately after seeding. See label for buffer and rotation restrictions. Limited GA research.
Dry Bean Lima Bean Snap Bean (not for Southern Pea)	Nutsedge suppression; non-ALS resistant pigweed, ragweed, wild radish.	<i>halosulfuron</i> Sanda 75DF	2	0.5-0.67 oz	0.024-0.031	12 H/ 30 D	Apply within 1 D of planting; do not apply while soil is cracking. Use lower rate on coarse soils with low organic matter. Do not apply more than 1 oz/A/crop cycle (includes POST and hooded applications). Rates by bean type: Dry bean: 0.5-0.67 oz; 0.024-0.031 ai/A; max of 0.67 oz/crop cycle* Lima bean: 0.5-0.75 oz; 0.024-0.036 ai/A; max of 1 oz/crop cycle* Snap bean: 0.5-1.0 oz; 0.024-0.048 ai/A; max of 1 oz/crop cycle* *Crop cycle includes PRE, POST, and hooded applications.
Snap Bean (not for Lima Bean or Southern Pea)	Pigweeds, wild radish, bristly starbur, and suppression of yellow nutsedge.	<i>fomesafen</i> Reflex 2EC	14	12-16 fl oz	0.19-0.25	24 H/ 45 D	A rate of 12 oz/A is ideal for most soils. Apply as a PRE application within 1 D of planting. Overhead irrigate lightly between 2 D after planting and 36 H before emergence in an effort to avoid splashing treated soil onto beans when they are emerging. Rotational restrictions are a significant concern to some crops, see label. Do not make more than 1 application/year (includes POST). Research has shown tremendous injury with Reflex on Lima bean and serious injury with Reflex on Southern Pea.

COMMERCIAL VEGETABLES-WEED CONTROL

BEANS

BEAN TYPES LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
BEANS: POSTEMERGENCE BROADLEAF WEED CONTROL (Refer to the first column to determine specific herbicide labeled for each bean type)							
Dry Bean Lima Bean Snap Bean Southern Pea	Annual broad-leaf weeds such as cocklebur and smallflower morningglory.	<i>bentazon</i> Basagran 4SL	6	1 pt	0.5	48 H/ 30 D for all crops except succulent Southern Pea = 10 D	Dry beans, Lima beans, and Snap beans are tolerant after the first trifoliolate leaf has fully expanded. For Southern Pea, English Pea, or Garden Pea, apply after 3 pairs of leaves are present. Yellowing, bronzing, speckling or burning of leaves may occur. In Georgia, Basagran cannot be applied alone. May be applied from 6-16 oz/A to dry and succulent beans ONLY when mixed with Raptor or Pursuit, see labels. Neither Raptor nor Pursuit are labeled on all bean types; see labels. The addition of an oil additive may increase leafburn and injury.
Dry Bean Snap Bean (Not for Lima Bean or Southern Pea)	Morningglory and pigweed less than 1".	<i>fomesafen</i> <i>Reflex 2EC</i>	14	12-16 fl oz	0.19-0.25	24 H/ Dry Beans = 45 D; Snap Beans = 30 D	Apply to beans with at least two fully expanded trifoliolate leaves; add NIS at 1 qt/100 gal of spray. Minor injury will likely occur. Injury may be more severe if applied in the morning with an overcast sky and/or a heavy dew. Allow 5 D between an application of Reflex and a grass herbicide. One application/yr. Rotational restrictions are a significant concern to some crops, see label. Lima bean and Southern pea injury would be severe.
Lima Bean Snap Bean (Not for Dry Bean or Southern Pea)	Nutsedge, ragweed, cocklebur, and wild radish.	<i>halosulfuron</i> Sanda 75DG	2	0.5-0.67oz	0.024-0.031	12 H/ 30 D	Apply after the 3rd trifoliolate stage but before flowering. Directed sprays are recommended. Can cause temporary chlorosis and stunting; rarely there is a maturity delay of a few days. Greatest injury most often occurs in cool environments when the crop is growing slowly. Add NIS at 1qt/100 gal spray mix. Do not exceed 1 oz/A/crop cycle (PRE + Post + Hood). Label states use of Sandea is at the grower's risk. Review rotational restrictions.
Dry Bean Southern Pea (Not for Lima or Snap Bean)	Wild radish, nightshade, suppression of non-ALS resistant pigweed and purslane.	<i>imazethapyr</i> Pursuit 2EC	2	See remarks for rate for each bean type	See remarks	4 H/ See remarks	For Dry Bean: apply after bean has at least one fully expanded trifoliolate leaf. Dry beans include navy great northern, red kidney, black turtle, cranberry, pinto, and small white dry beans. For Southern Pea: apply after Southern pea is at least 3" tall but prior to 5 nodes and before flowering. Add NIS at 1 qt/100 gal spray mixture; do not use COC. Do not make more than 1 application/year. Rotational restrictions are a significant concern, see label. Rates by bean type: Dry bean: 3 fl oz; 0.047 ai/A; PHI 60 days Southern Pea: 3-4 fl oz; 0.047-0.063 lb ai/A; PHI 30 days

COMMERCIAL VEGETABLES-WEED CONTROL

BEANS

BEAN TYPES LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
BEANS: POSTEMERGENCE GRASS CONTROL (Refer to the first column to determine specific herbicide labeled for each bean type)							
Dry Bean Lima Bean Snap Bean Southern Pea	Actively growing grasses. In general clethodim, fluazifop, and quizalofop are better on perennials while clethodim and sethoxydim are better on annuals.	<i>clethodim</i> SelectMax 0.97EC TapOut 0.97EC	1	9-16 fl oz 9-16 fl oz	0.07-0.12	24 H/ Dry beans = 30 D; All others = 21 D	A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 qt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. Select or similar generics are labeled for dry bean only, see labels. Do not make more than 1 application/season. Do not apply a POST broadleaf herbicide within 5 D of clethodim as reduced grass control may occur. Do not mix with other pesticides.
Dry Bean (Not for Lima, Snap or Southern Pea)		<i>fluazifop-P-butyl</i> Fusilade DX 2EC	1	8-16 fl oz	0.13-0.25	12 H/ 60 D	Add 1 qt NIS or 1 gal COC/100 gal of spray mix. Do not apply more than 48 oz/A/season of fluazifop. Do not mix with other pesticides. Adding crop oil increases injury potential.
Dry Bean Snap Bean Southern Pea (Not for Lima Bean)		<i>quizalofop P-ethyl</i> Assure II 0.88EC Targa 0.88EC	1	6-12 fl oz 6-12 fl oz	0.04-0.08	12 H/ Dry beans = 60 D Snap beans = 15 D Southern pea = 30 D	Add 1 qt NIS/100 gal spray. Do not mix with other pesticides. For dry bean, do not apply more than 24 oz/A Assure or 28 oz/A Targa/season. For snap bean or southern pea do not apply more than 14 oz/A/season. Adding crop oil increases injury potential.
Dry Bean Lima Bean Snap Bean Southern Pea		<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.29	12 H/ Dry bean = 30 D All others = 15 D	Add COC at 1 qt/A; see label about use of other additives. Adding crop oil increases injury potential. Do not mix with other pesticides. Do not apply more than 4 pt/A/season sethoxydim.
BEANS: POSTEMERGENCE or DIRECTED (Refer to the first column to determine specific herbicide labeled for each bean type)							
Lima Bean Snap Bean Southern Pea (Not for Dry Bean)	Residual control of pigweeds, purslane, spiderwort, and grasses.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	8-12 fl oz	0.47-0.7	24 H/ 50 D	A Section 24(c) Georgia Local Need Label must be obtained at www.farmassist.com prior to this use. Apply after 1st trifoliolate; expect some leaf speckling if applied topically. Avoid spraying plants with dew and apply only in water. Label is designed for directed application while cultivating. Do not apply more than 2 pt/A of Dual Magnum for the entire season including PRE and POST. Do not feed treated plant material.

COMMERCIAL VEGETABLES-WEED CONTROL

BEANS

BEAN TYPES LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
BEANS: ROW MIDDLE SPRAY (Refer to the first column to determine specific herbicide labeled for each bean type)							
Dry Bean Lima Bean Snap Bean Southern Pea	Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4 SL (3 lb ae) 5.5 SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA suggests against hooded sprays as drift often occurs. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant depends on brand used.
	Moringglory, spiderwort, and small pigweed, 1" or less.	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in row middles avoiding contact with crop. Apply to weeds less than 2". Add 1.5-2 gal COC/100 gal of spray mix.
Dry Bean Lima Bean Snap Bean (Not for southern pea)	Nutsedges, non ALS-resistant pigweed, cocklebur, ragweed, radish.	<i>halosulfuron</i> Sanda 75DG	2	0.5-1 oz	0.024-0.048	12 H/ 30 D	Apply between crop rows avoiding minimizing contact with crop. For emerged weeds add a NIS at 1 qt/100 gals of spray mix. For dry bean, do not exceed 2/3 oz/A/crop cycle (includes PRE applications). For Lima and Snap bean, do not exceed 1 oz/A/crop cycle.

BEETS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
BEETS (Garden or Table): PREPLANT						
Most emerged weeds except for resistant pigweed, primrose, or spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-2.25 lb ae	4 H/ NA	Garden beets only. Apply to emerged weeds at least 3 D before seeding. The need for an adjuvant depends on brand used.
BEETS (Garden or Table): PREEMERGENCE						
Broadleaf weeds only including common ragweed, smartweed, and wild mustard.	<i>pyrazon</i> Pyramin 65DF	5	4.6-5.4 lb	3.1-3.7	12 H/ NA	Table beets only. Not recommended for use on sands or loamy sand soils as severe injury may occur. Use lower rates on coarse soils. Apply after planting but before crop and weeds emerge. If rain does not occur within 5 D after application, beets should be irrigated. Do not mix with other pesticides. Availability is a concern!

COMMERCIAL VEGETABLES-WEED CONTROL

BEETS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
BEETS (Garden or Table): POSTEMERGENCE						
A few broadleaf weeds including clover, nightshade, jimsonweed and ragweed.	<i>clopyralid</i> Stinger 3EC	4	0.25-0.5 pt	0.09-0.19	12 H/ 30 D	Garden beets only. Apply to beets between the 2 and 8 leaf stage when weeds are small and actively growing. <u>No Georgia research</u> , try on limited acreage first. Apply no more than 0.5 pt/A/year; see label for rotational restrictions.
Broadleaf weeds; including mustard purslane suppression.	<i>phenmedipham</i> Spin-Aid 1.3EC	5	3-6 pt	0.5-1	12 H/ 60 D	Garden beets only. Apply when beets have at least 6 true leaves and weeds have less than 2 leaves. Use higher rates only on well established plants not under stress. Minor crop stunting may be observed for approximately 10 D. Do not use additional wetting agents.
Broadleaf weeds only.	<i>pyrazon</i> Pyramin 65DF	5	5.4 lb	3.7	12 H/ --	Table beets only. Not recommended for sand or loamy sand soils as severe injury can occur. Use lower rates on coarse soils. Do not mix with other pesticides. Apply after beets have expanded 2 true leaves. Availability is a concern!
Actively growing annual and perennial grasses. In general, clethodim will be more effective on perennial weeds such as bermudagrass.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.12 0.07-0.12 0.07-0.12	24 H/ 30 D	Garden beets only. For Select, label requires addition of 1 gal COC/100 gal spray mix. For SelectMax or TapOut, add 1qt NIS/100 gal spray mix. Controls annual bluegrass. Adding crop oil will likely increase crop injury. Do not mix with other pesticides. Application of a broadleaf herbicide within 5 D of clethodim may result in reduced grass control.
	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.29	12 H/ 60 D	Garden beets only. Add 1 qt of COC/A. Adding crop oil will likely increase crop injury. Do not apply more than 5 pt/A/season sethoxydim. Do not mix with other pesticides.
BEETS (Garden or Table): ROW MIDDLE SPRAYS						
Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA suggests against hooded sprays because drift often occurs. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant varies by brand.
Morningglory, spiderwort, and very small pigweed, less than 1".	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2", except pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix.

COMMERCIAL VEGETABLES-WEED CONTROL

CARROTS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CARROTS : PREPLANT						
Contact kill of all green foliage; sensitive weeds should be less than 3".	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Apply to emerged weeds but before crop emergence. Add 1 qt NIS or 1 gal COC/100 gal spray mix.
Most emerged weeds except for resistant pigweed, primrose or spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-64 fl oz 22-44 fl oz	0.75-1.5 lb ae	4 H/ NA	Apply to emerged weeds at least 3D before seeding. The need for an adjuvant depends on brand used.
CARROTS: PREPLANT INCORPORATE						
Annual grasses and small-seeded broadleaf weeds.	<i>trifluralin</i> Treflan, others 4EC	3	1 pt	0.5	12 H/ NA	Apply preplant and soil incorporate 2-3" deep before seeding. Incorporate within 8 H of application or the herbicide may be lost to volatility.
CARROTS: POSTEMERGENCE BROADLEAF WEEDS						
Annual broadleaf weeds and some grasses.	<i>linuron</i> Lorox DF 50WDG	7	1.5-3 lb	0.75-1.5	24 H/ 14 D	Label prohibits use on soils with < 1% organic matter. Apply after carrots are 3" tall and weeds are less than 2". Label warns that growers are at their own risk if adding surfactant; DO NOT add any other product. Avoid spraying after 3 or more cloudy days or when temperature exceeds 85°F. Repeat applications may be made, but do not exceed 4 lb product/A/yr.
	<i>metribuzin</i> Numerous brands 75DF Metri 4F	5	0.33 lb 0.5 pt	0.25	12 H/ 60 D	Apply overtop when carrots have 5-6 true leaves but weeds are less than 1". Some injury may occur under cool, moist conditions. Avoid spraying after 3 or more cloudy days. Do not apply within 3 D of other pesticides. Need for additive is not discussed on label. Do not exceed 0.5 lb ai/A/crop season. Try limited acres; some GA growers believe injury level is not acceptable.
Residual control of pigweed, purslane, spiderwort and grasses.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	8-12 fl oz	0.47-0.7	24 H/ 64 D	A section 24(c) state local need label must be obtained at www.farmassist.com prior to this use. Apply 8 oz/A when carrots are at least 4" and have 5 leaves; 12 oz/A can be applied once carrots are 6" with at least 9 leaves. Avoid spraying plants with dew and apply only in water. New label, limit use and rate until experience obtained.
CARROTS: POSTEMERGENCE GRASS WEEDS						
Actively growing annual and perennial grasses. In general, clethodim and fluazifop are more effective on perennial grasses such as bermudagrass. Clethodim and sethoxydim are more effective on annuals. Clethodim also controls annual bluegrass.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.12 0.07-0.12 0.07-0.12	24 H/ 30 D	A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, add 1 gal COC/100 gal spray mix; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide within 5 D of clethodim may result in reduced grass control.
	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.29	12 H/ 30 D	Label requires addition of 1 qt of COC/A; the addition of crop oil increases injury potential. Do not apply more than 5 pt/A/season sethoxydim. Do not mix with other pesticides.
	<i>fluazifop-P-butyl</i> Fusilade DX 2EC	1	6-16 fl oz	0.1-0.25	12 H/ 45 D	Label requires addition of 1 gal COC or 1 qt NIS/100 gal spray mix. Adding crop oil increases injury potential. Do not mix with other pesticides. Do not apply more than 48 oz/A/ season.

COMMERCIAL VEGETABLES-WEED CONTROL

CARROTS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CARROTS: ROW MIDDLE SPRAYS						
Most emerged weeds except for resistant pigweed, primrose, or spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA suggests against hooded sprays as drift often occurs. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant varies by brand.
Morningglory, spiderwort, and very small pigweed less than 1".	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2" except pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix.

CELERY

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CELERY: PREPLANT						
Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-64 fl oz 22-44 fl oz	0.75-1.5 lb ae	4 H/ NA	Apply to emerged weeds before seeding. The need for an adjuvant depends on brand used.
Primrose, geranium, pigweeds, henbit and a few grasses; excellent herbicide for winter weeds.	<i>oxyfluorfen</i> Goaltender 4F Goal 2 XL 2EC	14	up to 1 pt up to 2 pt	up to 0.5 lb	24 H/ NA	Transplants only. Apply to soil surface of pre-formed beds at least 30 D prior to transplanting. NO Georgia research, try on limited acres.
CELERY: PREPLANT INCORPORATED or PREEMERGENCE						
Annual grasses and small-seeded broadleaf weeds.	<i>trifluralin</i> Treflan, other 4EC	3	1 pt	0.5	12 H/ NA	May be applied to direct seeded or transplant celery before planting, at planting, or immediately after planting. Incorporate within 8 H of application to avoid losing herbicide to volatility.
	<i>bensulide</i> Prefar 4-E	8	5-6 qt	5-6	12 H/ NA	Transplants only. Apply PRE after planting, irrigate immediately after application. See label about rotation restrictions.
CELERY: POSTEMERGENCE BROADLEAF WEEDS						
Annual grasses and broadleaf weeds 2" and less.	<i>linuron</i> Lorox DF 50WDG	7	1.5-2.5 lb	0.75-1.25 lb	24 H/ 45 D	Make a single application after transplants are established but before celery is 8" tall. Do not use surfactant or crop oil. Avoid spraying after 3 or more cloudy days or when temperature exceeds 85° F. Not recommended for sands or loamy sand soil. Do not apply within 1 week of other pesticides. No Georgia data.

COMMERCIAL VEGETABLES-WEED CONTROL

CELERY

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CELERY: POSTEMERGENCE GRASS WEEDS						
Actively growing annual and perennial grasses. In general, clethodim is more effective than sethoxydim on perennial weeds such as bermuda grass. Clethodim also controls annual bluegrass.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.12 0.07-0.12 0.07-0.12	24 H/ 30 D	For Select, label requires addition of 1 gal COC/100 gal spray mix. For SelectMax, add 1 qt NIS/100 gal spray mix. Adding crop oil increases injury potential. Do not mix with other pesticides. Application of a broadleaf herbicide within 5 D of clethodim may result in reduced grass control.
	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 30 D	Label requires addition of 1 qt of COC/A. Adding crop oil increases injury potential. Do not apply more than 3 pt/A/season. Do not mix with other pesticides.
CELERY: ROW MIDDLE SPRAYS						
Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA suggests against hooded sprays because of drift potential. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant varies by brand.
Morningglory, spiderwort, and very small pigweed less than 1".	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2" except pigweed being less than 1". Add 1.5-2 gal COC/100 gal of spray mix.

COLE CROPS (Broccoli, Cabbage, Cauliflower)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
COLE CROPS (Broccoli, Cabbage, Cauliflower): PREPLANT						
Contact kill of all green foliage; annual weeds should be less than 3".	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Apply to emerged weeds but before crop emergence or transplanting. Add 1 qt NIS or 1 gal COC/100 gal spray mix. If applying over plastic, must wash off with 0.5 inch of rain or irrigation in a single event prior to planting.
Most emerged weeds except for resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-64 fl oz 22-44 fl oz	0.75-2.25 lb ae	4 H/ NA	In bareground, apply at least 3 d prior to planting. In plastic, apply at least 7 d prior to planting and mulch must be washed off with 0.5 inch rain/irrigation in a single event prior to planting. Adjuvant needs depend on brand used.
Excellent residual option for henbit, purslane, pigweed, primrose, smartweed, and many others; controls small emerged weeds as well.	<i>oxyfluorfen</i> Goal 2 XL 2EC Galigan 2E Goaltender 4F Galigan H2O 4F	14	12-24 fl oz 12-24 fl oz 6-12 fl oz 6-12 fl oz	0.19-0.375	24 H/ NA	Transplants only. Prepare land, apply oxyfluorfen, irrigate, and then wait 3 D (need at least 1 sunny day) before transplanting. Do not incorporate or knock the bed off after application. For most fields 0.19-0.25 lb ai/A is in order; however, if planting on light soils with cool/wet conditions rates may need to be lowered 15%. Do not apply overtop of crop. The use of young (less than 5 weeks old) transplants grown in containers less than 1" increases injury potential. Leaf cupping or crinkling may be observed.

COMMERCIAL VEGETABLES-WEED CONTROL

COLE CROPS (Broccoli, Cabbage, Cauliflower)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
COLE CROPS (Broccoli, Cabbage, Cauliflower): PREPLANT INCORPORATE and/or PREEMERGENCE						
Annual grasses and small-seeded broadleaf weeds.	<i>trifluralin</i> Treflan, others 4EC	3	12-16 fl oz	0.38-0.5	12 H/ NA	Transplants: Apply preplant and incorporate into the soil 2-3" within 8 H of application. Use lower rates on coarse soils with low organic matter or when cold and/or wet. Direct Seeded: Apply preplant and incorporate 2-3" into the seed bed within 8 H of application. Suggest no more than 12 oz/A for most locations. <u>If soil conditions are cool and wet, reduced stands and stunting may occur.</u>
Annual grasses and small-seeded broadleaf weeds.	<i>bensulide</i> Prefar 4E	8	5-6 qt	5-6	12 H/ NA	Also labeled for, but not limited to, Chinese broccoli, broccoli rabb, brussels sprouts, Chinese cabbage, Chinese mustard cabbage, and kohirabi. Incorporate to a 1" depth or apply immediately after planting followed by irrigation immediately. Check replant restrictions for small grains and other crops on label.
Annual grasses and small-seeded broadleaf weeds including common ragweed and smartweed.	<i>napropamide</i> Devrinol 50DF Devrinol 2-XT	15	2-3 lb 2-3 qt	1-1.5	24 H/ NA	Apply to weed-free soil surface just after seeding or transplanting as a surface application. Light cultivation, rainfall, or irrigation will be needed within 24 H to activate the herbicide; the XT formulation should be SLIGHTLY slower to degrade with lack of activation. Plantback 60 D to leafy vegetables and 180 D for grains.
COLE CROPS (Broccoli, Cabbage, Cauliflower): POSTEMERGENCE						
Residual control of most grasses and some broadleaf weeds including purslane, spiderwort, and partial control of Texas millet.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	10-12 fl oz	0.6-0.7	24 H/ 60 D	Section 24(c) Special Local Need Label for Georiga must be obtained at www.farmassist.com prior to this use. TRANSPLANTS: After transplanting in bareground, irrigate to seal soil around root ball; about 10 D after sealing soil apply Dual Magnum overtop. If applying in mulched systems, apply 10 D after transplanting. SEEDED: Apply overtop after crop reaches 3".
Actively growing annual and perennial grasses. In general, clethodim is more effective on perennial weeds like bermuda grass.	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 30 D	Label requires addition of 1 qt of COC/A. Crop oil increases potential for injury. Do not apply more than 3 pt/A/season. Do not mix with other pesticides.
	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.12 0.07-0.12 0.07-0.12	24 H/ 30 D	Section 24(c) Special Local Need Label for Georiga allows an application of SelectMax without the addition of an adjuvant; applying SelectMax at 9-10 fl oz/A when grasses are less than 3" is the best option for control while minimizing injury potential. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, label requires addition of 1 gal COC/100 gal spray mix; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide within 5 D of clethodim may result in reduced grass control.
Limited weed spectrum such as clover, sowthistle, cocklebur, ragweed.	<i>clopyralid</i> Stinger 3EC	4	0.25-0.5 pt	0.09-0.19	12 H/ 30 D	Labeled for broccoli, cabbage, cauliflower, broccoli raab, brussels sprouts, cavalo broccoli, Chinese cabbage (bok choy), Chinese broccoli, Chinese mustard, and Chinese cabbage (Napa). Apply to crop when weeds are small and actively growing. Do not exceed 0.5 pt/A/yr. Review rotational restrictions.

COMMERCIAL VEGETABLES-WEED CONTROL

COLE CROPS (Broccoli, Cabbage, Cauliflower)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
COLE CROPS (Broccoli, Cabbage, Cauliflower): ROW MIDDLE SPRAYS						
Most emerged weeds except for resistant pigweed, primrose or spiderwort.	<i>glyphosate</i> 4 SL (3 lb ae) 5.5 SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA suggests against hooded sprays because of drift potential. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant varies by brand.
Morningglory, spiderwort, and very small pigweed less than 1".	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in the row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix.

COLE CROPS (Cabbage Only)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
COLE CROPS (Cabbage ONLY): ROW MIDDLE SPRAY						
Annual grass and broadleaf weeds; weak on pigweed.	<i>clomazone</i> Command 3ME	14	0.67-0.75 pt	0.25-0.28	12 H/ 45 D	Transplanted cabbage only. Prepare land, apply clomazone, irrigate, and then wait 3 d (need a sunny day) before transplanting. Roots of the transplants must be below the chemical barrier. Some plant whitening will likely occur. See label about rotation restrictions.
COLE CROPS (Cabbage ONLY): ROW MIDDLE SPRAY						
Excellent residual for pigweeds, purslane, beggarweed, and other broadleaf weeds; include a labeled tank mix partner for improved grass control.	<i>flumioxazin</i> Chateau 51WDG	14	up to 3 oz	up to 0.096	12 H/ NA	Cabbage Only. Row middle applications in RAISED BED (at least 24" wide and at least 4" tall) plasticulture only. Third Party Indemnification Label Available ONLY Through The Georgia Fruit and Vegetable Growers Association. Growers must obtain label to receive the appropriate application procedures (and to be legal); failure to follow these procedures will likely result in crop death. <ol style="list-style-type: none"> 1. Spray must remain between raised beds; spray can contact no more than the bottom 1" of the side of the mulched bed. 2. Must apply before transplanting. 3. Hooded sprayer. 4. Rainfall required after application but before transplanting. 5. Severe injury expected if spray contacts the top of the mulch.

COMMERCIAL VEGETABLES-WEED CONTROL

CORN (Sweet)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CORN (SWEET): PREPLANT						
Contact kill of all green foliage; annual weeds should be less than 3".	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2 SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Apply to emerged weeds but before crop emergence. Add 1 qt NIS or 1 gal COC/100 gal spray mix.
Most emerged weeds except for resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4 SL (3 lb ae) 5.5 SL (4.5 lb ae)	9	32-64 fl oz 22-44 fl oz	0.75-1.5 lb ae	4 H/ NA	Apply to emerged weeds at least 3 D before seeding. Do not feed crop residue to livestock for 8 weeks following treatment. The need for an adjuvant depends on brand used.
Morningglory, spiderwort, and small pigweed less than 1".	<i>carfentrazone</i> Aim EC 2EC	14	0.8-2 fl oz	0.013-0.031	12 H/ NA	Apply prior to planting to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Likely need to mix with glyphosate.
CORN (SWEET): PREPLANT INCORPORATED						
Nutsedge suppression plus grasses and broadleaves including panicum and seedling johnsongrass.	<i>EPTC</i> Eradicane 6.7EC	8	4.75 pt	4	12 H/ NA	Apply and incorporate immediately just prior to planting. Application and incorporation gives best control. A 2 pass incorporation required for nutsedge. Crop injury and reduced weed control may occur early in the growing season when conditions are cool and wet.
CORN (SWEET): PREEMERGENCE						
Residual control of grass and broadleaves including pigweeds, purslane, and spiderwort.	<i>alachlor</i> Micro-Tech 4FME	15	2-2.75 qt	2-2.75	12 H/ NA	Apply to soil surface immediately after planting. Use low rate on coarse textured soils and higher rates on medium textured soils. High rates improve control of ragweed and lambsquarters.
	<i>S-metolachlor</i> Dual II Mag. 7.64EC	15	1-1.33 pt	0.95-1.27	24 H/ 30 D	Apply to soil surface immediately after planting. Use lower rates on coarse soils and/or if organic matter is less than 3%. In addition to the PRE, one may apply up to another 2 pt/A POST after corn emergence. <i>In harsh conditions, Dual II Magnum is safer than Micro-Tech or Outlook and much safer than Dual Magnum.</i>
Most annual broadleaf and grass weeds.	<i>atrazine</i> various brands 4L 90WDG	5	1-2 qt 1.1-2.2 lb	1-2	12 H/ NA	Apply to the soil surface immediately after planting. Does not control fall panicum or smooth crabgrass. Check label for rotational restrictions. Do not apply more than 2.5 lb ai/A/yr with PRE+POST. <i>Atrazine is recommended for all acres except where carryover is an issue.</i>
	<i>simazine</i> Princep 4 L Princep Caliber 90WDG	5	1-1.2 qt 1.1-1.3 lb	1-1.2	48 H/ 45 D	Apply to soil surface immediately after planting. See label for directions and rotational restrictions.

COMMERCIAL VEGETABLES-WEED CONTROL

CORN (Sweet)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CORN (SWEET): PREEMERGENCE (continued)						
Most annual broadleaf and grass weeds. (continued)	<i>alachlor + atrazine</i> Bullet, Lariat 4 F	15 + 5	2.5-3.75 qt	1.5-2.3 + 0.9-1.4	12 H/ NA	Apply to soil surface immediately after planting. Use lower rates on coarse soils and/or with less than 3% organic matter. Do not make more than one application per year. Check label for rotational restrictions.
	<i>S-metolachlor</i> + <i>atrazine</i> Bicep II Magnum, Bicep II Magnum FC 5.5 F	15 + 5	1.3-2.6 qt	0.78-1.56 + 1-2	24 H/ NA	Apply to soil surface immediately after planting. Use lower rates on coarse soils and/or with less than 3% organic matter. Check label for rotational restrictions.
	<i>S-metolachlor</i> + <i>atrazine</i> + <i>mesotrione</i> Lexar 3.75F	15 + 5 + 27	3 qt	1.31 + 1.31 + 0.17	24 H/ NA	Apply to soil surface immediately after planting. Check label for rotational restrictions. Do not apply organophosphate or carbamate insecticides within 7 D of Lexar as severe injury can occur. Experiment on limited acres as only a small percentage of cultivars have been tested with mesotrione.
CORN (SWEET): POSTEMERGENCE						
Most annual broadleaf weeds; grasses less than 1".	<i>atrazine</i> 4L 90WDG	5	1-2 qt 1.1-2.2 lb	1-2	12 H/ NA	Apply overtop before corn exceeds 12 in. in height. Addition of COC improves activity on weeds but may result in some foliar burn of the crop. See label for rotational concerns and the amount of crop oil needed. If a PRE treatment was used, do not exceed a total of 2.5 lbs/ai/A per calendar year.
Most weeds except resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> Roundup Weather Max 5.5SL 4.5 lb ae	9	22-32 fl oz	0.75-1.13 lb ae	4 H/ 30 D	ROUNDUP READY SWEET CORN ONLY. Apply overtop from emergence through 8 visible leaf collars or until sweet corn reaches 30", whichever comes first. After implementing a sound at-plant residual herbicide program make either: 1 application of WeatherMax at 32 oz/A mixed with atrazine (atrazine must be applied prior to 12" tall corn), OR Make 2 applications of Roundup WeatherMax at 22 oz/A if atrazine carryover is a concern. Allow at least 10 D between in-crop applications. Do not exceed 44 fl oz for in-crop applications.
Annual broadleaf weeds including pigweeds; limited data experiment on small acres.	<i>mesotrione</i> Callisto 4L	27	3 fl oz	0.094	12 H/ 45 D	Apply overtop up to the 8-leaf corn to actively growing small weeds (less than 4"). Addition of NIS at 1 qt/100 gals of spray mix is recommended, however COC may be used at 1 gal/100 gals of spray mix. A crop oil will increase weed control but may increase corn injury. Rotation to peas, beans, cucurbits and most other vegetables is 18 months. Do not apply any organophosphate or carbamate insecticide within 7 D of mesotrione as severe injury can occur.
Residual control of annual grasses and small-seeded broadleaf weeds; does not control emerged weeds.	<i>pendimethalin</i> Prowl 3.3 EC Prowl H20 3.8 AS	3	1.8-2.4 pt 2 pt	0.75-1 0.9	24 H/ NA	May be applied from early postemergence until sweet corn is 24" tall or has 8 visible leaf collars (V8), whichever is more restrictive. Drop nozzles would be more effective in larger corn. Do not apply in reduced tillage programs. Control may be poor if activation does not occur within 24 H of application.

COMMERCIAL VEGETABLES-WEED CONTROL

CORN (Sweet)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CORN (SWEET): POSTEMERGENCE (continued)						
Control of small emerged weeds plus excellent residual control including Texas millet; will not control emerged grasses over 0.25" consistently.	<i>pendimethalin</i> Prowl 3.3EC + <i>atrazine</i> AAtrex 4F	3 + 5	1.8-2.4 pt + 1-2 qt	0.75-1 + 1-2	24 H/ NA	<u>When using Prowl:</u> Apply tank mix from early postemergence until corn is 12" tall or has 8 visible leaf collars whichever is more restrictive. Prowl will not control emerged weeds; atrazine rarely controls emerged grasses larger than 1". Activation needed within 24 H of application for Prowl.
	<i>S-metolachlor</i> Dual II Mag. 7.64EC + <i>atrazine</i> AAtrex 4L AAtrex 90WDG	15 + 5	1-1.67 pt + 1-2 qt 1.1-2.2 lb	0.95-1.6 + 1-2	24 H/ 30 D	Apply overtop of corn (5" or less) before weeds exceed the 2-leaf stage. Also available as the commercial product Bicep II Magnum. Check label for rotational restrictions. Do not exceed a total of 2.5 lbs ai atrazine/yr. Do not exceed a total of 2 pt/A of Dual Magnum POST to corn.
Cocklebur, common ragweed, jimsonweed, smallflower morningglory.	<i>bentazon</i> Basagran 4SL	6	1-2 pt	0.5-1	48 H/ NA	Apply when corn has 1 to 5 leaves. Add COC at 1 qt/A.
Limited weed spectrum such as clover, sowthistle, cocklebur, and ragweed.	<i>clopyralid</i> Stinger 3EC	4	0.3-0.67 pt	0.13-0.25	12 H/ 30 D	Apply to sweet corn used for processing only . Apply after sweet corn emergence up to 18" tall with weeds less than 5 leaf and actively growing. Will control most legumes. Do not exceed 0.67 pt/A/year. See label about rotation restrictions.
Cocklebur, pigweed, lambsquarters, morningglory, sicklepod, and many other annual broadleaf weeds.	<i>2,4-D amine</i> (various brands) 3.8SL	4	0.5-1 pt	0.24-0.48	48 H/ 45 D	Significant injury expected. Suggest not using unless crop loss from weeds is certain. Use 0.25 lb ai when corn is 4-5" tall and weeds are small. Increase rate to 0.5 lb ai as corn reaches 8". Use drop nozzles and direct spray toward base of corn. Do not apply overtop. Do not use additives. Reduce rate of 2,4-D if extremely hot and soil is wet. Do not cultivate for at least 10 D after application as corn may be brittle. Do not apply within weeks of tasseling. Do not make more than 1 POST application/season. Be careful to avoid drift to sensitive crops.
Nutsedge, cocklebur, passionflower (maypop), non- ALS resistant 1" pigweed.	<i>halosulfuron</i> Sanda 75DG	2	0.67 oz	0.032	12 H/ 30 D	Apply overtop or with drop nozzles to sweet corn from spike to layby for control of emerged weeds. Add NIS at 1qt/100 gal of spray mix. Not recommended for "Jubilee". Any injury arising from the use of halosulfuron is the responsibility of the grower. See label for tank mix partners including atrazine. Review rotational restrictions. Do not make more than 2 applications/year.

COMMERCIAL VEGETABLES-WEED CONTROL

CORN (Sweet)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CORN (SWEET): POSTEMERGENCE (continued)						
Small pigweeds less than 2" and the best option for 1-2" Texas millet; <i>the best option for controlling emerged grasses without hurting crop.</i>	<i>tembotrione</i> Laudis 3.5SC	27	3 fl oz	0.082	12 H/ NA	Apply once from emergence to V7 stage of growth. Should be tank-mixed with atrazine at 0.5 lb ai/A if corn is less than 12 in. Use a methylated seed oil at 1% v/v and nitrogen (1.5 qt/A UAN or 1.5 lb/AAMS). Rain-free period is 1 hour. Label rotational restrictions are 18 months to most vegetable crops. DO NOT apply to Merit or Shogun cultivars. With new cultivars try on limited acres until crop tolerance experience is obtained.
Small pigweeds, nightshade, common ragweed, and very small crabgrass.	<i>topramezone</i> Impact 2.8L	27	0.75 fl oz	0.016	12 H/ 45 D	Apply to weeds smaller than 3". The addition of a methylated seed oil or crop oil concentrate that contains at least 14% emulsifiers and 80% oil must be used at a rate of 1-1.5% v/v. Rotation is 18 months to vegetables, 9 months to cotton, peanut, potato, sorghum, soybean, and 3 months to wheat, barley, oats, and rye. Mixtures with atrazine are far more effective than when applied alone. Limited research, try on few acres only.
CORN (SWEET): ROW MIDDLE SPRAYS						
Contact kill of annual grasses and broadleaf weeds.	<i>paraquat</i> FirestormParazone 3SL Gramoxone Inteon 2SL	22	0.75-1.3 pt 1-2 pt	0.28-0.49	24 H/ --	Do not apply overtop or corn will likely be completely killed. Suggest application as hooded spray only. Severe damage and/or complete kill is likely if spray contacts corn plants! This application should only be made as a salvage treatment. Add a NIS at a rate of 2 pt/100 gal of spray mix.
Morningglory, spiderwort, and small pigweed less than 1".	<i>carfentrazone</i> Aim 2EC	14	0.5-1 fl oz	0.008-0.016	12 H/ NA	Suggest as directed application only. If leaf contact occurs, significant leaf speckling and necrosis will occur in hot, humid conditions; however, crop will fully recover. Apply to sensitive weeds 3" or less; pigweeds less than 1". Add 1 qt NIS/100 gal spray mix. Mixing with atrazine improves control. Do not apply more than 2 oz/A per season including preplant applications. Do not apply after 14 leaf collars.

COMMERCIAL VEGETABLES-WEED CONTROL

CUCURBITS

Recommended Herbicide Uses in Specific Cucurbit Crops		Cucurbit					
Herbicide	Application Method*	Cantaloupe (muskmelon)	Cucumber	Pumpkin	Summer Squash	Winter Squash	Watermelon
<i>carfentrazone</i> Aim EC	Preplant	X	X	X	X	X	X
<i>paraquat</i> (numerous)	Preplant	X	X	X	X	X	X
<i>pyraflufen</i> ET	Preplant	X	X	X	X	X	X
<i>glyphosate</i> Roundup, others	Preplant	X	X	X	X	X	X
<i>fomesafen</i> Reflex	Preplant or PRE			X	X		X
<i>bensulide</i> Prefar	PPI or PRE	X	X	X	X	X	X
<i>clomazone</i> Command 3 ME	PRE	X	X		X	X	X
<i>ethalfuralin</i> Curbit	PRE	X	X	X	X	X	X
<i>ethalfuralin</i> + <i>clomazone</i> Strategy	PRE	X	X	X	X	X	X
<i>halosulfuron</i> Sandea	PRE	X	X	X		X	X
<i>terbacil</i> Sinbar	PRE						X
<i>halosulfuron</i> Sandea	POST	X	X	X		X	
<i>S-metolachlor</i> Dual Magnum	POST			X			
<i>clethodim</i> Select, Select Max, TapOut	POST	X	X	X	X	X	X
<i>sethoxydim</i> Poast	POST	X	X	X	X	X	X
<i>carfentrazone</i> Aim EC	Row middles only	X	X	X	X	X	X
<i>flumioxazin</i> Chateau	Row middles only	X	X	X	X	X	X
<i>glyphosate</i> Roundup, others	Row middles only	X	X	X	X	X	X
<i>halosulfuron</i> Sandea	Row middles	X	X	X	X	X	X
<i>paraquat</i> Gramoxone Inteon	Row middles only	X	X	X	X	X	X
<i>S-metolachlor</i> Dual Magnum	Row middle only	X		X			X
<i>trifluralin</i> Treflan HFP	Row middles only	X	X	X	X	X	X

*PPI = preplant incorporated; PRE = preemergence; POST = postemergence.

COMMERCIAL VEGETABLES-WEED CONTROL

CUCURBITS (Cantaloupe, Cucumber, Pumpkin, Summer and Winter Squash, Watermelon)

CUCURBIT TYPE LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CUCURBITS: PREPLANT (Refer to column 1 for specific herbicide labeled for each cucurbit)							
Cantaloupe Cucumber Pumpkin Summer Squash Winter Squash Watermelon	Suppression or control of most annual grasses and broadleaf weeds. Full rate will provide about 80% control of nutsedge if applied properly.	<i>metam sodium</i> Vapam HL 42%	Fumigant	45-75 gal	19-31.5	5 D/ NA	Rates are dependent on soil type and weeds present. Apply when soil moisture is near field capacity (60-80%). Apply through soil injection preferably shanking the product to a depth of 4" using knives spaced 4" apart; follow immediately with a bed shaper, roller, or other method to smooth and compact the soil surface. If irrigation is available, irrigate with at least 0.25" and/or cover with tarp immediately. If using irrigation to seal soil, sequential irrigations are needed for the first week. May apply through drip irrigation prior to planting a second, third, or fourth crop on mulch. Plant back interval is often 14-21 D and can be 30 D in some environments. May also apply preplant through center pivot but must follow serious buffer restrictions noted on label. <u>Labels require buffer restrictions, additional worker protection safety procedures, and a fumigant management plan; study this label closely which can be found at www.cdms.net.</u>
	Contact kill of all green foliage.	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Apply to emerged weeds but before crop emergence or transplanting. Add 1 qt NIS or 1 gal COC/100 gal spray mix. If applying over plastic, must wash off with 0.5" of rain or irrigation prior to planting.
	Most emerged weeds except for resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-64 fl oz 22-44 fl oz	0.75-2.25 lb ae	4 H/ NA	In bareground, apply at least 3 D prior to planting. In plastic, apply at least 7 D prior to planting and mulch must be washed off with 0.5" rain/irrigation prior to planting. Adjuvant needs depend on brand used.
	Morningglory, spiderwort, and small pigweed less than 1".	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ NA	Transplants only. Apply prior to planting to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Likely need to mix with glyphosate. If applied over plastic mulch, a single 0.5" irrigation/rain event plus a 7 D waiting period is needed before transplanting.
	Morningglory and small pigweed less than 1".	<i>pyraflufen ethyl</i> ET 0.208L	14	1-2 fl oz	0.0016-0.0032	12 H/ NA	Bareground. Wait 1 D following preplant bumdown application before planting. Mulch Production. May apply over mulch; however, a single 0.5" irrigation/rain event plus a 7 D waiting period is needed before transplanting.

COMMERCIAL VEGETABLES-WEED CONTROL

CUCURBITS (Cantaloupe, Cucumber, Pumpkin, Summer and Winter Squash, Watermelon)

CUCURBIT TYPE LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CUCURBITS: PREPLANT FOR CANTALOUPE-COTTON INTERCROPPING ONLY							
Cantaloupe-Cotton intercropping only.	Annual grass and broadleaf weeds including purslane and pigweed.	<i>trifluralin</i> Treflan 4EC	3	1-1.5 pt	0.5-0.75	12 H/ 30 D	A state 2(ee) label for GA only. After laying mulch without holes and developing a bed facilitating herbicide wash off; apply in combination with Roundup or Gramoxone and then irrigate with at least 0.5" between 12-24 H after application. Irrigation will activate trifluralin and remove herbicides from mulch. If using Roundup apply at least 7 D prior to transplant; for Gramoxone at least 1 D prior to transplant. Maximum use rate for season is 1.5-2 pt/A; depending on soil type, see label.
CUCURBITS: PREPLANT OR PREPLANT INCORPORATED (Refer to column 1 for specific herbicide labeled for each cucurbit)							
Cantaloupe Cucumber Pumpkin Summer Squash Winter Squash Watermelon	Suppresses annual grasses and small-seeded broadleaf weeds such as pigweeds.	<i>bensulide</i> Prefar 4E	8	5-6 qt	5-6	12 H/ NA	Apply preplant and soil incorporate 1" deep before planting, or apply preemergence and follow with irrigation within 24 H. Check replant restrictions for small grains and other crops on label.
CUCURBITS: PREPLANT OR PREEMERGENCE (Refer to column 1 for specific herbicide labeled for each cucurbit)							
Pumpkin Summer Squash Watermelon (Not for use in cucumber or cantaloupe; severe injury would likely occur)	Pigweeds, wild radish, bristly starbur, and suppression of yellow nutsedge. Evaluate rotation restrictions on label before use.	<i>fomesafen</i> Reflex 2EC	14	Watermelon: 12 fl oz Squash: 8 fl oz	0.19 0.13	24 H/ NA	Watermelon and Summer Squash Only. A Section 24(c) Local Need Label must be obtained at www.farmassist.com prior to this use. Mulch transplants or seeds: May apply under mulch as long as plastic laying process does not disturb treated soil; thus, do not apply prior to laying drip or forming bed. May apply over mulch as long as the mulch is washed with 0.5" rainfall/irrigation in a single event prior to punching holes and planting; bed formation must allow herbicide to wash off the mulch and not concentrate in low areas on the mulch. Bareground transplant: Prepare land for planting; apply Reflex; lightly irrigate to activate herbicide and move it into soil; and then prepare plant holes and plant. Bareground seeded: Apply within 1 D of planting; lightly irrigate after application but at least 36 H prior to emergence. Row middle: Must apply prior to crop emergence or transplanting. May use up to 16 oz/A in watermelon and up to 12 oz/A in squash. Squash types include straight neck yellow, crooked neck yellow and zucchini types only. More research is being conducted on other squash types for potential label expansion.
				Pumpkin: 8-10 fl oz	0.13-0.16		Pumpkin Only. A Section 24(c) Local Need Label must be obtained at www.farmassist.com prior to this use. Bareground transplants: Prepare land for planting; apply Reflex; lightly irrigate to activate herbicide and move it into soil; and then prepare plant holes and plant. Bareground seeded: Apply within 1 D of planting; lightly irrigate after application but at least 36 H prior to emergence. Row middle: Must apply prior to crop emergence or transplanting; may use 12 oz/A.

COMMERCIAL VEGETABLES-WEED CONTROL

CUCURBITS (Cantaloupe, Cucumber, Pumpkin, Summer and Winter Squash, Watermelon)

CUCURBIT TYPE LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CUCURBITS: PREPLANT OR PREEMERGENCE (Refer to column 1 for specific herbicide labeled for each cucurbit) (continued)							
Cantaloupe Cucumber Pumpkin Winter Squash Watermelon <i>(Not for use in summer squash)</i>	Nutsedge suppression, non-ALS resistant pigweed, wild radish, and ragweed control.	<i>halosulfuron</i> Sandeia 75DG	2	0.5-0.75 oz	0.024-0.036	12 H/ 30 D	Pumpkin is very sensitive and injury is almost certain at these rates on sandy soils. Winter squash has not been thoroughly tested in GA; however, initial data also suggest significant injury is expected. UGA suggests avoiding use in pumpkin or any squash type without a lot of experience; for other crops, stunting occasionally occurs but should be short lived with no noted yield effects in favorable growing conditions. Apply 7 D prior to transplanting or seeding <u>in plasticulture</u> . Application may also be made to preformed beds prior to laying plastic, do not disturb bed when laying plastic. In <u>bareground production</u> , apply after seeding but prior to soil cracking; for transplants, wait 7 D after application before transplanting. Review rotational restrictions. Do not exceed 2 oz/crop cycle for cantaloupe and cucumber and 1 oz/crop cycle for pumpkin, winter squash and watermelon. Crop cycle and year (includes PRE, POST, and hooded applications).
Watermelon ONLY <i>Other cucurbits will likely die</i>	Morningglory and pigweed suppression; very effective with Reflex.	<i>terbacil</i> Sinbar 80WP	5	2-4 oz	0.1-0.2	12 H/ 70 D	Watermelon only. Apply prior to transplanting or immediately after seeding. DO NOT apply ovetop of the crop. May be applied under plastic mulch (avoid soil movement while laying plastic). May be applied over mulch without holes but must be washed off of mulch with at least 0.5" rain/irrigation in a single event prior to punching holes and transplanting.
CUCURBITS: PREEMERGENCE (Refer to column 1 for specific herbicide labeled for each cucurbit)							
Cantaloupe Cucumber Summer Squash Winter Squash Watermelon <i>(For processing pumpkin only, see label for numerous restrictions.)</i>	Suppression of annual grasses and some broadleaf weeds; weak on pigweed and morningglory.	<i>clomazone</i> Command 3ME	13	See Remarks	0.15-0.75 (see remarks)	12 H/ 45 D	USE RATES PER CROP: Cantaloupe: 0.4-0.67 pt/A Cucumber: 0.4-1 pt/A Summer Squash*: 0.67-1.3 pt/A Winter Squash*: 0.67-2 pt/A (no Georgia research, try only on a few acres) Watermelon: 0.4-0.67 pt/A Apply immediately after seeding or just prior to transplanting. Roots of transplants must be below the chemical barriers when planting. See label for buffer and rotation restrictions. At this use rate, Command should be only a component of a weed management system. *The label restricts clomazone use on some squash cultivars, see label before use.
Cantaloupe Cucumber Pumpkin Summer Squash Winter Squash Watermelon	Annual grasses and small-seeded broadleaf weeds such as pigweeds.	<i>ethalfluralin</i> Curbit 3EC	3	1-1.5 pt	0.38-0.56	24 H/ NA	Apply immediately after seeding but before crop and weeds emerge. Do not apply prior to seeding and do not incorporate. Do not use under mulch. If rainfall does not occur within 2 D of application, irrigate as needed. Labels do not allow application over transplants; only in row middles of transplanted crop. If applying in row middles can use higher rate, see label. Avoid applications when periods of cool, moist conditions exist prior to emergence to prevent crop injury. Injury can also be observed if planted too shallow. Suggested use rates are lower than recommended due to injury potential. See label about rotation and buffer restrictions for clomazone. Clomazone label restricts pumpkin use to processing only and also prohibits use on several squash cultivars, see label before using in pumpkin or squash.
		<i>ethalfluralin</i> + <i>clomazone</i> Strategy 2.1L	3 + 13	2-3 pt	0.4-0.6 + 0.13- 0.18	24 H/ NA	

COMMERCIAL VEGETABLES-WEED CONTROL

CUCURBITS (Cantaloupe, Cucumber, Pumpkin, Summer and Winter Squash, Watermelon)

CUCURBIT TYPE LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CUCURBITS: POSTEMERGENCE (Refer to column 1 for specific herbicide labeled for each cucurbit)							
Cantaloupe Cucumber Pumpkin Winter Squash <i>(Not labeled for summer squash or watermelon)</i>	Yellow and purple nutsedge, ragweed, cocklebur, and wild radish. Residual control of radish and pigweed.	<i>halosulfuron</i> Sanda 75DG	2	0.5-0.67 oz	0.024-0.032	12 H/ Cucumber, Pumpkin, Winter Squash = 30 D Cantaloupe = 57 D	Limited research on winter squash; however, results so far have noted up to 35% stunting of winter squash. Research has also shown up to 25% stunting on pumpkin. Injury for winter squash and pumpkin has noted up to 1 week delayed maturity. Thus, UGA suggests not using overtop of winter squash or pumpkin but rather using a directed spray. Label allows applications after seeded crop has reached the 3rd true leaf for cantaloupe and cucumber, and has reached the 4th true leaf for pumpkin and winter squash but before flowering. Apply to transplants no sooner than 14 D after transplanting, may apply overtop of plastic mulch. Add NIS at 1 qt/100 gal of spray solution for adequate weed control; adjuvant does increase injury. Review rotational restrictions. Do not exceed 2 oz/crop cycle for cantaloupe and cucumber and 1 oz/crop cycle for pumpkin or winter squash. A crop cycle includes PRE + POST + Row Middle.
Pumpkin Only	Residual control of pigweed, purslane, spiderwort, and grasses.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	8-12 fl oz	0.47-0.7	24 H/ 60 D	Pumpkin Only. A Section 24(c) Local Need Label must be obtained at www.farmassist.com prior to this use. New label; limit acres treated. Bareground seeded: Apply topically or directed once pumpkin reach 4 inch. Bareground transplant: After planting, immediately irrigate to seal soil around root ball and then apply topically or directed 10-14 days later. Mulch seeded: Apply topically or directed once pumpkins reach 3". Mulch transplant: Apply topically or directed 7-10 days after transplant. Row middles: Rate can be increased to 1.33 pt/A when applied between rows. Avoid applications to wet plants including dew. Apply Dual only in water.
CUCURBITS: POSTEMERGENCE GRASSES (Refer to column 1 for specific herbicide labeled for each cucurbit)							
Cantaloupe Cucumber Pumpkin Summer Squash Winter Squash Watermelon	Actively growing annual and perennial grasses. Clethodim is usually more effective on perennial grasses such as bermuda grass.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.12 0.07-0.12 0.07-0.12	24 H/ 14 D	A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, add 1 gal COC/100 gal spray mix according to the label; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control.
		<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ Cantaloupe = 3 D Others = 14 D	Add 1 qt of COC/A according to the label. Adding crop oil increases injury potential. Do not apply more than 3 pt/A/season sethoxydim. Do not mix with other pesticides. Do not cultivate within 5 D of application.

COMMERCIAL VEGETABLES-WEED CONTROL

CUCURBITS (Cantaloupe, Cucumber, Pumpkin, Summer and Winter Squash, Watermelon)

CUCURBIT TYPE LABELED FOR USE	WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
				AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
CUCURBITS: ROW MIDDLE SHIELDED or HOODED SPRAYS (Refer to column 1 for specific herbicide labeled for each cucurbit)							
Cantaloupe Pumpkin Watermelon (Not labeled for any squash type)	Residual control of pigweed, purslane, spiderwort, and grasses.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	12 oz	0.7	24 H/ 60 D	A Section 24(c) Local Need Label must be obtained at www.farmassist.com prior to use. Bareground row middles: Apply between crop rows; avoid contact with the crop or with soil within 6" of the crop root ball. Mulch row middles: Do not allow spray to contact crop or top of mulched bed; avoid contact of soil within 6" of the crop root ball.
Cantaloupe Cucumber Pumpkin Summer Squash Winter Squash Watermelon	Residual control of annual grasses and small-seeded broadleaf weeds.	<i>trifluralin</i> Treflan 4EC Trifluralin 4L	3	1-1.5 pt	0.5-0.75	24 H/ 30 D; except Watermelon = 60 D	Apply as a directed spray in row middles when plants have reached the 3-4 true leaf stage of growth. Avoid direct crop contact and incorporate immediately. Incorporation equipment may be set to move treated soil around the plant base. Maximum use rate for season is 1.5-2 pt; depending on soil type, see label.
	Purple & yellow nutsedge, wild radish, ragweed. Residual control of radish and pigweed.	<i>halosulfuron</i> Sanda 75DG	2	0.75-1 oz	0.036-0.048	12 H/ Cantaloupe and Watermelon=57 D all others=30 D	Apply between crop rows avoiding spray contact with crop. Add a NIS at 1 qt/100 gals of spray. Review rotational restrictions. Do not exceed 2 oz/crop cycle for cantaloupe and cucumber and 1 oz/crop cycle for pumpkin, squash, and watermelon. A crop cycle is PRE, POST, and Row Middle.
CUCURBITS: ROW MIDDLE HOODED SPRAYS (Refer to column 1 for specific herbicide labeled for each cucurbit)							
Cantaloupe Cucumber Pumpkin Summer Squash Winter Squash Watermelon	Contact kill of emerged annual weeds less than 3".	<i>paraquat</i> Gramoxone Inteon 2SL	22	1.95 pt	0.5	24 H/ --	Use precision hooded application equipment adjusted to prevent spray contact with crop plants. Add a NIS at a rate of 2 pt/100 gal of spray mix. Do not exceed 30 psi nozzle pressure or spray under conditions which may cause drift. Do not make more than 3 applications/yr.
	Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Labeled as a hooded spray or wiper application in row middle; UGA does not recommend hooded sprays once the crop is planted because drift is likely. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant depends on brand used.
	Morningglory, spiderwort, and pigweed less than 1".	<i>carfentrazone</i> Aim EC 2EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in row middles before any fruit is present. Do not allow herbicide to contact the crop. Apply to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Speckling of crop leaves should be expected from drift.
	Excellent residual for pigweeds, purslane, beggarweed, and other broadleaf weeds.	<i>flumioxazin</i> Chateau 51WDG	14	up to 4 oz	up to 0.127	12 H/ NA	Row middle applications in RAISED BED (at least 24" wide and at least 4" tall) plasticulture only. Third Party Indemnification Label Available ONLY Through The Georgia Fruit and Vegetable Growers Association. Growers must obtain label to receive the appropriate application procedures (and to be legal); failure to follow these procedures will likely result in crop death. 1) Spray must remain between raised beds; spray can contact no more than the bottom 1" of the side of the mulched bed. 2) Must apply before transplanting. 3) Hooded sprayer. 4) Rainfall required after application but before transplanting. 5) Severe injury expected if spray contacts top of mulch.

COMMERCIAL VEGETABLES-WEED CONTROL

EGGPLANT

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
EGGPLANT: PREPLANT						
Suppression or control of most annual grasses and broadleaf weeds. Full rate will provide about 80% nutsedge control; greater control is achieved when used in a system with chloropicrin.	<i>metam sodium</i> Vapam HL 42%	Fumigant	45-75 gal	19-31.5	5 D/ NA	Rates are dependent on soil type and weeds present. Apply when soil moisture is near field capacity (60-80%). Apply through soil injection preferably shanking the product to a depth of 4" using knives spaced 4" apart; follow immediately with a final bed press, roller, or other method to smooth and compact the soil surface. If irrigation is available, irrigate with at least 0.25" and/or cover with tarp immediately. May apply through drip irrigation prior to planting a second, third, or fourth crop on mulch. Plant back interval is often 14-21 D and can be 30 D in some environments. For first crop mulch , chloropicrin (150 lb/A broadcast) will also be used in a program with metam to obtain adequate nutsedge control. Visit www.gaweed.com for the latest circular on fumigant systems. <i>New labels require buffer restrictions, additional worker protection safety procedures, and a fumigant management plan; study this label closely.</i>
Contact kill of all green foliage; annual weeds should be 3" or less.	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Apply to emerged weeds but before crop emergence or transplanting. Add 1 qt NIS or 1 gal COC/100 gal spray mix. If applying over plastic, must wash off with 0.5" of rain/irrigation prior to planting. For stale seedbed apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Most emerged weeds except for resistant pigweed; full rate for purslane and nutsedge.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-2.25 lb ae	4 H/ NA	In bareground, apply at least 3 D prior to planting. In plastic, apply at least 7 D prior to planting and mulch must be washed off with 0.5" rain/irrigation prior to planting. Adjuvant needs depend on brand used. For stale seedbed apply glyphosate 7 days prior to planting; follow with paraquat 1 day prior to planting.
Morningglory, spiderwort and pigweed < than 1".	<i>carfentrazone</i> Aim EC 2EC	2	0.8-2 fl oz	0.013-0.03	12 H/ NA	Transplants only. Apply prior to planting to weeds less than 3"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Likely need to mix with glyphosate. If applied over plastic mulch, a single 0.5" irrigation/rain event plus a 7 D waiting period must occur before transplanting.
Morningglory and pigweed < than 1".	<i>pyraflufen ethyl</i> ET 0.208L	2	1-2 fl oz	0.0016-0.0032	12 H/ NA	Include crop oil concentrate at 1% v/v. For bareground : Wait 1 D following preplant burndown application before planting. For mulch production : May apply over mulch; however, a single 0.5" irrigation/rain event plus a 7 D waiting period must occur before transplanting.
EGGPLANT: PREPLANT, PREPLANT INCORPORATED, PREMERGENCE						
Annual grasses, ragweed, smartweed, galinsoga, and suppression of pigweeds.	<i>napropamide</i> Devrinol 50DF Devrinol 2-XT	15	2-4 lb 2-4 qt	1-2	24 H/ NA	Transplants for bareground : Label notes to apply preplant and incorporate into the soil 1-2" before transplanting. Use the lower rate on coarse soils. Transplants in Plasticulture : Apply to the soil surface of preformed beds immediately prior to laying plastic. Ensure the plastic laying process does not incorporate or disturb the treated bed. Soil must be moist for activity. <i>Devrinol is much less likely to cause injury compared to Treflan.</i>
Annual grasses and small-seeded broadleaf weeds.	<i>trifluralin</i> Treflan, others 4EC	3	≤1 pt ≤1 pt	≤0.5	24 H/ NA	BE AWARE that any tillage practices that concentrate trifluralin in the root zone will cause significant stunting and delayed maturity. Similarly, cold and wet conditions will increase injury potential. Eggplant tolerance to trifluralin is marginal unless one can place the root ball below the treated area. NOT RECOMMENDED FOR MULCH SYSTEMS!

COMMERCIAL VEGETABLES-WEED CONTROL

EGGPLANT

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
EGGPLANT: POSTEMERGENCE						
Residual annual grass and small-seeded broadleaf weed control.	<i>DCPA</i> Dacthal W-75 6F	3	6-8 lb 6-8 pt	4.5-6	12 H/ NA	Can be applied over-the-top of transplants 4-6 weeks after transplanting. Can also be applied after direct seeded plants that are 4-6" tall. Does not control emerged weeds.
Actively growing annual and perennial grasses. In general clethodim is more effective on perennial weeds like bermuda grass.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.12 0.07-0.12 0.07-0.12	24 H/ 20 D	A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, add 1 gal COC/100 gal spray mix according to the label; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control.
	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 20 D	Add 1 qt of COC/A. Adding crop oil may increase crop injury at high temperatures. Do not apply more than 4.5 pt/A/season. Do not mix with other pesticides.
EGGPLANT: ROW MIDDLE SHIELD or HOODED SPRAY						
Yellow and purple nutsedge, wild radish, ragweed. Residual radish and pigweed control.	<i>halosulfuron</i> Sanda 75DG	2	0.5-1 oz	0.024-0.048	12 H/ 30 D	Apply to row middles as a preemergence or postemergence spray. Do not allow spray to contact the crop. In plasticulture, do not allow spray to contact plastic. Add a NIS at 1 qt/100 gal spray solution. Review rotational concerns.
EGGPLANT: ROW MIDDLE SHIELD or HOODED SPRAY						
Contact kill of all green foliage; annual weeds less than 3".	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3 pt 2 pt	0.5	24 H/ --	Use hooded application equipment adjusted to prevent spray contact with crop plants. Add a NIS at a rate 2 pt/100 gal of spray mix. Do not exceed 30 psi nozzle pressure or spray under conditions which may cause drift. Do not make more than 3 applications per season.
Most emerged weeds excluding resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4 SL (3 lb ae) 5.5 SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Labeled as a hooded spray or wiper application in row middle; UGA does not recommend hooded sprays as drift is likely to occur. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant depends on brand used.
Excellent residual control for pigweeds, purslane, beggarweed, and other broadleaf weeds. The addition of grass control product is beneficial.	<i>flumioxazin</i> Chateau 51WDG	14	up to 4 oz	up to 0.127	12 H/ NA	Row middle applications in RAISED BED (at least 24" wide and at least 4" tall) plasticulture only. Third Party Indemnification Label Available ONLY Through The Georgia Fruit and Vegetable Growers Association. Growers must obtain label to receive the appropriate application procedures (and to be legal); failure to follow these procedures will likely result in crop death. 1) Spray must remain between raised beds; spray can contact no more than the bottom 1" of the side of the mulched bed. 2) Must apply before transplanting. 3) Hooded sprayer. 4) Rainfall required after application but before transplanting. 5) Severe injury expected if spray contacts top of mulch.
Morningglory, spiderwort, and pigweed < 1".	<i>carfentrazone</i> Aim EC 2 EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix.

COMMERCIAL VEGETABLES-WEED CONTROL

GARLIC

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
GARLIC: PREPLANT						
Contact kill of all green foliage.	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.7-2.7 pt 2.5-4pt	0.64-1	24 H/ NA	Apply to emerged weeds but before crop emergence or transplanting. Add 1 qt NIS or 1 gal COC/100 gal spray mix. For stale seedbed apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Most emerged weeds except for resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-2.25 lb ae	4 H/ NA	Apply to emerged weeds at least 3 D before seeding or transplanting. The need for an adjuvant depends on brand used. For stale seedbed apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
GARLIC: PREPLANT INCORPORATED or PREEMERGENCE						
Annual grasses and small-seeded broadleaf weeds.	<i>bensulide</i> Prefar 4E	8	5-6 qt	5-6	12 H/ NA	Apply PPI to a depth of 1" or apply PRE after planting. With PRE application, irrigate immediately. Poor growing conditions may increase the potential for reduced stands and vigor.
GARLIC: PREEMERGENCE						
Annual grasses and small-seeded broadleaf weeds.	<i>pendimethalin</i> Prowl 3.3EC Prowl H20 3.8AS	3	1.8-2.4 pt 1.5-2 pt	0.75-1 0.72-0.95	24 H/ 45 D	Apply PRE after planting but before weed and crop emergence. Can be applied sequentially by applying PRE followed by a POST application, see label. Does not control emerged weeds. Use lower rates on coarse soils. No Georgia Research.
GARLIC: POSTEMERGENCE						
Residual control of annual grasses and small-seeded broadleaf weeds.	<i>pendimethalin</i> Prowl 3.3EC Pendimax 3.3EC Prowl H20 3.8AS	3	1.8-2.4 pt 1.2-2.4 pt 1.5-2 pt	0.75-1 0.5-1 0.72-0.95	24 H/ 45 D	Apply to garlic in the 1-5-leaf stage but before weed emergence. Can be applied sequentially by applying a PRE followed by a POST application, see label. Use lower rates on coarse soils.
Excellent residual option for henbit, purslane, pigweed, primrose, smartweed, and many others; controls small emerged weeds as well.	<i>oxyfluorfen</i> Goal 2XL 2EC Galigan 2E Goaltender 4F Galigan H20 4F	14	0.5-2 pt 0.5-2 pt 0.25-1 pt 0.25-1 pt	0.125-0.5	24 H/ 60 D	Seeded dry bulb only. Apply 8 fl oz of Goal 2 XL or Galigan 2E (4 oz for Goaltender) to seeded garlic that has at least 2 true leaves. Multiple applications may be made but do not exceed total of 2 pt/A (1 pt/A for Goaltender). Transplant dry bulb only. Suggest making a single application using up to 2 pt/A of Goal 2XL or Galigan (1 pt/A of Goaltender) within 2 D of transplanting but after an irrigation to seal the soil around the root ball. Do not exceed 2 pt/A of Goal 2XL or Galigan (1 pt/A of Goaltender) per crop season. A program with Prowl has shown excellent season long control.
Actively growing annual and perennial grasses.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-16 fl oz 9-32 fl oz 9-32 fl oz	0.09-0.25 0.07-0.25 0.07-0.25	24 H/ 45 D	A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, add 1 gal COC/100 gal spray mix according to the label; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control.

COMMERCIAL VEGETABLES-WEED CONTROL

GARLIC

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
GARLIC: POSTEMERGENCE (continued)						
Actively growing annual and perennial grasses. (continued)	<i>fluzifop-P-butyl</i> Fusilade DX 2 EC	1	6-16 fl oz	0.1-0.25	12 H/ 45 D	Add 1 gal COC or 1 qt NIS/100 gal spray mix. Adding crop oil increases injury potential. Do not apply more than 48 oz/A/season. Do not mix with other pesticides and do not apply a broadleaf herbicide or cultivate within 5 D of application.
	<i>sethoxydim</i> Poast 1.53 EC	1	1-1.5 pt	0.19-0.3	12 H/ 30 D	Add 1 qt of COC/A. Adding crop oil may increase crop injury at high temperatures. Do not apply more than 4.5 pt/A/season. Do not mix with other pesticides. Do not mix with other pesticides and do not apply a broadleaf herbicide or cultivate within 5 D of application.
GARLIC: ROW MIDDLE HOODED SPRAYS						
Most emerged weeds excluding resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4 SL (3 lb ae) 5.5 SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA does not recommend hooded sprays because drift will likely occur. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant depends on brand used.
Morningglory, spiderwort, and pigweed < 1".	<i>carfentrazone</i> Aim EC 2 EC	14	0.8-2 fl oz	0.013-0.031	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Expect some speckling from drift.

GREENS (Collard, Kale, Mustard, Turnip)

Recommended Herbicide Uses in Specific Greens		Crop			
Herbicide	Application Method*	Collard	Kale	Mustard	Turnip
<i>paraquat</i> (numerous)	Preplant	X			X
<i>glyphosate</i> Roundup, others	Preplant	X	X	X	X
<i>bensulide</i> Prefar	PPI or PRE	X	X	X	
<i>trifluralin</i> Treflan HFP, others	PPI	X	X	X	X
<i>DCPA</i> Dacthal	PRE or PPI	X	X	X	X
<i>clethodim</i> Select, SelectMax, TapOut	POST	X	X	X	X
<i>clopyralid</i> Stinger	POST	X	X	X	X
<i>S-metolachlor</i> Dual Magnum	POST	X	X		
<i>sethoxydim</i> Poast	POST	X	X	X	
<i>carfentrazone</i> Aim EC	Row middles only	X	X	X	X
<i>glyphosate</i> Roundup, others	Row middles only	X	X	X	X

*PPI = preplant incorporated; PRE = preemergence; POST = postemergence.

COMMERCIAL VEGETABLES-WEED CONTROL

GREENS (Collard, Kale, Mustard, Turnip)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
GREENS (Collard, Kale, Mustard, Turnip): PREPLANT						
Contact kill of all green foliage; annual weeds less than 3".	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Collard and turnip only. Apply to emerged weeds but before crop emergence or transplanting. Add 1 qt NIS or 1 gal COC/100 gal spray mix. If applying over plastic, must wash off with 0.5" rain/ irrigation prior to planting. For stale seedbed apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Most emerged weeds except resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-1.5 lb ae	4 H/ NA	In bareground, apply at least 3 D prior to planting. In plastic, apply at least 7 D prior to planting and mulch must be washed off with 0.5" rain/irrigation prior to planting. Adjuvant needs depend on brand used. For stale seedbed apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
GREENS (Collard, Kale, Mustard, Turnip): PREPLANT INCORPORATE						
Annual grasses and small-seeded broadleaf weeds.	<i>trifluralin</i> Treflan, others 4EC	3	12-16 fl oz	0.375-0.5	24 H/ NA	Apply and incorporate 2-3" deep before planting. Rates less than 1 pt/A needed on sandy soils with low organic matter or when conditions are cold and wet. Rates higher than provided here can be used on heavier soils, see label. Incorporate within 8 H of application. Do not use on turnip roots that are to be consumed.
GREENS (Collard, Kale, Mustard, Turnip): PREPLANT INCORPORATE or PREEMERGENCE						
Suppresses annual grasses and small-seeded broadleaves.	<i>bensulide</i> Prefar 4E	8	5-6 qt	5-6	12 H/ NA	Not labeled for turnip. Apply PPI to a 1" depth or apply PRE after planting. With PRE application, irrigate immediately. Also labeled for, but not limited to, rape greens, mustard spinach, arugula, cress, endive, parsley, and radicchio. Review rotational restrictions.
GREENS (Collard, Kale, Mustard, Turnip): POSTEMERGENCE						
A few broadleaf weeds including clover, sowthistle, cocklebur, jimsonweed, ragweed; will not control radish.	<i>clotyralid</i> Stinger 3EC	4	0.3-0.5 pt	0.11-0.19	12 H/ 30 D Turnip Tops = 15 D	Also labeled on mizuna, mustard spinach, and rape. Apply to crop when weeds are small and actively growing. Will control most legumes. One application/yr. See label for rotational issues. Minor mustard green injury has been observed in some research trials.
Actively growing annual and perennial grasses. In general clethodim is more effective on perennial grasses such as bermuda grass. Clethodim also controls annual bluegrass.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.13 0.07-0.12 0.07-0.12	24 H/ 14 D Turnip Root = 30 D	A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, add 1 gal COC/100 gal spray mix according to the label; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control.
	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 30 D Mustard = 14 D	Not labeled on turnip. Add 1 qt of COC/A. Adding crop oil may increase crop injury at high temperatures. Do not apply more than 3 pt/A/season. Do not mix with other pesticides.

COMMERCIAL VEGETABLES-WEED CONTROL

GREENS (Collard, Kale, Mustard, Turnip)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
GREENS (Collard and Kale ONLY): POSTEMERGENCE						
Residual control of pigweed, purslane, spiderwort, and grasses.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	10-12 fl oz	0.6-0.7	24 H/ 30 D	COLLARDS AND KALE ONLY. A Section 24(c) Local Need Label must be obtained at www.farmassist.com prior to this use. TRANSPLANTS: After transplanting into bare soil, irrigate to seal soil around root ball. About 10 D after sealing soil, apply Dual Magnum overtop. If applying in mulched systems, apply 10 D after transplanting. SEEDED: Apply overtop after crop reaches 3". ROW MIDDLE: May apply 1.25 pt/A in row middles as a banded application.
GREENS (Collard, Kale, Mustard, Turnip): HOODED ROW MIDDLE SPRAYS						
Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Labeled as a hooded spray or wiper application in row middle; UGA does not recommend hooded sprays as drift often occurs. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant depends on brand used.
Morningglory, spiderwort, and pigweed < 1".	<i>carfentrazone</i> Aim EC 2EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Expect speckling from drift.

LETTUCE

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
LETTUCE: PREPLANT						
Control of most annual grasses and broadleaf weeds, full rate will provide about 80% nutsedge control if applied properly.	<i>metam sodium</i> Vapam HL 42%	Fumigant	45-75 gal	19-31.5	5 D/ NA	Rates are dependent on soil type and weeds present. Apply when soil moisture is near field capacity (60-80%). Apply through soil injection preferably shanking the product to a depth of 4" using knives spaced 4" apart; follow immediately with a bed shaper, roller, or other method to smooth and compact the soil surface. If irrigation is available, irrigate with at least 0.25" and/or cover with tarp immediately. If using irrigation to seal soil, sequential irrigations are needed for the first week. May apply through drip irrigation prior to planting a second, third, or fourth crop on mulch. Plant back interval is often 14-21 D and can be 30 D in some environments. May also apply preplant through center pivot but must follow serious buffer restrictions noted on label. Labels require buffer restrictions, additional worker protection safety procedures, and a fumigant management plan; study this label closely which can be found at www.cdms.net.
Contact kill of all green foliage; annual weeds less than 3".	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Apply to emerged weeds before crop emergence or transplanting. Add 1 qt NIS or 1 gal COC/100 gal spray mix. If applying over plastic, must wash off with 0.5" rain/irrigation prior to planting. For stale seedbed apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.

COMMERCIAL VEGETABLES-WEED CONTROL

LETTUCE

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
LETTUCE: PREPLANT (continued)						
Most emerged weeds except for resistant pigweeds, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-2.25 lb ae	4 H/ NA	In bareground, apply at least 3 D prior to planting. In plastic, apply at least 7 D prior to planting and mulch must be washed off with 0.5" rain/irrigation prior to planting. Adjuvant needs depend on brand used. For stale seedbed apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
LETTUCE: PREPLANT INCORPORATE or PREEMERGENCE						
Suppression of annual grasses and small-seeded broadleaf weeds.	<i>bensulide</i> Prefar 4E	8	5-6 qt	5-6	12 H/ NA	Apply PPI to a depth of 1" or apply PRE after planting. With PRE application, irrigate immediately. See label for more directions and rotational restrictions.
	<i>benefin</i> Balan 60DF	15	2-2.5 lb	1.2-1.5	12 H/ NA	Apply preplant and incorporate 2-3" deep before seeding or transplanting. Use lower rate on coarse soils.
Most annual grasses and broadleaf weeds.	<i>pronamide</i> Kerb 50W Kerb 3.3SC	3	2-4 lb 2.5-5 pt	1-2	24 H/ NA	Head lettuce only. Make one preplant or PRE application. Use less than 3 lb of 50W or 3.75 pt of 3.3 SC on val temp, grande verde and prima verde varieties of crisp head lettuce, or on endive, escarole, or radicchio greens. Consult label for rotational restrictions and other restrictions.
LETTUCE: POSTEMERGENCE						
Most annual grasses and broadleaf weeds.	<i>pronamide</i> Kerb 50W Kerb 3.3SC	3	2-4 lb 2.5-5 pt	1-2	24 H/ NA	Head lettuce only. Apply before weed germination if possible, no later than weeds in the 2-leaf stage. Use lower rates on coarse soil textures and use less than 3 lb on val temp, grande verde and prima verde varieties of crisp head lettuce, or on endive, escarole, or radicchio greens. Make only one application/crop. Consult label for rotational restrictions which are significant.
Actively growing annual and perennial grasses. Clethodim is usually more effective on perennial grasses like bermuda grass and also controls annual bluegrass.	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ See Remarks	Label requires adding 1 qt of COC/A. Adding crop oil increases injury potential. Do not apply more than 3 pt/A/season. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control. Head Lettuce PHI = 30 D; Leaf Lettuce PHI= 15 D.
	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.12 0.07-0.12 0.07-0.12	24 H/ 14 D	Head and Leaf lettuce only. A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, add 1 gal COC/100 gal spray mix according to the label; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control.
LETTUCE: HOODED ROW MIDDLE SPRAYS						
Most weeds except for resistant pigweed, primrose, or spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-64 fl oz 22-44 fl oz	0.75-1.5 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA suggests against hooded sprays. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant varies by brand used.
Morningglory, spiderwort, and pigweed <1".	<i>carfentrazone</i> Aim EC 2EC	14	0.8-2 fl oz	0.013-0.031	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Expect leaf speckling from drift.

COMMERCIAL VEGETABLES-WEED CONTROL

OKRA

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
OKRA: PREPLANT						
Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-2.25 lb ae	4 H/ NA	Apply to emerged weeds but before crop emergence. The need for an adjuvant depends on brand used. For stale seedbed , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Contact kill of green foliage; annual weeds <3”.	<i>paraquat</i> Gramoxone Inteon 2SL	22	2-4 pt	0.5-1	24 H/ NA	Apply to emerged weeds before planting or up to 1 D after planting. Add 1 qt NIS or 1 gal COC/100 gal of spray mix. For stale seedbed , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Morningglory, spiderwort, and pigweed < 1”.	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ NA	Transplants ONLY. Apply prior to planting to weeds less than 2”; pigweed less than 1”. Add 1.5-2 gal COC/100 gal of spray mix. Likely need to mix with glyphosate.
OKRA: PREPLANT INCORPORATE						
Annual grasses and small-seeded broadleaf weeds.	<i>trifluralin</i> Treflan 4EC Trifluralin 4L	3	1-1.5 pt	0.5-0.75	12 H/ NA	Apply and soil incorporate 2-3” deep before planting. Incorporate within 8 H of application. Use lower rates on coarse soils.
OKRA: PREEMERGENCE						
Small seeded broadleaves and annual grasses.	<i>prometryn</i> Caparol 4L	5	1.5-2 pt	0.75-1	12 H/ NA	Apply after planting but before emergence. Less than 10% stunting is expected at 2 pt/A. Apply a max of 1.5 pt/A if a directed Caparol application will be made as well.
OKRA: POSTEMERGENCE						
Actively growing grasses.	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 14 D	Label requires addition of 1 qt of COC/A. Adding crop oil increases injury potential. Do not apply more than 5 pt/A/season. Do not mix with any other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control.
OKRA: POSTEMERGENCE DIRECTED						
Small seeded broadleaves and annual grasses.	<i>prometryn</i> Caparol 4L	5	1.5 pt	0.75	12 H/ 14 D	Direct spray to base of Okra with 7-9 leaves; expect up to 10% chlorosis. There is no mention of adjuvant on the label and an adjuvant would likely increase injury significantly.
OKRA: HOODED ROW MIDDLE SPRAYS						
Most weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles. To avoid severe injury, do not allow herbicide to contact foliage, green shoots, stems, exposed roots, or fruit of crop. The need for an adjuvant depends on brand used.
Contact kill of green foliage; annual weeds < 3”.	<i>paraquat</i> Gramoxone Inteon 2SL	22	2 pt	0.5	24 H/ --	Spray must not contact okra plants. Hooded sprayers must be used. Two applications can be made, allow 14 D interval between the two applications. Add 1 qt NIS or 1 gal COC/100 gal of spray mix.
Morningglory, spiderwort, and pigweed < 1”.	<i>carfentrazone</i> Aim EC 2EC	14	0.8-2 fl oz	0.013-0.031	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow spray to contact crop. Apply to weeds less than 2”; pigweed less than 1”. Add 1.5-2 gal COC/100 gal of spray mix.
Nutsedge, wild radish, ragweed.	<i>halosulfuron</i> Sanda 75DG	2	0.5-1 oz	0.02-0.048	12 H/ --	Apply between rows of seeded or transplanted crop while avoiding contact with crop. Do not apply more than 2 oz/A per crop cycle.

COMMERCIAL VEGETABLES-WEED CONTROL

ONIONS (Dry Bulb & Green)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
ONIONS (Dry Bulb and Green): PREPLANT						
Suppression or control of most annual grasses and broadleaf weeds. Full rate provides about 80% control of nutsedge.	<i>metam sodium</i> Vapam HL 42%	Fumigant	45-75 gal	19-31.5	5 D/ NA	Rates are dependent on soil type and weeds present. Apply when soil moisture is near field capacity (60-80%). Apply through soil injection preferably shanking the product to a depth of 4" using knives spaced 4" apart; follow immediately with a bed shaper, roller, or other method to smooth and compact the soil surface. If irrigation is available, irrigate with at least 0.25" and/or cover with tarp immediately. If using irrigation to seal soil, sequential irrigations are needed for the first week. May apply through drip irrigation prior to planting a second, third, or fourth crop on mulch. Plant back interval is often 14-21 D and can be 30 D in some environments. May also apply preplant through center pivot but must follow serious buffer restrictions noted on label. Labels require buffer restrictions, additional worker protection safety procedures, and a fumigant management plan; study this label closely which can be found at www.cdms.net.
Contact kill of all green foliage; annual weeds < 3"	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.7-2.7 pt 2.5-4 pt	0.64-1	24 H/ NA	Seeded Onion Only. Apply to emerged weeds before crop emergence. Add 1 qt NIS or 1 gal COC/100 gal spray mix. For stale seedbed , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Most emerged weeds except for resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-1.5 lb ae	4 H/ NA	Apply to emerged weeds before seeding or 3 D before seeding or transplanting. The need for an adjuvant depends on brand used. For stale seedbed , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
ONIONS (DRY BULB AND GREEN): PREEMERGENCE						
Annual grasses and small-seeded broadleaf weeds.	<i>DCPA</i> Dacthal W-75 Dacthal 6 F	3	≤ 6-8 lb ≤ 6-8 pt	≤ 4.5-6	12 H/ NA	SEEDING: Apply uniformly over soil after seeding. Incorporate using about 0.25" irrigation; preplant incorporation is not recommended. Contact your local extension office for the most effective weed management program implementing sequential applications at lower rates to avoid crop injury. Injury can occur when onion emergence is delayed under cool or wet conditions. TRANSPLANT: Can apply overtop of plants after transplanting. Better options exist for dry bulb transplant production.
ONIONS (Dry Bulb and Green): POSTEMERGENCE						
Residual control of pigweed, purslane, spiderwort, and grasses.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	8-16 fl oz	0.47-0.96	24 H/ Green Onion = 21 D Dry Bulb = 60 D	SEEDED GREEN OR DRY BULB ONION: Do not apply before 4 leaf stage. From the 4-6-leaf stage may apply 8 oz/A; rate can be increased to 12 oz/A after the 6 leaf stage. TRANSPLANT DRY BULB ONION: Transplant, irrigate to seal soil around the root ball, and then apply within 48 H of planting/sealing soil around onions. Rates of 12-16 fl oz are recommended.
Residual control of pigweed, purslane, spiderwort, and grasses.	<i>dimethenamid</i> Outlook 6 L	15	10-12 fl oz	0.47-0.56	12 H/ 30 D	SEEDED GREEN OR DRY BULB ONION: Label allows application after 2 leaf; between 2-6-leaf apply no more than 10 oz/A; rate can be increased to 12 oz/A after the 6 leaf stage. If applied to 2 leaf onions, some stunting is expected. TRANSPLANT GREEN OR DRY BULB ONION: Transplant, irrigate to seal soil around the root ball, and then apply within 48 H of planting/ sealing soil around onions.
Actively growing annual grasses.	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 30 D	Label requires addition of 1 qt of COC/A. Adding crop oil increases injury potential. Do not apply more than 4.5 pt/A/season. Do not mix with other pesticides and do not apply within 5 D of a broadleaf herbicides or cultivation.

COMMERCIAL VEGETABLES-WEED CONTROL

ONIONS (Dry Bulb Only)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
ONIONS (Dry Bulb Only): POSTEMERGENCE						
Residual control of annual grasses and small-seeded broadleaf weeds including purslane.	<i>pendimethalin</i> Prowl 3.3 EC Prowl H20 3.8 AS	3	1.8-2.4 pt 1.5-2 pt	0.75-1 0.72-0.95	24 H/ NA	Seedbed or direct seeded: Apply when onions have 2-9 true leaves but prior to weed emergence. Use lower rates for applications to very young onions. Transplants: Apply to onions after soil has settled (watered) around transplants and no cracks are present. If no rainfall occurs within 2 D after application, irrigate as needed.
Excellent residual control of henbit, purslane, pigweed, primrose, smartweed, and many others; controls small emerged weeds as well.	<i>oxyfluorfen</i> Goal 2 XL 2EC Galigan 2E Goaltender 4F Galigan H20 4F	14	3-32 fl oz 3-32 fl oz 1.5-16 fl oz 1.5-16 fl oz	0.05-0.5	24 H/ 60 D	Seeded dry bulb onions: Apply 3-8 oz/A of Goal 2XL (1.5-4 oz/A of Goaltender) in a minimum of 40 GPA and with no less than 20 psi. Apply when onions have at least 3 true leaves, when weeds are 1" or smaller, and when conditions are not cool, wet, and/or cloudy. Use lower rates on younger onions with 3-4 oz/A of Goal 2XL ideal for onion in the 3-4-leaf stage. Sequential applications may be made but do not exceed 2 pt/A/season of Goal 2 XL or Galigan (1 pt/A for Goaltender). DO NOT mix anything else with this application as increased injury could be observed. Transplanted onions: Suggest making a single application using up to 2 pt/A of Goal 2XL or Galigan (1 pt/A of Goaltender) within 2 D of transplanting but after irrigating to seal soil around root ball. Do not wait longer than 2 D after planting to make this application, if possible, or less weed control and greater injury is to be expected. Do not exceed 2 pt/A of Goal 2XL or Galigan (1 pt/A of Goaltender) per crop season. <u>A tank mix with Prowl has shown excellent season long control.</u> NOTE: Never use surfactant or crop oil with oxyfluorfen or serious onion damage may occur. Do not apply if onions are under stress. Do not tank mix with fertilizer.
Actively growing annual and perennial grasses. Clethodim generally more effective on annual grasses.	<i>clethodim</i> Select, others 2 EC SelectMax 0.97 EC TapOut 0.97 EC	1	6-16 fl oz 9-32 fl oz 9-32 fl oz	0.09-0.25 0.07-0.25 0.07-0.25	24 H/ 45 D	A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, add 1 gal COC/100 gal spray mix according to the label; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control.
	<i>fluzifop-P-butyl</i> Fusilade DX 2 EC	1	6-16 fl oz	0.1-0.25	12 H/ 45 D	Label requires addition of 1 gal COC or 1 qt NIS/100 gal spray mix. Adding crop oil increases injury potential. Do not mix with other pesticides. Do not apply more than 48 oz/A/season.
ONIONS (Dry Bulb Only): ROW MIDDLE HOODED SPRAYS						
Most emerged weeds except for resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4 SL (3 lb ae) 5.5 SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA does not recommend hooded sprays because of drift potential. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant varies by brand.
Morningglory, spiderwort, and pigweed < 1".	<i>carfentrazone</i> Aim EC 2 EC	14	0.8-2 fl oz	0.013-0.031	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 3"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Expect some leaf speckling from drift.

COMMERCIAL VEGETABLES-WEED CONTROL

PEAS, Green (Note: For southern pea recommendations, see Bean section.)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PEAS, GREEN (See bean section for Southern pea): PREPLANT						
Contact kill of all green foliage; annual weeds less than 3”.	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Apply to emerged weeds before crop emergence. Add 1 qt NIS or 1 gal COC/100 gal spray mix. For stale seedbed , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Most emerged weeds except for resistant pigweed, spiderwort, or primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-1.5 lb ae	4 H/ NA	Apply to emerged weeds but before crop emergence. Do not feed crop residue to livestock for 8 weeks following treatment. The need for an adjuvant depends on brand used. For stale seedbed , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Morningglory, spiderwort, and pigweed < 1”.	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ NA	Apply prior to planting or before crop emergence to weeds less than 3”; pigweed less than 1”. Add 1.5-2 gal COC/100 gal of spray mix. Likely need to mix with glyphosate.
PEAS, GREEN (See bean section for Southern pea): PREPLANT INCORPORATE or PREEMERGENCE						
Annual grasses and broadleaf weed suppression; POOR pigweed control.	<i>clomazone</i> Command 3ME	13	up to 1.3 pt	up to 0.48	12 H/ --	Succulent peas only. Apply to the soil surface immediately after seeding. <u>Limited GA research</u> ; limit acres treated and use lower rates until confidence is obtained. See label for buffer and rotation restrictions.
Annual grasses and small-seeded broadleaf weeds such as pigweeds and purslane.	<i>pendimethalin</i> Prowl 3.3EC Pendimax 3.3EC Prowl H20 3.8AS	3	1.8-2.4 pt 1.2-2.4 pt 1.5-2 pt	0.75-1 0.5-1 0.72-0.95	24 H/ 45 D	English, Dry, Garden, Dwarf, Green, Pigeon, and Edible Pod. Incorporate 2-3” deep prior to planting. Rates lower than some products recommend (1.2-1.5 pt/A) are suggested for sandy soils with low organic matter or when following with a Dual type product PRE. An application made after planting and then irrigating is not supported by the label.
	<i>trifluralin</i> Treflan, other 4EC	3	1-1.5 pt	0.5-0.75	12 H/ NA	Incorporate 2-3” deep, within 8 H of application, into the soil prior to SPRING (according to label) planting. Rates lower than those labeled (12 oz/A) are suggested for sandy soils with low organic matter or when following with a Dual type product PRE. Applying immediately after planting and then irrigating is not supported by the label.
Annual grasses, small-seeded broadleaves, and suppression of yellow nutsedge and Texas millet.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	12-16 oz	0.7-0.95	24 H/ NA	Label specifies use in English peas only . Apply to soil surface within 1 D of planting and irrigate the following day (2 D after planting). Use lower rates on sandy soils with low organic matter and when in a system with pendimethalin or trifluralin.
Wild radish, nightshade, suppression of non-ALS resistant pigweed and purslane.	<i>imazethapyr</i> Pursuit 2EC	2	2-3 fl oz	0.03-0.047	4 H/ 30 D	English peas only. Apply preplant incorporated prior to planting or to soil surface immediately after planting. Suggest mixing with a grass herbicide. Do not make more than 1 application Pursuit/yr. <u>Rotational restrictions are a concern to some crops.</u>

COMMERCIAL VEGETABLES-WEED CONTROL

PEAS, Green (Note: For southern pea recommendations, see Bean section.)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PEAS, GREEN (See bean section for Southern pea): POSTEMERGENCE						
Broadleaves such as cocklebur and smallflower morningglory.	<i>bentazon</i> Basagran 4SL	6	1-2 pt	0.5-1	48 H/ Succulent Pea = 10 D Dry Pea = 30 D	Garden, English and Southern peas. Apply after 3 pairs of leaves are present. Injury such as yellowing, bronzing, speckling or burning of leaves may occur. <u>Do not add oil according to label.</u> In Georgia, Basagran cannot be applied alone. May be applied from 6-16 oz/A to dry and succulent peas ONLY when mixed with Raptor or Pursuit, see labels. Raptor is not labeled on some peas/beans grown in Georgia, see label.
Wild radish, nightshade, suppression of non-ALS resistant pigweed and purslane.	<i>imazethapyr</i> Pursuit 2EC	2	3 fl oz	0.047	4 H/ 30 D	English pea only. Apply to 1-3" weeds when peas are at least 3" tall but prior to 5 nodes. Add NIS at 1 qt/100 gal of spray mix. Do not use COC. Do not make more than 1 application per year. <u>Rotational restrictions are a significant concern.</u>
Actively growing annual and perennial grasses. Clethodim and quizalofop are usually better on perennials and clethodim and sethoxydim are usually better on annuals.	<i>clethodim</i> SelectMax 0.97EC TapOut 0.97EC	1	9-16 fl oz 9-16 fl oz	0.07-0.12	24 H/ 21 D	Apply only one application before bloom. A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced control.
	<i>quizalofop p-ethyl</i> Assure II 0.88EC Targa 0.88EC	1	6-12 fl oz 6-12 fl oz	0.04-0.08	12 H/ 30 D	With sethoxydim, according to label, add 1 qt of COC/A; see label about use of other additives. With quizalofop, add 1 qt NIS/100 gal to spray mix. Do not mix with other pesticides. Do not exceed 14 oz/A/season quizalofop. Do not apply more than 4 pt/A/season sethoxydim. Application of a broadleaf herbicide or cultivation within 5 D of application may result in reduced control.
	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ Succulent Pea = 15 D Dry Pea = 30 D	
PEAS, GREEN (See bean section for Southern pea): HOODED ROW MIDDLE SPRAYS						
Most weeds except resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA suggests against using hooded sprays as drift is likely to occur. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant depends on brand used.
Morningglory, spiderwort, and small pigweed.	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.031	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Expect leaf speckling from drift.

COMMERCIAL VEGETABLES-WEED CONTROL

PEPPERS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PEPPER: PREPLANT						
Suppression or control of most annual grasses and broadleaf weeds. Full rate will provide about 80% control of nutsedge; a program approach with chloropicrin is needed to improve control.	<i>metam sodium</i> Vapam HL 42%	Fumigant	45-75 gal	19-31.5	5 D/ NA	Rates are dependent on soil type and weeds present. Apply when soil moisture is near field capacity (60-80%). Apply through soil injection preferably shanking the product to a depth of 4" deep using knives spaced 4" apart; follow immediately with a final bed press, roller, or other method to smooth and compact the soil surface. If irrigation is available, irrigate with at least 0.25" and/or cover with tarp immediately. May apply through drip irrigation prior to planting a second, third, or fourth crop on mulch. Plant back interval is often 14-21 D and can be 30 D in some environments. For first crop mulch , chloropicrin (150 lb/A broadcast) will also be needed in a program with metam to obtain adequate nutsedge control. Visit www.gaweed.com for the latest circular on fumigant systems. <i>New labels require buffer restrictions, additional worker protection safety procedures, and a fumigant management plan; study this label closely.</i>
Most emerged weeds except for resistant pigweed, primrose, spiderwort, and purslane > 3".	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-1.5 lb ae	4 H/ NA	In bareground, apply at least 3 D prior to planting. In plastic, apply at least 7 D prior to planting and mulch must be washed off with 0.5" rain/irrigation prior to planting. Adjuvant needs depend on brand used. For stale seedbed or second crop mulch , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting (mulch must be washed off).
Contact kill of all green foliage; annual weeds less than 3".	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	14 H/ NA	Apply to emerged weeds before crop emergence. Add 1 qt NIS or 1 gal COC/100 gal spray mix. If applying over plastic, must wash off with 0.5" rain or irrigation before transplant. For stale seedbed or second crop mulch , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting (mulch must be washed off).
Broadleaf weeds such as henbit, geranium, primrose and a few grasses.	<i>oxyfluorfen</i> Goal 2 XL 2EC Goaltender 4F	14	up to 2 pt up to 1 pt	up to 0.5 lb	24 H/ NA	Plasticulture only. Apply to soil surface of preformed beds at least 30 D prior to transplanting. Plastic mulch can be laid any time after application but do not disturb treated preformed bed.
Morningglory, spiderwort, and pigweed less than 1".	<i>carfentrazone</i> Aim EC 2EC	14	0.8-2 fl oz	0.013-0.03	12 H/ NA	Transplants only. Apply prior to planting to weeds less than 3"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Likely need to mix with glyphosate. If applied over plastic mulch, a single 0.5" irrigation/rain event plus a 7 D waiting period must occur before transplanting.
Morningglory and pigweed less than 1".	<i>pyraflufen ethyl</i> ET 0.208L	14	1-2 fl oz	0.0016-0.0032	12 H/ NA	Bareground: Wait 1 D following preplant burndown application before planting. Mulch Production. May apply over mulch; however, a single 0.5" irrigation/rain event plus a 7 D waiting period must occur before transplanting. Apply ET with a crop oil concentrate at 1% v/v to sensitive weeds that are less than 2".

COMMERCIAL VEGETABLES-WEED CONTROL

PEPPERS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PEPPER: PREPLANT OR PREEMERGENCE						
Annual grasses and small-seeded broadleaf weeds. Devrinol is generally the safest option with moderate weed control.	<i>bensulide</i> Prefar 4E	8	5-6 qt	5-6	12 H/ NA	Preplant incorporate 1" or apply preemergence after planting. With PRE application, irrigate immediately after application. See label for rotational restrictions.
	<i>napropamide</i> Devrinol 50 DF Devrinol 2 XT	15	2-4 lb 2-4 qt	1-2	24 H/ NA	Bareground: Apply preplant and incorporate into the soil 1-2" as soon as possible after application. Shallow cultivation or irrigation will improve control. Can be used on direct-seeded and transplanted peppers. Plasticulture: Apply to the soil surface of preformed beds immediately prior to laying plastic. Make sure the plastic laying process does not incorporate or disturb the treated bed. Soil must be moist for activity. May also be used as a row middle application, but better options are available.
	<i>trifluralin</i> Treflan, other 4 EC	3	≤ 1 pt	≤0.5	12 H/ NA	Transplants only. Apply pretransplant and incorporate to a depth of 2-3" within 8 H. Use of high rates and/or deep incorporation WILL result in crop injury. Lower than labeled rates may be needed on some GA soils. Any tillage practice that concentrates trifluralin in the root zone WILL cause significant injury. NOT SUGGESTED FOR USE IN MULCHED SYSTEMS.
Annual grasses and small-seeded broadleaf weeds, morningglory suppression, poor pigweed control.	<i>clomazone</i> Command 3 ME	13	0.7-2.67 pt	0.25-1	12 H/ NA	Apply to the soil surface of preformed beds immediately prior to laying plastic. Ensure the plastic laying process does not incorporate or disturb the treated bed. Pepper has excellent tolerance but one should consult the label for rotational crop intervals and buffer zone requirements. Not labeled for use on banana pepper.
PEPPER: PREPLANT or POSTEMERGENCE						
Residual control of pigweed, purslane, spiderwort, and grasses; suppresses Texas millet.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	8-16 oz	0.47-0.94	24 H/ 60 D	Bell Pepper Transplants Only. A Section 24(c) Local Need Georgia Label must be obtained at www.farmassist.com prior to this use. Mulch Production: Option 1: Preferred application is to apply 10-12 oz/A Dual Magnum overtop of bell pepper between 1 and 2 weeks after transplanting. Option 2: Apply 8-12 oz/A to the soil surface of pre-formed beds prior to laying plastic; make sure the plastic laying process does not disturb the treated bed. <i>Pepper stunting can be observed, especially in the fall, if high amounts of water through drip irrigation are implemented.</i> Option 3: A split application (preplant under mulch followed by POST) is also labeled; rates must be reduced to not exceed a total of 16 oz/A. Option 4: Row middle application at 1 pt/A. Bareground Production: Apply conservative rate overtop of transplants 2 D after both transplanting and sealing soil around root ball. Dual also may be applied pre-transplant without disturbance but some stunting is expected.

COMMERCIAL VEGETABLES-WEED CONTROL

PEPPERS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
Pepper: PREPLANT and/or ROW MIDDLE						
Yellow nutsedge, pigweeds, eclipta, purslane suppression.	<i>fomesafen</i> Reflex 2L	14	12-16 fl oz	0.19-0.25	24 H/ NA	<p>Transplants Only. A Section 24(c) Local Need Georgia Label must be obtained at www.farmassist.com prior to this use.</p> <p>Plasticulture First Crop: Apply on soil surface of preformed bed after laying drip BUT before laying mulch. Make sure plastic laying process does not disturb treated area. Soil must be moist for activity.</p> <p>Plasticulture Second Crop: May be applied overtop of mulch prior to transplanting but only if 1) bed formation allows the herbicide to be washed from the mulch, 2) a single rainfall or irrigation event of at least 0.5" occurs after applying Reflex and prior to transplanting, and 3) transplant holes are not punched until after the herbicide is washed from the mulch. Suggest no more than 12 oz/A for this use.</p> <p>Bareground: Prepare land for planting, apply Reflex at no more than 12 oz/A non-incorporated preplant up to 7 D prior to transplanting, irrigate lightly, and then transplant. Do not concentrate the treated soil around the plant with the transplanting process. Use lower rates in cool, wet conditions and on sands.</p> <p>Row Middle: Apply 1-1.5 pt/A prior to transplanting; do not contact mulch top. If contacts mulch, must be washed off prior to planting.</p> <p>Carryover is a Concern.</p>
PEPPER: POSTEMERGENCE GRASSES						
Actively growing annual and perennial grasses.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.12 0.07-0.12 0.07-0.12	24 H/ 20 D	A section 24(c) state local need label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, add 1 gal COC/100 gal spray mix according to the label; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control.
	<i>sethoxydim</i> Poast 1.53 EC	1	1-1.5 pt	0.19-0.3	12 H/ 7 D	Add 1 qt COC/A. Adding crop oil may increase crop injury at high temperatures. Do not apply more than 4.5 pt/A/season. Do not mix with other pesticides.
PEPPER: HOODED ROW MIDDLE SPRAYS						
Nutsedge, wild radish, non-ALS resistant 1" pigweed, ragweed.	<i>halosulfuron</i> Sanda 75DG	2	0.5-1 oz	0.024-0.048	12 H/ 30 D	Apply to row middles as a preemergence or postemergence spray. Do not allow spray to contact the crop or the plastic mulch. Add a NIS at 1 qt/100 gal spray solution. See rotational restrictions on label.
Contact kill of succulent weeds less than 3".	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3 pt 2 pt	0.47	24 H/ --	Use hooded sprays adjusted to prevent spray contact with crop. Add a NIS at a rate 2 pt/100 gal of spray mix. Do not exceed 30 psi nozzle pressure or spray under conditions which may cause drift. Do not make more than 3 applications/season.

COMMERCIAL VEGETABLES-WEED CONTROL

PEPPERS

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
PEPPER: HOODED ROW MIDDLE SPRAYS (continued)						
Most emerged weeds except resistant pigweed, spiderwort, or primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Labeled as a hooded spray or wiper application in row middle; UGA does not recommend hooded sprays as drift is likely. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant depends on brand used.
Morningglory, spiderwort, and pigweed < 1”.	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.031	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 3”; pigweed less than 1”. Add 1.5-2 gal COC/100 gal of spray mix. Expect some leaf speckling from drift.
Excellent residual control for pigweeds, purslane, beggarweed, and other broadleaf weeds. Mixtures with grass control products encouraged.	<i>flumioxazin</i> Chateau 51WDG	14	up to 4 oz	up to 0.127	12 H/ NA	Row middle applications in RAISED BED (at least 24”wide and at least 4” tall) plasticulture only. Third Party Indemnification Label Available ONLY Through The Georgia Fruit and Vegetable Growers Association. Growers must obtain label to receive the appropriate application procedures (and to be legal); failure to follow these procedures will likely result in crop death. 1) Spray must remain between raised beds; spray can contact no more than the bottom 1” of the side of the mulched bed. 2) Must apply before transplanting. 3) Hooded sprayer. 4) Rainfall required after application but before transplanting. 5) Severe injury expected if spray contacts top of mulch.

POTATO (Irish)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POTATO, IRISH: PREPLANT						
Contact kill of green foliage; annual weeds < 3”.	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3 pt 2 pt	0.49	24 H/ NA	Apply to emerged weeds up before crop emergence. May be used instead of the drag-off operation to kill emerged weeds before the application of PRE herbicides. Add 1 qt NIS or 1 gal COC/100 gal spray mix. For stale seedbed , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Most emerged weeds except for resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-64 fl oz 22-44 fl oz	0.75-1.5 lb ae	4 H/ NA	Apply to emerged weeds before crop emergence. Do not feed crop residue to livestock for 8 weeks following treatment. Perennial weeds may require higher rates. The need for an adjuvant depends on brand used. For stale seedbed , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting.
Morningglory, spiderwort, and pigweed less than 1”.	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ NA	Apply prior to planting up to 1 D after planting to weeds less than 2”; pigweed less than 1”. Add 1.5-2 gal COC/100 gal of spray mix. Likely need to mix with glyphosate. Do not contact any portion of the crop or severe injury will occur.

COMMERCIAL VEGETABLES-WEED CONTROL

POTATO (Irish)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POTATO, IRISH: PREPLANT OR PREEMERGENCE						
Annual grasses and small-seeded broadleaves.	<i>pendimethalin</i> Prowl 3.3EC Prowl H20 3.8AS	3	1.8-2.4 pt 1.5-2 pt	0.75-1 0.72-0.95	24 H/ NA	Apply just after planting or drag-off to weed-free soil before crop emerges. Incorporate into the top 1-2" without damaging sprouts or seed pieces. Can also be applied early POST from crop emergence to the 6" stage of growth. Only one application can be made per season.
	<i>trifluralin</i> Treflan 4EC Trifluralin 4L	3	1-1.5 pt	0.5-75	12 H/ NA	Apply and incorporate after planting but before emergence or immediately following drag-off or after plants have fully emerged. Do not concentrate the herbicide in the bed during the incorporation process and do not damage sprouts or seed pieces.
Annual grasses (suppresses Texas millet), small-seeded broadleaf weeds such as pigweeds, and suppression of yellow nutsedge.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	1-1.66 pt	0.95-1.58	24 H/ 60 D	Apply immediately after drag-off to weed-free soil before crop emerges. Can also be applied at layby for residual control of late season weeds. Consult label for tank mixtures with metribuzin, linuron, pendimethalin, and EPTC. Consult label for proper rates on your soil type and other instructions. Injury can result with cool/wet soil conditions especially for early maturing cultivars such as "Superior." Irrigate within 48 H of application.
Annual grasses, most broadleaf weeds; nutsedge suppression.	<i>EPTC</i> Eptam 7E	8	3.5 pt	3.1	12 H/ 30 D	Apply preplant and incorporate 2-3" deep. The variety "Superior" has been shown to be sensitive to Eptam.
Annual broadleaf weeds including pigweeds, purslane, Florida pusley.	<i>flumioxazin</i> Chateau 51WDG	14	1.5 oz	0.048	12 H/ NA	Apply after drag-off or hilling but before potatoes and weeds emerge. A minimum of 2" of soil must cover the potatoes or injury may occur. Check label for proper sprayer clean out instructions. Limited research has been conducted; try on a small acreage first.
Pigweeds, yellow nutsedge, eclipta, and wild poinsettia.	<i>fomesafen</i> Reflex 2L	14	12-16 fl oz	0.019-0.25	24 H/ 70 D	Apply after planting but before potato emergence. May mix with other registered herbicides. Do not preplant incorporate. Do not apply to emerged potato. Do not apply on yams. Do not harvest potato within 70 D of application. Limited research, try on few acres only at the 12 oz/A or lower rate.
Limited residual control but controls many emerged grasses and broadleaf weeds.	<i>linuron</i> Lorox DF 50WDG	7	1.5-2.5 lb	0.75-1.25	24 H/ NA	Apply just after planting or drag-off or hilling but before crop emerges. If emerged weeds are present, add 1 pt NIS/25 gal spray mixture. Do not use on sand or loamy sand soils. Repeat applications may be made, but do not exceed 3 lb/A/yr. Weeds should be less than 3" when treated.
Most annual broadleaf weeds and some annual grasses.	<i>metribuzin</i> Metri 75 DF Metri 4 F	5	0.3-1.3 lb 0.5-2 pt	0.25-1	12 H/ 60 D	Apply just after planting or drag-off, but before crop emerges. Refer to label for specific cultivar tolerances. <u>Not recommended for use on sand or sandy loam soils; do not apply more than 0.5 lb ai/A on sandy soils.</u> Refer to product label for specific rates and cultivar tolerances. See label for rotational restrictions.
Fair control of several weeds such as pigweed, lambsquarter, morningglory.	<i>rimsulfuron</i> Matrix 25DF	2	1-1.5 oz	0.016-0.02	4 H/ 60 D	Apply after drag-off or hilling but before potatoes and weeds emerge. If emerged weeds are present, add 1 qt NIS/100 gal of water. Limited research has been conducted!

COMMERCIAL VEGETABLES-WEED CONTROL

POTATO (Irish)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POTATO, IRISH: POSTEMERGENCE						
Many annual broadleaf weeds and some annual grasses.	<i>metribuzin</i> Metribuzin 75DF Metri 4F	5	0.3-0.67 lb 0.5-1 pt	0.25-0.5	12 H/ 60 D	Can be used on russet or white-skinned varieties that are not early maturing. Apply only if there have been at least 3 successive days of sunny weather before application. Treat before weeds are 1" tall. Treatment may cause some chlorosis or minor necrosis. Do not apply more than 0.5 lb ai/A. See rotational restrictions.
	<i>rimsulfuron</i> Matrix 25DF	2	1-1.5 oz	0.016-0.02	4 H/ 60 D	Apply to young actively growing weeds after crop emergence but before the crop exceeds 14" tall. Add 1 qt NIS/100 gal of water. Limited research has been conducted! Do not exceed 2.5 oz/A/yr.
Actively growing annual and perennial grasses.	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 30 D	Label requires addition of 1 qt COC/A. Adding crop oil increases injury potential. Do not apply more than 5 pt/A/season. Do not mix with other pesticides.
	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-16 fl oz 9-32 fl oz 9-32 fl oz	0.09-0.25 0.07-0.25 0.07-0.25	24 H/ 30 D	Select label requires addition of 1 gal COC/100 gal spray mix. Adding crop oil may increase crop injury at high temperatures. For SelectMax add 1qt NIS/100 gal spray mix. Effective on annual bluegrass. Do not mix with other pesticides. Do not apply a broadleaf grass herbicide or cultivate within 5 D of applying clethodim as reduced grass control may occur.
POTATO, IRISH: ROW MIDDLE SPRAY						
Most emerged weeds except resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant depends on brand used.
Morningglory, spiderwort, and small pigweed.	<i>carfentrazone</i> Aim EC 2.0EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 7 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Ground speed should not exceed 3.5 mph.

COMMERCIAL VEGETABLES-WEED CONTROL

POTATO (Sweet)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POTATO, SWEET: PREPLANT						
Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4 SL (3 lb ae) 5.5 SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-2.25 lb ae	4 H/ NA	Apply to emerged weeds before transplanting. Do not feed crop residue to livestock for 8 weeks following treatment. Perennial weeds may require higher rates. The need for an adjuvant depends on brand used. For stale seedbed , apply glyphosate 7 d prior to planting; follow with paraquat 1 d prior to planting.
Contact kill of green foliage; annual weeds < 3”.	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3 pt 2 pt	0.49	24 H/ NA	Apply to emerged weeds up before transplanting. May be used instead of the drag-off operation to kill emerged weeds before the application of PRE herbicides. Add 1 qt NIS or 1 gal COC/100 gal spray mix. For stale seedbed , apply glyphosate 7 d prior to planting; follow with paraquat 1 d prior to planting.
Controls most problematic broadleaf weeds including pigweeds, purslane, Fl. Pusley.	<i>flumioxazin</i> Valor SX 51 WDG Chateau 51 WDG	14	2.5 oz 2.5 oz	0.08	12 H/ NA	Apply 2-5 D prior to transplanting to the pre-formed row. Do not incorporate, and minimize movement of soil during transplanting. Do not apply after transplanting or severe injury and crop death will occur. Do not use greenhouse grown transplants. If using a variety other than Beauregard, test a small area first before use. See label for other precautions including tank clean out concerns.
POTATO, SWEET: POST-TRANSPLANT AND PREEMERGENCE						
Annual grass and broadleaf weeds, morningglory suppression, weak on pigweed.	<i>clomazone</i> Command 3ME	13	1.5 pt	0.56	12 H/ 95 D	Post-transplant. Apply within 5 D of transplanting for preemergence control of annual grasses and broadleaf weeds. Place roots below soil surface where treatment will occur. See label regarding buffers and rotation restrictions.
Residual suppression of annual grass and broadleaf weeds.	<i>napropamide</i> Devrinol 50DF Devrinol 2-XT	15	2-4 lb 2-4 qt	1-2	24 H/ NA	Plant beds: Apply to soil surface after sweet potato roots are covered with soil but prior to soil cracking and sweet potato plant emergence. Production fields: Apply to soil surface immediately after transplanting. If rainfall does not occur within 24 H, shallow incorporation or irrigate with sufficient water to wet the soil to a depth of 2-4”.
Residual control of pigweeds, purslane, spiderwort, and grasses.	<i>S-metolachlor</i> Dual Magnum 7.62 EC	15	8-12 fl oz	0.47-0.7	24 H/ 40 D	A Section 24(c) State Local Need Georgia Label must be obtained at www.farmassist.com prior to this use. New label, experiment on few acres first. After transplant, irrigate to seal soil around transplant root ball, apply Dual Magnum, and then lightly irrigate within 48 H. A second application at 8 oz/A may be made 14-21 D later. Use conservative rates on light soils and in cool/wet conditions. Do not preform tillage operation that concentrates Dual around the crop root ball.
POTATO, SWEET: POSTEMERGENCE						
Actively growing annual and perennial grasses. Generally, clethodim and fluazifop are more effective on perennials, and clethodim and sethoxydim are more effective on annuals.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-16 fl oz 9-32 fl oz 9-32 fl oz	0.09-0.25 0.07-0.25 0.07-0.25	24 H/ 30 D	For Select, label requires the addition of 1 gal COC/100 gal spray mix. Adding crop oil increases injury potential. For SelectMax add 1qt NIS/100 gal spray mix. Effective on annual bluegrass. Do not apply a broadleaf grass herbicide or cultivate within 5 D of application as reduced grass control may occur.
	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 30 D	With sethoxydim, label requires addition of 1 qt COC/A. With fluazifop, label requires addition of 1 gal of COC or 1 qt NIS/100 gal spray mix. Adding crop oil increases injury potential. Do not apply more than 48 oz/A fluazifop/season. Do not apply more than 5 pt/A/season sethoxydim. Do not mix with other pesticides. Do not apply a broadleaf grass herbicide or cultivate within 5 D of application as reduced grass control may occur.
	<i>fluazifop-P-butyl</i> Fusilade DX 2EC	1	6-16 fl oz	0.1-0.25	12 H/ 55 D	

COMMERCIAL VEGETABLES-WEED CONTROL

POTATO (Sweet)

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
POTATO , SWEET: ROW MIDDLE HOODED SPRAY						
Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant depends on brand used.
Morningglory, spiderwort, and pigweed < 1".	<i>carfentrazone</i> Aim EC 2 EC	14	0.8-2 fl oz	0.013-0.031	12 H/ 7 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix.

SPINACH

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
SPINACH: PREPLANT						
Most emerged weeds except for resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-2.25 lb ae	4 H/ NA	Apply to emerged weeds before seeding. Do not feed crop residue to livestock for 8 weeks following treatment. Perennial weeds may require higher rates. The need for an adjuvant depends on brand used.
SPINACH: POSTEMERGENCE						
Broadleaf weeds including clover, sowthistle, cocklebur, ragweed, jimsonweed.	<i>clpyralid</i> Stinger 3EC	4	0.25-0.33 pt	0.1-0.13	12 H/ 21 D	Apply to spinach in the 2-5-leaf stage when weeds are small and actively growing. Will control most legumes. See label for rotational concerns. Do not exceed 0.5 pt/A/yr.
Broadleaf weeds.	<i>phenmedipham</i> Spin-aid 1.3EC	5	3-6 pt	0.5-1	12 H/ 21 D	Processing spinach only. Do not use when expected high temperatures will be above 75°F. For best results, spray when weeds are in the 2-leaf stage and crop has at least 6 true leaves. Use the 6 pt rate ONLY on well-established crops that are not under stress. The application may be split, see label. Additives are not required.
Actively growing annual and perennial grasses. In general, clethodim is more effective on perennial grasses.	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 15 D	Label requires addition of 1 qt COC/A. Adding crop oil increases injury potential. Do not apply more than 3 pt/A/season sethoxydim. Do not mix with other pesticides. Do not apply a broadleaf grass herbicide or cultivate within 5 D of application as reduced grass control may occur.
	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-8 fl oz 9-16 fl oz 9-16 fl oz	0.09-0.12 0.07-0.12 0.07-0.12	24 H/ 14 D	For Select, label requires addition of 1 gal COC/100 gal spray mix. Adding crop oil will increase injury potential. For SelectMax, add 1qt NIS/100 gal spray mix. Effective on annual bluegrass. Do not mix with other pesticides. Do not apply a broadleaf grass herbicide or cultivate within 5 D of application as reduced grass control may occur.

COMMERCIAL VEGETABLES-WEED CONTROL

SPINACH

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
SPINACH : HOODED ROW MIDDLE SPRAYS						
Most emerged weeds except for resistant pigweed, primrose, and spiderwort.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	16-30 fl oz 11-22 fl oz	0.4-0.75 lb ae	4 H/ 14 D	Apply as a hooded spray or as a wiper application in row middles; UGA recommends against row middle sprays because of drift potential. To avoid severe injury, do not allow herbicide to contact any part of the crop including exposed roots. The need for an adjuvant varies by brand.
Morningglory, spiderwort, and pigweed < 1".	<i>carfentrazone</i> Aim EC 2EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 3"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Expect some leaf speckling from drift.

TOMATO

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
TOMATO: PREPLANT						
Suppression or control of most annual grasses and broadleaf weeds. Full rate provides about 80% control; systems with chloropicrin are needed for improved control.	<i>metam sodium</i> Vapam HL 42%	Fumigant	45-75 gal	19-31.5	5 H/ NA	Rates are dependent on soil type and weeds present. Apply when soil moisture is near field capacity (60-80%). Apply through soil injection preferably shanking the product to a depth of 4" using knives spaced 4" apart; follow immediately with a final bed press, roller, or other method to smooth and compact the soil surface. If irrigation is available, irrigate with at least 0.25" and/or cover with tarp immediately. May apply through drip irrigation prior to planting a second, third, or fourth crop on mulch. Plant back interval is often 14-21 D and can be 30 D in some environments. For first crop mulch , chloropicrin (150 lb/A broadcast) will also be needed in a program with metam to obtain adequate nutsedge control. Visit www.gaweed.com for the latest circular on fumigant systems. <i>New labels require buffer restrictions, additional worker protection safety procedures, and a fumigant management plan; study this label closely.</i>
Most emerged weeds except for resistant pigweed, spiderwort, and primrose.	<i>glyphosate</i> 4SL (3 lb ae) 5.5SL (4.5 lb ae)	9	32-96 fl oz 22-66 fl oz	0.75-2.25 lb ae	4 H/ NA	In bareground, apply at least 3 D prior to planting. In plastic, apply at least 7 D prior to planting and mulch must be washed off with 0.5" rain/irrigation prior to planting. Adjuvant needs depend on brand used. For stale seedbed or second crop mulch , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting (mulch must be washed off).
Contact kill of green foliage; annual weeds < 3".	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2SL	22	1.3-2.7 pt 2-4 pt	0.49-1	24 H/ NA	Apply to emerged weeds before transplanting. Add 1 qt NIS or 1 gal COC/100 gal spray mix. If applying over plastic, must wash off with 0.5" of rain or irrigation before transplanting or seeding. For stale seedbed or second crop mulch , apply glyphosate 7 D prior to planting; follow with paraquat 1 D prior to planting (mulch must be washed off).

COMMERCIAL VEGETABLES-WEED CONTROL

TOMATO

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
TOMATO: PREPLANT (continued)						
Morningglory, spiderwort, and pigweed < 1".	<i>carfentrazone</i> Aim EC 2EC	14	0.8-2 fl oz	0.013-0.03	12 hours/ N/A	Transplants only. Apply prior to planting to weeds less than 2"; pigweed less than 1". Add 1.5-2 gal COC/100 gal of spray mix. Likely need to mix with glyphosate. If applied over plastic mulch, a single 0.5" irrigation/rain event plus a 7 D waiting period must occur before transplanting.
Mornnglory and pigweed < 1".	<i>pyraflufen ethyl</i> ET 0.208L	14	1-2 fl oz	0.0016-0.0032	12 hours/ N/A	Bareground: Wait 1 D following preplant burndown application before planting. Mulch Production: May apply over mulch; however, a single 0.5" irrigation/rain event plus a 7 D waiting period must occur before transplanting. Apply ET with a crop oil concentrate at 1% v/v to sensitive weeds less than 2".
Broadleaf weeds and a few grasses including radish, geranium, and primrose.	<i>oxyfluorfen</i> Goaltender4F Goal XL 2EC	14	up to 1 pt up to 2 pt	up to 0.5 lb	24 hours/ N/A	Plasticulture only. Apply to soil surface of preformed beds at least 30 D prior to transplanting crop. Plastic mulch can be laid any time after application but do not disturb treated preformed bed when laying plastic.
Annual grasses, small-seeded broadleaf weeds; suppresses yellow nutsedge.	<i>S-metolachlor</i> Dual Magnum 7.62EC	15	12-16 fl oz	0.7-0.95	24 hours/ 30 days	Can be applied preplant to pre-formed beds just prior to laying plastic. Do not disturb treated bed when laying plastic. During environments where significant watering through drip irrigation is required, some crop stunting may be observed especially with higher rates.
Annual grasses and broadleaf weeds. Devrinol is generally safer but often less effective.	<i>napropamide</i> Devrinol 50DF Devrinol 2XT	15	2-4 lb 2-4 qt	1-2	24 hours/ N/A	Bareground: Apply preplant and incorporate into the soil 1-2" as soon as possible after application. Shallow cultivation or irrigation will improve control. Can be used on direct-seeded and transplanted tomatoes. Plasticulture: Apply to the soil surface of pre-formed beds immediately prior to laying plastic. Make sure the plastic laying process does not incorporate or disturb the treated bed. Soil must be moist for activity.
	<i>trifluralin</i> Treflan, others 4EC	3	≤ 1 pt	≤0.5	12 hours/ N/A	Apply pre-transplant and incorporate to a depth of 2-3" within 8 H of application. Use of high rates and/or deep incorporation WILL result in crop injury. Lower than labeled rates may be needed in some Georgia fields. Cultural practices that concentrate trifluralin in the root zone WILL cause tomato injury. NOT SUGGESTED FOR MULCH SYSTEMS.
Nutsedge suppression; wild radish, non-ALS resistant pigweed.	<i>halosulfuron</i> Sanda 75DG	2	0.5-1 oz	0.024-0.048	12 hours/ N/A	Transplants only: Apply after final bed forming and just prior to laying plastic mulch, do not disturb bed when laying mulch. May transplant into treated area 7 D after application. Do not exceed a total of 2 oz/A/yr. Rotational restrictions may be a concern, see label. Use conservative rate if in bareground production. Likely more helpful postemergence.

COMMERCIAL VEGETABLES-WEED CONTROL

TOMATO

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
TOMATO: PREPLANT (continued)						
Yellow nutsedge, pigweeds, eclipta; suppresses purslane.	<i>fomesafen</i> Reflex 2L	14	12-16 fl oz	0.19-0.25	24 H/ N/A	<p>Transplants Only. A Section 24(c) Local Need Georgia Label must be obtained at www.farmassist.com prior to this use.</p> <p>Plasticulture First Crop: Apply on soil surface of preformed bed after laying drip BUT before laying mulch. Make sure plastic laying process does not disturb treated area. Soil must be moist for activity.</p> <p>Plasticulture Second Crop: May be applied ovetop of mulch prior to transplanting but only if 1) bed formation allows the herbicide to be washed from the mulch, 2) a single rainfall or irrigation event of at least 0.5" occurs after applying Reflex and prior to transplanting, and 3) transplant holes are not punched until after the herbicide is washed from the mulch. Suggest applying no more than 12 oz/A.</p> <p>Bareground: Prepare land for planting, apply Reflex non-incorporated preemergence up to 7 D prior to transplanting, irrigate, and then transplant. Suggest applying no more than 12 oz/A. Do not concentrate the treated soil around the plant with the transplanting process. Use conservative rate if cool and wet or on sands.</p> <p>Row Middle: Apply 1-1.5 pt/A prior to transplanting; do not contact mulch.</p> <p>Carryover under mulch is a large concern.</p>
Annual grasses and broadleaf weeds including cocklebur, ragweed, smartweed, and velvetleaf.	<i>metribuzin</i> Metribuzin 75DF Metri 4F	5	0.3-0.67 lb 0.5-1 pt	0.25-0.5	12 H/ N/A	<p>Transplants only: Apply after final bed forming and just prior to laying plastic mulch, do not disturb bed when laying mulch. Place tomato transplant roots below herbicide layers to avoid injury. Use conservative rates when on sands or if it is cool/wet. See label for other instructions.</p> <p>See rotational restrictions on label for all crops, a second crop of cucumber may be damaged.</p>
TOMATO: POSTEMERGENCE						
Annual grasses and broadleaf weeds including cocklebur, ragweed, smartweed, velvetleaf, and morningglory.	<i>metribuzin</i> Metribuzin 75DF Metri 4F	5	0.3-0.5 lb 0.5-0.75 pt	0.25-0.37	12 H/ 7 D	<p>Seeded tomato must have at least 5-6 true leaves. For transplanted tomatoes, do not apply within 14 D of transplanting and until recovery from transplant shock and new growth is evident. Multiple treatments should be separated by at least 14 D. Apply only if there have been at least 3 successive days of sunny weather prior to application. Do not exceed 1 lb ai/yr. Do not apply within 24 hours of application of other pesticides. Do not tank mix with other pesticides.</p> <p>See rotational restrictions on label for all crops, a second crop of cucumber may be damaged.</p>

COMMERCIAL VEGETABLES-WEED CONTROL

TOMATO

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
TOMATO: POSTEMERGENCE (continued)						
Nutsedge ragweed, radish, cocklebur; residual control of non-ALS resistant pigweed.	<i>halosulfuron</i> Sanda 75DG	2	0.5-0.75 oz	0.024-0.036	12 H/ NA	Apply postemergence 14 D after transplanting but before first bloom. May apply over plastic mulch. Add NIS at 1qt/100 gal of spray mix. If a PRE under plastic application of halosulfuron was made, use halosulfuron as a POST spot treatment only. Do not exceed a total of 2 oz/A/yr. Review rotational restrictions.
Suppresses wild radish, common purslane, non-ALS resistant 1" pigweeds and some annual grasses.	<i>rimsulfuron</i> Matrix DF 25WDG	2	1-2 oz	0.015-0.03	4 H/ 45 D	Apply after the crop has at least 2 true leaves and weeds are small (1" or less) and actively growing. Add nonionic surfactant at 1 qt/100 gal of spray solution. See label for rotational restrictions.
Residual control of pigweeds, purslane, spiderwort, and grasses.	<i>S-metolachlor</i> Dual Magnum 7.62 EC	15	8-12 fl oz	0.47-0.7	24 H/ 30 D	A Section 24(c) Local Need Georgia Label must be obtained at www.farmassist.com prior to this use. New label, experiment on few acres first. Do Not exceed 1.33 pt/A for season. Post-transplant Mulch: Apply topically or directed 7-14 D after transplant. Post-transplant Bareground: Transplant, irrigate to seal soil around root ball, apply topically or directed 7-14 D after transplanting and irrigating. Topical applications may cause minor leaf speckling; use 8 oz/A in hot humid conditions. No injury expected with directed applications to base of plant.
Actively growing annual and perennial grasses. In general, clethodim is more effective on perennial grasses.	<i>clethodim</i> Select, others 2EC SelectMax 0.97EC TapOut 0.97EC	1	6-16 fl oz 9-32 fl oz 9-32 fl oz	0.09-0.25 0.07-0.25 0.07-0.25	24 H/ 20 D	A Section 24(c) State Local Need Label allows an application of SelectMax without the addition of an adjuvant; applying Select Max at 9-10 fl oz/A when grasses are less than 3" is the best option for control without injury. The addition of NIS at 1 pt/100 gal spray mix is recommended for large grasses and goosegrass for SelectMax. For Select, add 1 gal COC/100 gal spray mix according to the label; injury is more likely with crop oil. Do not mix with other pesticides. Application of a broadleaf herbicide or cultivation within 5 D of clethodim may result in reduced grass control.
	<i>sethoxydim</i> Poast 1.53EC	1	1-1.5 pt	0.19-0.3	12 H/ 20 D	Add 1 qt/A of COC. Apply after transplants have recovered from shock (label specifies 14 D) or after seeded tomatoes have 5-6 leaves. Adding crop oil may increase crop injury at high temperatures. Do not apply more than 4.5 pt/A/season sethoxydim. Do not mix with other pesticides.

COMMERCIAL VEGETABLES-WEED CONTROL

TOMATO

WEED	FORMULATION	MOA	RATE/A BROADCAST		REI/PHI (Hours or Days)	REMARKS AND PRECAUTIONS
			AMOUNT OF FORMULATION	LBS ACTIVE INGREDIENT		
TOMATO: DIRECTED SPRAYS						
Very small annual grasses plus broadleaf weeds including cocklebur, ragweed, smartweed, velvetleaf, and morningglory.	<i>metribuzin</i> Metribuzin 75DF Metri 4F	5	0.6-1.33 lb 1-2 pt	0.5-1	12 H/ 7 D	Postemergence directed: Seeded tomato must have at least 5-6 true leaves. For transplanted tomatoes, do not apply within 14 D of transplanting and until recovery from transplant shock and new growth are evident. Multiple treatments should be separated by at least 14 D. Apply only if there have been at least 3 successive days of sunny weather prior to application. Do not exceed 1 lb ai/yr. Do not apply within 24 H of application of other pesticides. Do not tank mix with other pesticides. Do not apply within 7 D of harvest.
Nutsedge and annual broadleaf weed control including <i>Ipomoea</i> morningglory.	<i>trifloxysulfuron</i> Envoke 75 WDG	2	0.1-0.2 oz	0.0047-0.0094	12 H/ 45 D	Apply as a postemergence directed spray adjusted to limit contact with tomato foliage. Add non-ionic surfactant at 1 qt/100 gal of spray mix. See label for rotation restrictions.
TOMATO: HOODED ROW MIDDLE SPRAYS						
Contact kill of all green foliage.	<i>paraquat</i> Firestorm Parazone 3SL Gramoxone Inteon 2 SL	22	1.3 pt 2 pt	0.5	24 H/ 30 D	Apply for control of emerged weeds between rows of tomato. Do not exceed 30 PSI. Add 1 qt NIS or 1 gal COC/100 gal spray mix. Do not allow spray to contact crop or injury will occur. Do not make more than 3 applications/season.
Morningglory, spiderwort, and pigweed < 1".	<i>carfentrazone</i> Aim EC 2 EC	14	0.8-2 fl oz	0.013-0.03	12 H/ 0 D	Apply as a hooded spray in row middles. Do not allow herbicide to contact the crop. Apply to weeds less than 3". Add 1.5-2 gal COC/100 gal of spray mix. Expect some leaf speckling from drift.
Excellent residual control for pigweeds, purslane, beggarweed, and other broadleaf weeds.	<i>flumioxazin</i> Chateau 51 WDG	14	up to 4 oz	up to 0.127	12 H/ NA	Row middle applications in RAISED BED (at least 24" wide and at least 4" tall) plasticulture only. Third Party Indemnification Label Available ONLY Through The Georgia Fruit and Vegetable Growers Association. Growers must obtain label to receive the appropriate application procedures (and to be legal); failure to follow these procedures will likely result in crop death. 1) Spray must remain between raised beds; spray can contact no more than the bottom 1" of the side of the mulched bed. 2) Must apply before transplanting. 3) Hooded sprayer. 4) Rainfall required after application but before transplanting. 5) Severe injury expected if spray contacts top of mulch.

WEED RESPONSE TO HERBICIDES USED IN VEGETABLE CROPS

A. Stanley Culpepper, Extension Agronomist-Weed Science

HERBICIDE	Prefar	Sutan	Eptam/ Eradicane	Tillam	Ro-Neet	Treflan/ Prowl	Pursuit	Outlook	Lasso	Dual Magnum ¹
TIME OF APPLICATION	PPI	PPI	PPI	PPI	PPI	PPI	PPI/PRE	PPI/PRE	PPI/PRE	PPI/PRE
PERENNIAL WEEDS										
johnsongrass (rhizome)	P	F	F-G		P	P	P-F	P	P	P
purple nutsedge	P	G	G	F-G	P	P	F-G	P	P	P
yellow nutsedge	P	G-E	G-E	F-G	P	P	F	F	P	F
ANNUAL GRASSES										
barnyardgrass	F-G	E	G-E	G-E	G	E	F	G-E	E	E
crabgrass	F-G	E	G-E	G-E	G	E	F	E	E	E
crowfootgrass	F-G	E	G-E	G-E	G	E	P	E	E	E
fall panicum	F-G	G	G	G	G	G	P-F	G-E	G-E	G-E
foxtails	F-G	E	G-E	G-E	G	E	F-G	E	E	E
goosegrass	F-G	G	G	F-G	G	E	F	E	E	E
johnsongrass (seedling)	F-G	G	G	G	G	G-E	G	P-F	P-F	P-F
sandbur	F-G	G-E	G	G	G	E		F-G	F-G	F-G
signalgrass, broadleaf	F-G	G-E	G-E	P	G	E	P-F	F-G	F-G	G
Texas panicum	F	F-G	F-G	P-F	G	G	P	P-F	P-G	P-F
ANNUAL BROADLEAF WEEDS										
bristly starbur			P	G		P	F	P-F	F	P-F
citronmelon	P					P	P	P	P	P
cocklebur	P	P	P	P		P	G-E	P	P	P
crotalaria						P		P	P	P
croton, tropic						P	P	P	P-F	P
cutleaf eveningprimrose	P-F	G	G	G		G	G-E	F-G	G	G
Florida beggarweed	P	P-F	P-F			P	P	F	F	F
Florida pusley	F	G-E	G-E	G		E	G	G	G	G
jimson weed	P	P	P	P	P	P	F-G	P	P	P

PPI=preplant incorporated
PRE=preemergence.

¹ Weed response from Dual Magnum and Dual II Magnum is similar.

E = Excellent control, control above 90%
G = Good control, control above 80%
F = Fair control, control between 60 and 80%
P = Poor control, control less than 60%
If no response symbol is shown control is unknown.

WEED RESPONSE TO HERBICIDES USED IN VEGETABLE CROPS

HERBICIDE	Prefar	Sutan	Eptam/ Eradicane	Tillam	Ro-Neet	Treflan/ Prowl	Pursuit	Outlook	Lasso	Dual Magnum ¹
TIME OF APPLICATION	PPI	PPI	PPI	PPI	PPI	PPI	PPI/PRE	PPI/PRE	PPI/PRE	PPI/PRE
ANNUAL BROADLEAF WEEDS (continued)										
lambquarters	F	G	G	F	F	G-E	F-G	G	F-G	F-G
morningglory	P	P-F	P-F	P		P	F-G	P	P	P
nightshade, East. black					P	G		G	G	
pigweeds	F	G	G	G	G	G-E	G-E	G	G-E	G
prickly sida		P-F	P-F	P-F		P	G	P-F	P-F	P-F
purslane	P-F	G	G	G	G	E	G	G	G	G
ragweed, common	P	P-F	P-F	P-F	P	P	F-G	F	P-F	P
sicklepod	P	P-F	P-F	P		P	P	P	P-F	P
WINTER ANNUALS										
annual ryegrass	P					F-G		F-G	P	F-G
cudweed	P									
shepherdspurse	P-F			P	G	F-G	G		G	
swinecress	P									
wild mustards	P	P				P	E	P-F	P	P
wild radish	P	P				P	E	P	P	P

PPI=preplant incorporated
PRE=preemergence.

¹ Weed response from Dual Magnum and Dual II Magnum is similar.

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WEED RESPONSE TO HERBICIDES USED IN VEGETABLE CROPS

HERBICIDE	atrazine	Curbit/ Prowl	Command	Dacthal	Devrinol
TIME OF APPLICATION	PRE	PRE	PRE	PRE	PRE
PERENNIAL WEEDS					
johnsongrass (rhizome)	P	P	P	P	P
johnsongrass (rhizome)	P	P	P	P	P
yellow nutsedge	P	P	P	P	P-F
ANNUAL GRASSES					
barnyardgrass	F	G-E	G-E	F-G	G-E
crabgrass	G	G-E	E	G	G-E
crowfootgrass	G	G-E	E	G	G-E
fall panicum	P	G	G-E	F	G
foxtails	F	G-E	E	F-G	G-E
goosegrass	F-G	G	E	G	G
johnsongrass (seedling)	P	G	F-G	G	G
sandbur	F	G	F-G	F-G	G-E
signalgrass, broadleaf	P	G	E	F-G	G
Texas panicum	P	F-G	F	F	G
ANNUAL BROADLEAF WEEDS					
bristly starbur	G	P	P	P	P
citronmelon	F-G	P	P		P
cocklebur	G-E	P	P-F	P	P
crotalaria	G-E	P		P	P
croton, tropic	G	P	E	P	P
cutleaf eveningprimrose	E	G	F	F	F
Florida beggarweed	E	P	F-G	P	P-F
Florida pusley	E	G-E	F-G	F-G	G
jimsonweed	E	P	F-G	P	P
lambsquarters	E	G	G	G	G
morningglory	G	P	P-F*	P	P
nightshade, east. black	G	P		N	P
pigweeds	E	G-E	P	F-G	F-G
prickly sida	E	P	E	G	F
purslane	E	G-E	G	F-G	G-E
ragweed, common	E	P	F-G		G
sicklepod	G	P	P	P	P

HERBICIDE	atrazine	Curbit/ Prowl	Command	Dacthal	Devrinol
TIME OF APPLICATION	PRE	PRE	PRE	PRE	PRE
WINTER ANNUALS					
annual ryegrass	G				
cudweed				P-F	
shepherdspurse	G	P	F	P-F	F-G
swinecress	G			P-F	
wild mustards	G	P		P-F	P
wild radish	G	P		P-F	P

PRE = preemergence.

*Command provides fair control of pitted morningglory but poor control of other morningglory species.

E = Excellent control, control above 90%

G = Good control, control above 80%

F = Fair control, control between 60 and 80%

P = Poor control, control less than 60%.

If no response symbol is shown control is unknown.

WEED RESPONSE TO HERBICIDES USED IN VEGETABLE CROPS

HERBICIDE	Goal	Pyramin	Reflex	Sandea	Sencor	Valor/Chateau
TIME OF APPLICATION	PRE	PRE	PRE	PRE	PRE	PRE
PERENNIAL WEEDS						
johnsongrass (rhizome)	P		N	P	P	P
purple nutsedge	P		P-F	F	P	P
yellow nutsedge	P		G-E	F	P	P
ANNUAL GRASSES						
barnyardgrass	P			P	G	P
crabgrass	P		F-G	P	F-G	P
crowfootgrass	P			F	G	P
fall panicum	P			P	P	P
foxtails	P			P	P	P
goosegrass	P			P	F-G	P
johnsongrass (seedling)	P			P	P-F	P
sandbur	P			P	P	P
signalgrass, broadleaf	P		F-G	P	P-F	P
Texas panicum	P		F	P	P	P
ANNUAL BROADLEAF WEEDS						
bristly starbur			G-E	F	G	P-F
citronmelon					P-F	F-G
cocklebur			G	G	F	P
crotalaria					G	
croton, tropic			F-G		G	G
cutleaf eveningprimrose	G-E	G			G-E	E
Florida beggarweed			P	F	G-E	G
Florida pusley			P	F	G-E	G-E
jimsonweed				G	G	G
lambquarters	F		E	F-G	G	G
morningglory			P-G*	P-F	P-G	F
nightshade, east. black		N		P	G	

PRE = preemergence.

*Reflex provides P – F control on Ipomoea morningglory and G control of smallflower morningglory.

E = Excellent control, control above 90%

G = Good control, control above 80%

F = Fair control, control between 60 and 80%

P = Poor control, control less than 60%.

If no response symbol is shown control is unknown.

WEED RESPONSE TO HERBICIDES USED IN VEGETABLE CROPS

HERBICIDE	Goal	Pyramin	Reflex	Sandea	Sencor	Valor/Chateau
TIME OF APPLICATION	PRE	PRE	PRE	PRE	PRE	PRE
ANNUAL BROADLEAF WEEDS (continued)						
pigweeds	G-E		E	G-E	G-E	E
prickly sida					G	F-G
purslane	G-E		G	F	G-E	E
ragweed, common	F		G	G	G	F-G
sicklepod	P		P	P	F-G	P
WINTER ANNUALS						
annual ryegrass	P	G		P	G	F
cudweed	G-E	G			G	
shepherdspurse	G-E	G			G	
swinecress	G-E	G			G	E
wild mustards	G-E	G	E	G-E	G-E	E
wild radish	G-E	G	E	G-E	G-E	E

<p>PRE = preemergence.</p> <p>*Reflex provides P – F control on Ipomoea morningglory and G control of smallflower morningglory.</p>	<p>E = Excellent control, control above 90%</p> <p>G = Good control, control above 80%</p> <p>F = Fair control, control between 60 and 80%</p> <p>P = Poor control, control less than 60%.</p> <p>If no response symbol is shown control is unknown.</p>
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WEED RESPONSE TO HERBICIDES USED IN VEGETABLE CROPS

HERBICIDE	Aim	Atrazine	Basagran	Callisto	Goal	Lorox	Matrix	Pursuit	Sandea	Envoke	Laudis	Reflex
TIME OF APPLICATION	POST/ PD	POST	POST	POST	POST	POST/ PD	POST	POST	POST	POST	POST	POST
PERENNIAL WEEDS												
johnsongrass (rhizome)	P	P	P	P	P	P		P	P	P		P
purple nutsedge	P	P	P	P-F	P-F	P		G	E	F-G		P
yellow nutsedge	P	P	G	P-F	P-F	P-F	P-F	F	E	G		P-F
ANNUAL GRASSES												
barnyardgrass	P		P			F-G	G	F-G	P	P		P
crabgrass	P	G	P	F-G	P-F	G	F	P-F	P	P	F-G	P
crowfootgrass	P	G	P	P	P	G		P-F	P	P		P
fall panicum	P	G	P	P	P	G	F-G	P-F	P	P		P
goosegrass	P	F-G	P	P	P	G	P	P	P	P		P
johnsongrass (seedling)	P	F	P	P	P	G		F	P	P-F		P
sandbur	P	F	P	P	P-F	G			P	P		P
signalgrass, broadleaf	P	P-F	P	F	P-F	G		P-F	P	P		P
Texas panicum	P	P-F	P	P-F	P	G		P-F	P	P	G	P
ANNUAL BROADLEAF WEEDS												
bristly starbur	P	E	G-E		F-G	G		P-F	G-E	G-E		
citronmelon		G	P		F-G	G-E		P-F		G-E		
cocklebur	F-G	E	E	G-E	F-G	G-E	P-F	G-E	E	G-E		F-G
crotalaria	F	G	P		F-G	E		P				G-E
croton, tropic	F	G	P		G	G		P		F		
cutleaf eveningprimrose	P-F		F-G		F-G	F-G		F-G	P			P-F
Florida beggarweed	F	G	P		F	G-E		P	P-F	G-E		P
Florida pusley	F	G	P		P-F	G		F	P	P		F-G
jimsonweed	F	E	E	G-E	G	G	F	G	F	P		G
lambsquarters	G	E	P	G-E	P-F	E	F-G	P-F	P	G		P-F
morningglory, Ipomoea	G-E	E	P	F-G	G-E	G	F	F-G	P-F	G-E		G
morningglory, smallflower	F-G	E	G	F-G	G-E	G-E	F	P-F	P-F	P		G

POST = postemergence
 PD = post-directed.

*Will not control ALS-resistant pigweed.

E = Excellent control, control above 90%
 G = Good control, control above 80%
 F = Fair control, control between 60 and 80%
 P = Poor control, control less than 60%

If no response symbol is shown control is unknown.

WEED RESPONSE TO HERBICIDES USED IN VEGETABLE CROPS

HERBICIDE	Aim	Atrazine	Basagran	Callisto	Goal	Lorox	Matrix	Pursuit	Sandea	Envoke	Laudis	Reflex
TIME OF APPLICATION	POST/ PD	POST	POST	POST	POST	POST/ PD	POST	POST	POST	POST	POST	POST
ANNUAL BROADLEAF WEEDS												
nightshade, eastern black	G		P			F-G	P		P			
pigweeds	F-G	E	P	G	G-E	G-E	G*	E*	G*	F*	G	G-E
prickly sida	F	E	G	P	F-G	G		P		P		P
purslane	F	E	P		F-G	G	F-G	F	P			
ragweed, common	P	E	F	F-G	G	E	P	P-F	G-E	G		G-E
sicklepod	P	E	P	P	F-G	G-E		P	P	E	P	P
WINTER ANNUALS												
annual ryegrass	P	F	P	P	F-G	F-G			P	P		P
cudweed					E	G						
shepherdspurse					G	G	G	P-F				
swinecress					G	G						
wild mustards	F		P-F		G	G		G-E	E		G	
wild radish	F	F-G	P-F		G	G	G	G-E	E		G	

POST = postemergence
 PD = post-directed.

*Will not control ALS-resistant pigweed.

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WEED RESPONSE TO HERBICIDES USED IN VEGETABLE CROPS

HERBICIDE	Sencor	Spin-aid	Stinger	Fusilade	Select	Poast	glyphosate	paraquat
TIME OF APPLICATION	POST	POST	POST	POST	POST	POST	POST/HOOD	POST/HOOD
PERENNIAL WEEDS								
johnsongrass (rhizome)	P	P	P	G-E	G-E	G	G-E	P
purple nutsedge	P	P	P	P	P	P	F-G	P-F
yellow nutsedge	P	P	P	P	P	P	F	P-F
ANNUAL GRASSES								
Barnyardgrass	F	P	P	G-E	E	E	E	G
Crabgrass	F	P	P	G	G-E	G-E	E	F
Crowfootgrass	F-G	P	P	F	G	F-G	E	G
fall panicum	P-F	P	P	G-E	G-E	G-E	E	G
Goosegrass	F	P	P	G	G-E	G-E	E	G
johnsongrass (seedling)	G	P	P	G-E	E	E	E	G
Sandbur	G	P	P	G	G	E	E	G
signalgrass, broadleaf	P	P	P	G-E	E	E	E	G-E
Texas panicum	P	P	P	G-E	E	E	E	G
ANNUAL BROADLEAF WEEDS								
bristly starbur	G		F-G	F	P	P	G-E	E
Citronmelon			F-G	P	P	P	G-E	G
Cocklebur	E		G-E	P	P	P	E	G
Crotalaria	E		G-E	P	P	P	G	G
croton, tropic	G		G	P	P	P	E	F
cutleaf eveningprimrose	G	G		P	P	P	P-F	F
Florida beggarweed	G	E	G	P	P	P	E	E
Florida pusley	F-G	G	F	P	P	P	P-G	P-F
jimsonweed	E	G	G	P	P	P	E	G
Lambsquarters	G-E	F-G	P	P	P	P	G	F
Morningglory	F-G	F-G	P	P	P	P	F-G	F-G**

POST = postemergence
 PD = post-directed.

**Paraquat provides P-F of smallflower morningglory but G control of other morningglories.

E = Excellent control, control above 90%
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WEED RESPONSE TO HERBICIDES USED IN VEGETABLE CROPS

HERBICIDE	Sencor	Spin-aid	Stinger	Fusilade	Select	Poast	glyphosate	paraquat
TIME OF APPLICATION	POST	POST	POST	POST	POST	POST	POST/HOOD	POST/HOOD
ANNUAL BROADLEAF WEEDS (continued)								
nightshade, eastern black	P		P	P	P	P	G	
Pigweeds	E	P-F	P	P	P	P	E	G
prickly sida	E			P	P	P	F-G	P-F
Purslane	G	F-G	P	P	P	P	G	G
ragweed, common	G	F-G	G	P	P	P	E	F
Sicklepod	E		F	P	P	P	E	G-E
WINTER ANNUALS								
annual ryegrass	F-G	F	P	G-E	G-E	E	G	F-G
Cudweed	G	G		P	P	P	G	G
Shepherdspurse	G	G	P	P	P	P	G	F
Swinecress	G	G		P	P	P	G	P
wild mustards	G-E	E		P	P	P	F-G	F-G
wild radish	G-E	E		P	P	P	F-G	F-G

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**Paraquat provides P-F of smallflower morningglory but G control of other morningglories.

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FOLIAR CALCIUM SPRAYS

George Boyhan, Professor and Extension Vegetable Specialist

CROP	MATERIAL	AMOUNT OF FORMULATION	REMARKS
Broccoli	Ele-Max Clear Cal 12.1%	2 qt/A	Apply in 20 gallons water at head development. Repeat two to three times at 10-14 day intervals. Also contains 21% Cl.
	Stoller Calcium 5X	1-2 pt/A	Apply at 4-5 leaves and every 10-14 days.
	Stoller Calcium 5S	12 oz/A	Apply at 4-5 leaf stage and then every 7-14 days.
	Sorba-Spray CaB	1-4 qt/A	Make 1-3 applications at intervals of 2-3 weeks beginning when plants are 3-4 weeks old. Also contains 5% nitrogen and 1.5% Boron.
Cabbage	Ele-Max Clear Cal 12.1%	2 qt/A	Apply in 20 gal water at head development. Repeat two to three times at 10-14 day intervals. Also contains 21% Cl.
	Stoller Calcium 5X	1-2 pt/A	Apply at 4-5 leaves and every 10-14 days.
	Stoller Calcium 5S	12 oz/A	Apply at 4-5 leaf stage and then every 7-14 days.
	Sorba-Spray CaB	1-4 qt/A	Make 1-3 applications at intervals of 2-3 weeks beginning when plants are 3-4 weeks old. Also contains 5% nitrogen and 1.5% Boron.
Carrots	Ele-Max Clear Cal 12.1%	2 qt/A	Apply in 20 gallons water when crop is 4-6 inches tall. Repeat two to three times at 10-14 day intervals. Also contains 21% Cl.
	Stoller Calcium 5X	1 qt/A	Apply at enlarged root initiation and 2-3 weeks later.
	Sorba-Spray CaB	1-4 qt/A	Apply when plants are 3-4 weeks old. Repeat every 3-4 weeks. Also contains 5% nitrogen and 1.5% Boron.
Leafy vegetables	Sorba-Spray CaB	1-4 qt/A	Make 1-3 applications at intervals of 2-3 weeks beginning when plants are 3-4 weeks old. Also contains 5% nitrogen and 1.5% Boron.
	Stoller Calcium 5S	12 oz/A	Apply at 4-5 leaf stage and then every 7-14 days.
Peppers	Ele-Max Calcium FL 4%	2 qt/A	One to four applications from flowering up to one month before harvest in 50 gallons of water. Allow 7 days between applications.
	Ele-Max Clear Cal 12.1%	2 qt/A	Apply one to four applications in 50 gallons water beginning at flowering. Also contains 21% Cl. Potatoes
	Stoller Calcium 5X	1-2 qt/A	Apply just prior to first bloom then 10 and 20 days later.
	Stoller Calcium 5S	8 oz/A	Begin at transplant then at 7-14 day intervals.
	Sorba-Spray CaB	1-4 qt/A	Make 1-3 applications at intervals of 3-4 weeks starting prior to bloom. Also contains 5% nitrogen and 1.5% Boron.
Potatoes	Ele-Max Calcium FL 4%	2 qt/A	2-3 applications commencing at tuber initiation in 20 gal of water. Allow 10-14 days between applications.
	Ele-Max Clear Cal 12.1%	2-4 qt/A	2-3 applications commencing at tuber initiation in 20 gal of water. Allow 10-14 days between applications. Also contains 21 % Cl.
	Stoller Calcium 5X	1 qt/A	Apply at first tuber set and then 2-3 weeks later.
	Stoller Calcium 5S	1 qt/A	Apply at tuber initiation and use half rate at 8-10 leaf stage and every 10-14 days.
	Sorba-Spray CaB	1-4 qt/A	Apply when plants are 4-12" high and repeat three weeks later. Also contains 5% nitrogen and 1.5% Boron.

FOLIAR CALCIUM SPRAYS

CROP	MATERIAL	AMOUNT OF FORMULATION	REMARKS
Tomatoes	Ele-Max Calcium FL 4%	2 qt/A	One to four applications from flowering up to one month before harvest in 50 gal of water. Allow 7 days between applications.
	Ele-Max Clear Cal 12.1%	2 qt/A	Apply 1-4 applications in 50 gal water beginning at flowering. Allow 7 days between applications. Also contains 21% Cl.
	Stoller Calcium 5X	1 qt/A	Apply at transplanting and 2-3 weeks after first bloom.
	Stoller Calcium 5S	8 oz/A	Apply at flower bud initiation and at 7-10 day intervals.
	Sorba-Spray CaB	1-4 qt/A	Make 1-3 applications at intervals of 3-4 weeks starting prior to bloom. For blossom end rot apply 2qt/A every 7-10 days. Also contains 5% nitrogen and 1.5% Boron.
	Stoller CabY	1-2 qt/A	To correct physiological disorders begin 2-3 weeks after full bloom and continue at two week intervals. Also contains Boron.
	Tracite Calcium 6%	1-2 qt/A	Apply every two weeks after first bloom.
Watermelons	Ele-Max Clear Cal 12.1%	2 qt/A	Make two to three applications in 20 gal of water beginning at first fruit set at seven day intervals. Also contains 21% Cl.
	Stoller Calcium 5X	1-2 pt/A	Apply at 4-8" stage, at early bloom and at start of fruiting.
	Stoller Calcium 5S	8 oz/A	Apply at flower bud initiation and then at 7-14 day intervals.
	Sorba-Spray CaB	1-2 qt/A	Make 2 or more applications at 2-3 week intervals starting just prior to bloom. Also contains 5% nitrogen and 1.5% Boron.
	Stoller CabY	1-2 qt/A	To correct physiological disorders begin 2-3 weeks after full bloom and continue at two week intervals. Also contains Boron.

*Soil calcium levels and proper irrigation are the best methods to assure proper plant calcium nutrition.

FOLIAR BORON SPRAYS

George Boyhan, Professor and Extension Vegetable Specialist

Foliar boron sprays are no longer recommended. Consult soil test recommendations for application rates for a specific crop. Never apply more than two pounds of elemental Boron to any crop during the season.

HARVEST AIDS/DESICCANTS AND POST HARVEST CONTROL OF CROPS

A. Stanley Culpepper, Extension Agronomist-Weed Science

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DESICCANT	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	
<i>diquat</i> Reglone 2 SL	1.5-2 pt	0.375-0.5	Preharvest desiccation of seed crop only. On thin stands of seed alfalfa, use 1 pt/A. Desiccation is complete in 3-10 days. Harvest within 7 D, but not before 3 D. DO NOT graze or feed treated forage to livestock. DO NOT use seed from treated plants for food, feed, or oil purposes. Add nonionic surfactant at 0.06-0.5% of finished spray volume or add 0.5 to 4 pt nonionic surfactant per 100 gal of spray.

CHILI PEPPERS

DESICCANT	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	
<i>sodium chlorate</i> (3 lb Chlorate) 3 L (Defol 750) 7.5 L	4-10 qt 1.6-4 qt	3-7.5	PROCESSING ONLY. Consult processor before applying. Apply in 20-40 gal of water by ground rig. Apply 14 D before anticipated harvest, longer if temperatures are cool. Do not graze treated fields or feed waste to livestock.

CORN (SWEET)

DESICCANT	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	
<i>carfentrazone</i> Aim 2 EC	up to 1.9 fl oz	up to 0.031	Desiccation of morningglory and tropical spiderwort. Apply when crop is mature and grain has begun to dry down. Use a minimum of 10 gallon of finished spray for ground application and 5 gallon of finished spray for aerial application. Add crop oil concentrate at 1 % v/v. Do not apply within 3 D of harvest. Aerial applications pose significant drift concerns and are not recommended within 1 mile of any vegetable or fruit crop!

DRY BEANS (sweet lupin, white sweet lupin, white lupin, grain lupin, adzuki beans, asparagus beans, black beans, broad beans, field beans, garbanzo beans, kidney beans, lablab beans, lima beans, moth beans, mung beans, navy beans, pinto beans, rice beans, tepary beans, urd beans, blackeyed peas, cowpeas, crowder peas, southern peas, catjang, and guar) **AND DRY PEAS.**

DESICCANT	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	
<i>carfentrazone</i> Aim 2 EC	1-2 fl oz	0.016-0.032	Apply when crop is mature and grain has begun to dry down. Use a minimum of 10 gallon of finished spray for ground application. Add crop oil concentrate at 1% v/v or non-ionic surfactant at 0.25% v/v. Do not apply within 3 D of harvest.
<i>paraquat</i> Firestorm, Parazone 3 SL Gramoxone Inteon 2 SL	0.8-1.3 pt 1.2-2 pt	0.3-0.48	Apply paraquat for weed and bean/pea desiccation. Apply when the crop is mature and <u>AT LEAST 80%</u> of the pods are yellowing and mostly ripe with no more than 40% (bush-type beans) or 30% (vine-type beans) of the leaves still green in color. Add nonionic surfactant at 1 qt/100 gal spray mix. Do not apply when weather conditions favor spray drift. Do not harvest or graze for at least 7 D after application. Make application in at least 20 gal of water/A.

HARVEST AIDS/DESICCANTS AND POST HARVEST CONTROL OF CROPS

DRY BEAN, GUAR BEAN, SOUTHERN PEA

DESICCANT	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	
<i>sodium chlorate</i> (3 lb Chlorate) 3 L (Defol 750) 7.5 L	8 qt 3.2 qt	6	Apply in 10-20 gal of water to facilitate harvest. Apply approximately 7-10 D before anticipated harvest, longer if temperatures are cool. Do not graze treated fields or feed waste to livestock.

POTATO

DESICCANT	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	
<i>diquat</i> Reglone 2 SL	1-2 pt	0.25-0.5	Desiccation of non-stressed potato vines. Under conditions of heavy vine cover 2 applications may be applied. Applications must be at least 5 D apart. Do NOT harvest within 7 D of application. Apply in at least 20 gal water/A. Add nonionic surfactant at 0.06 to 0.5% of finished spray volume or add 0.5 to 4 pt nonionic surfactant/100 gal of spray.
<i>glufosinate-ammonium</i> Rely 200 1.67 SL	29 fl oz	0.375	Apply at the beginning of natural senescence of potato vines. Do not split application or apply more than once. Thorough coverage of the potato vines is essential. Use sufficient volume (20-100 gal) of water for excellent vine coverage. DO NOT harvest potatoes until 9 D or more after application. DO NOT apply to potatoes grown for seed.
<i>carfentrazone</i> Aim 2 EC	3.2-5.8 fl oz	0.05-0.09	Water volume must provide coverage of potato (>20 GPA). Desiccation fair at best; may make second application 7-14 D after the first application if needed. Add a NIS (2 pt/100 gal spray, COC (1-2 gal/100 gal spray)) or methylated seed oil. Do not apply more than 11.6 oz/A per season. Do not apply within 7 D of harvest
<i>pyraflufen ethyl</i> ET 0.208 L	2.75-5.5 fl oz	0.0045-0.0089	Apply as a foliar spray in the early stage of crop senescence. Apply by ground in 20-50 gallons of water/A. Make 1-2 applications at a minimum 7 D interval. Do not exceed 2 applications or 11 fl oz/A/season. Do not apply within 7 D of harvest.

TOMATO: Post Harvest Only

DESICCANT	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	
<i>paraquat</i> Firestorm Parazone 3 SL Gramoxone Inteon 2 SL	1.6-2.5 pt 2.4-3.75 pt	0.6-0.94	After final harvest. Apply in 40-120 gal of water/A. Add nonionic surfactant at 0.125% of final spray volume. Thorough coverage of vines is required.

HARVEST AIDS/DESICCANTS AND POST HARVEST CONTROL OF CROPS

VEGETABLES: Post Harvest Only

DESICCANT	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	
<i>paraquat</i> Gramoxone Inteon 2 SL	2.25-3 pt	0.56-0.75	Broadcast spray over plants following harvest to control many vegetables and emerged weeds. Add a nonionic surfactant at 1 qt/100 gal of spray mix. Do not graze livestock in treated areas. Do not use treated vegetables for human or animal consumption.
<i>glyphosate</i> Roundup WeatherMax 5.5 SL	11-32 fl oz	0.5-1.5	<p>May be applied as a POST-harvest application for the control of the following crops and emerged weeds:</p> <p><i>Brassica:</i> broccoli, cabbage, collard, kale, mustard <i>Bulb crops:</i> garlic, leek, onion <i>Cucurbits:</i> cucumber, melons, pumpkin, squash, <i>Leafy vegetables:</i> celery, lettuce, spinach <i>Fruiting vegetables:</i> eggplant, pepper, tomato <i>Legumes:</i> lima bean, snap bean, southern pea, English pea, garden pea <i>Root and Tuber:</i> beet, carrot, parsley, radish, rutabaga, sweet potato <i>Other:</i> globe artichoke, okra, sugar beet See label for use on additional crops.</p> <p>Apply at least 30 days prior to planting any non-labeled crop.</p>

VEGETABLES: Cucurbit & Fruiting Vegetable Transplants: Post Harvest Only

DESICCANT	BROADCAST RATE/ACRE		REMARKS AND PRECAUTIONS
	AMOUNT OF FORMULATION	POUNDS ACTIVE INGREDIENT	
<i>carfentrazone</i> Aim 2 EC	0.5-2 fl oz	0.008-0.032	<p>Burndown of previous crop and weeds prior to transplanting a new crop. Mix with glyphosate.</p> <p>Be aware of drift as severe injury will occur to most other crops and plants if contacted by this mixture.</p> <p>A single 0.5" water event, either by rainfall or irrigation, and a 7 day interval between application and transplanting the next crop is required to remove residues from mulch.</p>