Georgia Entomological Society Arthropod Survey

2016

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Apple

Apple insect and mite IPM in GA has been and continues to be quite stable. Resistance problems with codling moth (*Cydia pomonella*) and Oriental fruit moth (G*rapholita molesta*), both key fruit-attacking pests, are evident but continue to be seen as slowly unfolding, farm-specific processes. In most GA apple orchards insecticide applications timed by temperature-driven developmental models still provide excellent control of coddling moth, Oriental fruit moth, and tufted apple budmoth (*Platynota idaeusalis*) our key complex of fruit feeding lepidopterans. That said, significant GA apple acreage exhibits signs of resistance to phosmet (Imidan), methoxyfenozide (Intrepid) and/or novaluron (Rimon). Fortunately orchards experiencing declining insecticide performance have gotten good to excellent codling moth and Oriental fruit moth control with pheromonal mating disruption.

The relatively new invasive brown marmorated stink bug (*Halyomorpha halys*) is readily observed in GA's mountain counties, but to date has not been a significant pest in northern apple or peach production.

Wooly apple aphid (*Eriosoma lanigerum*) had been well controlled in GA apples for at least 30 years, but in recent years it became very problematic in isolated blocks. Use of spinetoram (Delegate), especially in early- or mid-season has been closely tied to aphid outbreaks in GA, likely as a result of this compound's non-target impact on the wooly apple aphid parasitoid *Aphelinus mali*. In this case, work by Betsy Beers from Washington State University, translated very well to southeastern apples. As such, the elimination of spinetoram use, or restricting its use to late-season, seems to be allowing re-establishment of wooly apple aphid biocontrol in GA apples, with aphid infestations declining to almost pre-spinetoram levels.

Blueberry

Spotted wing drosophila (SWD) is the key pest of blueberries in Georgia. However, research and extension efforts by UGA Blueberry Entomology program resulted in proactive implementation of monitoring and management strategies for SWD by majority of the blueberry growers during 2016. Consequently, crop losses due to SWD infestation were very low and no major fruit rejections were reported at the packing lines. Overall, SWD presence had a huge economic impact on GA blueberry industry because growers had to invest $100-150 per acre to prevent SWD infestations in fruit.

Over the last couple of years, we have seen a significant increase in secondary pest problems likely due to multiple applications of broad-spectrum insecticides (OPs and pyrethroids) to control SWD. During 2016, gall midge, thrips, and scales were reported to be the major concerns. Other reports of insect pests during 2016 included bud mites, cherry fruit worm, cranberry fruit worm, leafhoppers, whiteflies, and ground pearls. A significant proportion of the blueberry acreage was treated with 1-3 insecticide applications to control these secondary insect pests.

Corn

Corn acreage in Georgia was 380,000 acres which was greater than 2015 due to good conditions at planting. Average grain yield was 165 bu/acre which was lower than the year before, but many irrigated fields yielded 250-350 bu/acre. Dry conditions may have reduced yield in some areas. The national

yield winner for irrigated corn was Mr. Randy Dowdy near Valdosta, GA with 521 bu/acre. All corn seed is treated with a neonicotinoid insecticide, so soil insect damage was very low. Stink bug infestations were low to moderate in 2016 in most areas, although preventive sprays were still used widely. Fall armyworm populations were large in 2016, and some whorl infestations were treated in southern GA. Fall armyworm whorl infestations were severe in non-Bt corn in later planting. Corn earworm infestations were low to moderate in on-time planted corn, but increased to damaging levels in late-planted corn. Bt corn adoption is about 80% in the state. Cost of Bt technology was about $16 to $28 per acre depending on trait package. More unexpected ear/kernel damage by corn earworm was observed in late planted Bt corn than a few years earlier. This suggests field-evolved practical resistance may be occurring in some Bt traits in Georgia.

Cotton

Stink bugs and thrips continued to be the primary insect pests infesting cotton during 2016. An average yield of 903 lbs. lint per acre was harvested on 1.17 million acres of cotton. Average insecticide applications were 2.5 per acre, average yield loss due to insects was 3.27 percent, and the total costs associated with insect pests (losses plus control costs) were $78 per acre.

Thrips infestations were relatively normal, moderate to high infestations on April and early May planted cotton and relatively low infestations on plantings after May 10. Although we continue to have concerns of the resistance development to neonicotinoid insecticides in tobacco thrips populations in Georgia and the southeast, field performance of neonicotinoids was somewhat normal. Neonicotinoid seed treatments continue to be the standard at-plant insecticide for thrips, however in furrow liquid applications are becoming more common. Approximately 40 percent of the acres received a supplemental foliar insecticide for thrips control.

Tarnished plant bugs continue to be more common in Georgia cotton and this is a trend we have been observing for the last few years. Fourteen percent of the acres were treated for tarnished plant bug. Insecticide applications targeting plant bugs have the potential to flare secondary pests such as spider mites. Dry conditions also increased the risk of spider mite outbreaks resulting in approximately 6 percent of the acres treated for spider mites. A small percentage of acreage was treated for cotton aphid. Only 1.5 percent of the acreage was treated for corn earworm. Nearly all cotton planted in Georgia is Bt cotton. There are concerns in Georgia and the Cotton Belt as a whole that we are observing decreased efficacy of some Bt technologies in the field. This observation is most obvious in field corn. Stink bugs continue to be the most common insect pest treated in Georgia cotton; approximately 85 percent of the acres were treated for stink bugs.

The 2016 cotton production year will most be remembered by the major outbreak of silverleaf whitefly (SLWF). Initial infestations in cotton were observed in mid-June which was unusually early; historically if we see SLWF infesting cotton in July we may have economic problems. SLWF management was further complicated by the dry conditions during summer months which are conducive for SLWF buildup. During late summer and early fall, SLWF populations had built to very high levels in localized areas and were very difficult to manage. Conservation of natural enemies and the use of insect growth regulators in a timely manner to prevent infield reproduction continued to be our most effective management program.

Livestock, Poultry, and Pets

Among Georgia's Top 10 agricultural commodities, five are animal agriculture – broilers, laying hens, beef cattle, dairy cattle, and horses. The farmgate value of these five commodities totals over half the state's entire agricultural farmgate value. This illustrates the significance of animal agriculture in the state.

Beef cattle

Georgia ranks 30th nationally in cattle production, with about a million head produced annually, amounting to a farm gate value of over a billion dollars. Horn flies are the main pest of pastured cattle, causing irritation and aggravation to cattle because of their blood-feeding habit. Even more significantly, the cow's avoidance behaviors disrupt calf nursing, meaning that calf weaning weights may be reduced by 18 pounds per calf compared with calves on mother cows with good horn fly control. Statewide, annual losses to horn flies on Georgia cow-calf operations are over $14 million. Horn fly suppression is dependent on insecticides, although there are few options that effectively reduce horn fly numbers for more than a few days. Stable flies, the other bloodsucking fly attacking cattle, account for over $15 million in losses for Georgia cattle herds. To control horn flies and stable flies (as well as other ectoparasites such as face flies, lice, etc.), Georgia cattlemen invest ca. $5.7 million annually.

Broilers

Georgia continues to be the nation's number one broiler producing state. Broilers rank at the top of Georgia's agricultural commodities, bringing in $4.4 billion annually, or 32% of the state's farm gate value.

Worldwide, darkling beetles (*Alphitobius diaperinus*), whose larvae are known as lesser mealworms, are the primary pest of broiler production. These insects burrow into insulation to pupate, damaging facilities and lowering insulative capacity. Costs of keeping heat in the buildings during winter and out in summer significantly increase production costs. When litter is removed and applied to pastures or fields as soil amendment, beetles are distributed and may migrate to nearby homes, creating neighborhood friction. Lesser mealworms feed on dead birds and feces, thereby acquiring numerous pathogens which they can transfer to uninfected birds when consumed. They also maintain Salmonella in their guts during pupation, so that newly emerged adult beetles are infectious to chickens. Chickens are predators and prone to eating insects; filling their digestive tracts with indigestible beetles prevents their consuming nutritious feed and gaining weight, as meat birds are intended to do. *Alphitobius* populations worldwide have been shown resistant to most of the pesticides registered for their suppression, so management strategies are extremely limited. Suppression efforts have some effect on beetle numbers, but there are no tactics that significantly reduce beetle populations.

All 12,000 Georgia broiler houses are infested with darkling beetles and broiler producers spend approximately $9 million annually for *Alphitobius* suppression. Losses to the beetles are estimated at $4.5 million annually, for a total cost of lost production and control ca. $13.5 million annually in the state. Again, even the most conscientious and strategic intervention strategy is ineffective at suppressing *Alphitobius* beetles with current products and technology.

Caged Layers

Table eggs are Georgia's 2nd most lucrative commodity, with an annual value to the state of over $937 million (ranking Georgia 6th nationally). The principal pest in caged layer houses is the house fly, which causes spotting of eggs, degradation of equipment through fecal contamination, and neighborhood consternation when flies migrate away from the poultry farm to nearby residences. Because of suitable conditions inside layer houses, house flies can be a year-round problem. Producers use manure and water management, trapping, biological control (fly parasitoids and predators), and various pesticides to suppress house flies around caged layer operations. Worldwide, house flies have been shown resistant to most insecticides, so control is seldom adequate. Losses due to flies combined with costs of management are estimated to total $6.97 million annually.

Northern fowl mites are the second most significant pest in layer flocks. These mites are bloodsuckers that spend their entire life cycle on the chicken host, causing itching, scabbing, anemia, and general bird discomfort and lack of thriftiness. Losses due to reduced feed conversion efficiency and reduced egg production are estimated at $1.75 million annually, while suppression costs (primarily acaricides) are about $1.7 million per year, totally $3.45 million statewide annually.

Pets

Approximately 3.5 million Georgia households have dogs and cats. The three major arthropod pests affecting pets are fleas, ticks, and mosquitoes. Because fleas transmit tapeworms, ticks transmit pathogens such as Ehrlichia, and mosquitoes carry heartworm, pest suppression is essential for disease prevention and to maintain pet health. In Georgia, expenditures for ectoparasite control on dogs and cats amount to over $128 million annually.

Peach

Pest pressure from fruit-attacking insect pests, such as plum curculio (*Conotrachelus nenuphar*), Oriental fruit moth (*Grapholita molesta*), assorted stink bugs, and green June beetles in peach orchards across GA & SC was light to moderate in 2016. Premature tree decline associated with scale, lesser peachtree borer and peachtree borer continues to cause serious losses. Cover sprays do little to control/suppress these key tree pests. Scale, such as San Jose scale (*Comstockaspis perniciosus*) in particular are increasingly damaging. Scale control is very demanding but doable with rigorous application of dormant oils, followed by block-specific responses with an insect growth regulator application for scale outbreaks through October. Regardless, every orchard needs to receive two dormant, dilute oil applications (200 gals/acre) applied at a low tractor speed (2-3 mph) each year. Prompt, aggressive, often multi-step follow-ups are required where ever outbreaks are observed.

Lesser peachtree borer (*Synanthedon pictipes*) control is stable where dilute, pre-bloom chlorpyrifos sprays are complimented by in-season cover sprays and a post-harvest application of chlorpyrifos. Peachtree borer (*Synanthedon exitiosa*) infestations are worsening. Peachtree borer populations (univoltine) are now showing the same upward population trends previously seen with the multivoltine

lesser peachtree borer. Utilization of safer, but less effective, organophosphate-replacement cover sprays for the past 15+ years appears to be the key element in the emergence of these previously well-controlled species as primary tree-killing insect pests. Utilizing the female sex pheromone of lesser peachtree borer for mating disruption of lesser peachtree borer and peachtree borer is an effective management strategy in the Mid-Atlantic and Upper Mid-Western peach production areas, but this technology has struggled or failed with our higher pest abundance and longer, warmer growing seasons. Cottrell et al. at the USDA-ARS have worked for years to adapt mating disruption to the southeastern lesser peachtree borer and peachtree borer complex. There is optimism that Shin-Etsu's newest dispensers will last long enough to work under our conditions. Working with Shin-Etsu and CBC America, in 2015 and 2016 Cottrell initiated an 800+ acre, on-farm peachtree borer and lesser peachtree borer mating disruption trial in central GA. Preliminary results of this multi-year, area-wide study are very promising. Additionally, Shapiro-Ilan at the USDA-ARS is investigating curative applications of entomopathogenic nematodes for peachtree borer and lesser peachtree borers, which has shown promise on established infestations when used with an appropriate anti-desiccant to keep the borer wounds moist long enough for the nematodes to find larvae.

A sap beetle (*Carpophilus* spp.) and picnic beetle (*Glischrochilus* spp.) complex has emerged in recent years as an occasional, but where severe, damaging and difficult to control pest of sound, ripening mid- and late-season peaches. Problems seem to be more severe in wet years. In the fall of 2016, a graduate student began a project to identify the species and phenologies of the beetles attacking peaches and to develop a key to help growers detect, identify, and manage sap/picnic beetles in their orchards.

Peanut

Peanut was planted on more than 710,000 Georgia acres in 2016. Thrips pressure was moderate to heavy in many areas. Most growers used at-plant insecticides to manage thrips infestations. Granular phorate or liquid imidacloprid applied in-furrow were the most commonly used at-plant insecticides. Granular aldicarb was available in limited quantities in 2016, and thiamethoxam seed treatment was also used on some acres. Foliar acephate applications were common on acres where thiamethoxam seed treatment or no at plant insecticide were used.

Lesser cornstalk borer (LCB), *Elasmopalpus lignosellus*, activity was moderate to heavy in many non-irrigated peanut fields in 2016. Pressure was highest in the central and eastern portions of South Georgia where drought stress was most severe. Due in part to higher rainfall, LCB populations were lower than normal in southwest Georgia. Chlorantraniliprole, novaluron, and chlorpyrifos were the most commonly applied insecticide active ingredients for LCB management.

Two spotted spider mite, *Tetranychus urticae*, infestations have become common in non-irrigated peanut fields over the last three growing seasons. Hot, dry conditions in 2016 were ideal for spider mite infestation development. Mite problems were exacerbated in some areas by the application of pyrethroid insecticides. Propargite was the only miticide registered for use in peanut in 2016.

Peanut burrower bug, *Pangeaus bilineatus*, damage was reported in 2016. Overall damage as measured by the proportion of the crop that was downgraded to segregation 2 was lower than previous seasons, but some growers still experienced significant economic losses. Granular chlorpyrifos was applied in some fields in hopes of reducing burrower bug damage.

Foliage feeding caterpillar abundance and species composition varied from field to field in 2016. No significant statewide outbreaks of foliage feeders were reported. Flubendiamide had become a popular choice for caterpillar management in peanut prior to the cancellation of its registration in 2016. Other active ingredients used to target caterpillars included: chlorantraniliprole, novaluron, methoxyfenozide, diflubenzuron, indoxacarb, and various pyrethroids.

Georgia's state-wide average yield was reported to be slightly less than 4000 pounds per acre in 2016. Quality varied significantly due to high temperatures and drought stress in some growing regions. High percent hull weight resulted in lower than average grades for many producers.

Sorghum

Sorghum acreage in 2016 was 12,000 acres for grain production and 10,000 acres for forage/silage production. Grain yield averaged 54 bu/acre at a price of $6.30 per 100 lb seed. Acreage was much lower than in 2015 due to lower commodity prices and difficulty and cost of controlling the sugarcane aphid (SCA). SCA infestations were first detected in late April in southern GA and throughout the state by the end of June. SCA occurred on about every acre of sorghum. Virtually all grain sorghum hybrids were pretreated with the neonicotinoid insecticides clothianidin or thiamethoxam which provided good control for SCA for 30-40 days after planting. A Section 18 emergency use exemption was obtained again for use of Transform WG on sorghum for SCA control with a maximum of two applications per season. Almost all acres were treated once and some fields were treated 2 or 3 times with either Sivanto prime 200SL or Transform WG. Estimated cost of insecticide application for sugarcane aphid control was about $500,000 for product alone which does not include additional application costs. Some fields or portions of fields were severely damaged and abandoned. Sorghum midge infestations were absent or very low. Some later planted fields were treated for fall armyworm in the whorl or headworms (fall armyworm, corn earworm and/or sorghum webworm) on the grain heads. No insecticides are labeled for SCA control on sweet sorghum. Most sweet sorghum fields were completely destroyed by SCA in 2016.

Soybean

Insect pest problems in soybean were relatively minor during 2016. Foliage feeding caterpillars, including soybean looper and velvetbean caterpillar, and stink bugs were the most common pests infesting fields and requiring treatment. We continue to have concerns with soybean looper susceptibility to Diamide insecticides; laboratory bioassays suggest less susceptibility during recent years. As in 2015, kudzu bug infestations were very low in soybean. When kudzu bugs were observed in soybean or kudzu, egg parasitism by *Paratelenomus saccharalis* and infection by *Beauvaria bassiana* were present and are believed to be responsible for the demise of kudzu bug in Georgia and the southeast.

Urban and Structural

The tawny crazy ant, *Nylanderia fulva*, has shown up in Dougherty county (Albany, GA) in August 2013,Camden and Glynn counties along I-95 exits coming from Florida (August 2014), and Chatham (Garden City, GA), Lowndes (Valdosta, GA), and Brooks (Quitman, GA) Counties in 2015. There have been no detections in Georgia since. Our belief is that this major nuisance ant pest will be restricted to the lower half to one-third of GA and coastal GA. In our studies in Chatham County, at the Port of Savannah, we are seeing the rapid displacement of the red imported fire ant, *Solenopsis invicta*, by *N. fulva*. Control of *N. fulva* is much like that for the Argentine ant, *Linepithema humile*. Fipronil (Termidor SC) used close to the structure only and applied directly to trailing ants is the best method to date, to control *N. fulva*. Elimination of excessive trash and debris is also critical, as it eliminates nesting sites.

Several changes to insecticide labels (pyrethroids and neonicotinoids) have occurred over the past several years. For pyrethroids, changes (in OTC and professional markets) restrict where products can be applied. To prevent water contamination, for instance, they cannot be applied to hard surfaces, cannot be applied more than 3 feet high, must be applied crack and crevice, and must be applied over overhangs when applied to soil. For neonicotinoids, new labels have a pollinator protection box with language mandating that products not be applied to plants with flowers on them.

Although bed bug problems continue to be common in Georgia (mainly in commercial accounts), many companies (including some large ones) not equipped to handle them (multiple visits and labor intensive), or averse to the liability, are not pursuing bed bug work. Although bed bugs garner lots of attention, termites and ants are still more profitable for most companies, especially those small to mid-sized companies which make up more than three-fourths of the industry (Suiter's estimate). On the pest control side, ants (Argentine ants) are arguably the number one pest encountered by companies who conduct residential pest control (most of them) in GA. A major problem that has emerged for those people who have been unfortunate enough to have found themselves with a bed bug infestation is the cost to remedy the problem. The cost of a bed bug treatment, over the past decade, has reached the cost of a residential termite treatment. And many residents, especially those living in low-income environments, are simply not fortunate enough to be able to afford to hire a pest management company to solve their problem. This, coupled with virtually no over-the-counter remedies, is fueling the search for low-cost, effective remedies available to homeowners.

Attractants for bed bug traps is an active area of research. The "ClimbUp" pitfall trap continues to be the industry standard for traps as monitors. Traps are not used as a pest control tool, but are good monitors. Heat continues to be used to control bed bugs, mainly as an alternative to pyrethroid resistant populations; pyrethroid resistance in bed bugs is severe and widespread. There are few chemicals on the horizon that will alleviate this situation; however, chlorfenapyr (Phantom, BASF) is a fairly widely incorporated residual, as is diatomaceous earth (Cimexa dust and Mother Earth dust). Essential oils are being looked at, but are not promising. Heat, when used improperly, can worsen bed bug problems by driving bugs from heated premises. Dogs as inspection tools are variable when it comes to efficiency; the handler has proven to be a key to the success of dogs as inspectors. Information about bed bugs, in the form of webinar archives, can be viewed at www.gtbopc.com. Viewing is free.

Vegetables

As in every year with vegetables, some crops experienced minor problems with insect pests, while others were severely impacted by unmanageable pest problems. Three pests dominated the list of severe issues: diamondback moth, cowpea curculio and silverleaf whitefly.

Diamondback moth populations were relatively high in the winter/spring crop and insecticide resistance issues exacerbated this problem. While we do have multiple modes of action with which to control diamondback moth, we have experienced resistance to all of them. Research and extension efforts have focused on rotation of MOAs to try and maintain susceptibility in populations; however, recent activities to aid growers in identifying efficacious alternatives have highlighted the problem in that some populations show a single MOA still efficacious. The potential for a host free period in the summer has been emphasized with little impact on production habits.

The cowpea curculio threatens to eliminate commercial cowpea production in Georgia. This pest is widespread and insecticide resistance levels are high enough to preclude efficacious control. Research efforts have not been able to identify any efficacious insecticides for foliar use. Research on post-harvest soil applications to target the grubs and pupae in the soil has been inconsistent and would require a complete change in management of this pest. Host plant resistance in commercial varieties is inadequate for management needs. While crop rotation and movement into previously non-production areas should prove useful (the curculio is reported to rarely fly), this has not been the case.

Silverleaf whitefly populations were extremely high in the fall of 2016. This appeared to start in cotton and other summer crops and was aided by very favorable environmental conditions (hot and dry) for this pest. Populations of whiteflies were extremely high and more broadly distributed than normal for South Georgia. This impacted most vegetable crops grown in the fall; even pepper (which is not a favored host) was stunted and required multiple insecticide applications to produce. Cucurbit crops and snap beans were particularly hard hit as cucurbit leaf crumple virus, transmitted by the whitefly, decimated these crops. Fields which produced some harvestable yield were the exception. Finally, tomato yellow leaf curl virus, also transmitted by whitefly, was also present in the fall tomato crop. This problem was not a severe as the leaf crumple in cucurbits and snap beans but did have significant negative impact.

On the bright side, thrips pest pressure in onions was very light in 2016. We also did not experience issues with broad mites in fall peppers and eggplant, which was somewhat surprising as we normally see this pest when whitefly populations are high and broad mite has been a more consistent pest in recent years. Tarnished plant bugs were of concern in spring watermelons, as high populations were encountered in fields with high densities of pigweed and they were present on the melon plants; however, this pest appears to have little or no impact on watermelons. Spider mites also occurred in high populations in early summer in a wide variety of vegetable crops but were controlled with registered acaricides.

Wheat

Harvested wheat acreage in 2016 was about 110,000 acres with average statewide yield of 46 bu/acre at $4.25/bu. Acreage was lower than previous years due to poor conditions at planting time and low commodity prices. Resistant varieties continue to be the main line of defense against the Hessian fly. Some fields of susceptible varieties had significant Hessian fly damage in the spring. Aphids and barley/cereal yellow dwarf disease levels were generally low in the coastal plain region but caused significant damage in northern Georgia. Scab disease was extensive and severe again in 2016 causing serious losses and elevated levels of DON mycotoxin in the grain. Accidental contamination of wheat flour from Georgia by peanut debris presumably in transport vehicles caused cases of peanut allergy reactions in some people which required the recall of contaminated wheat products. It is unclear how this event will affect wheat production in Georgia in the future.