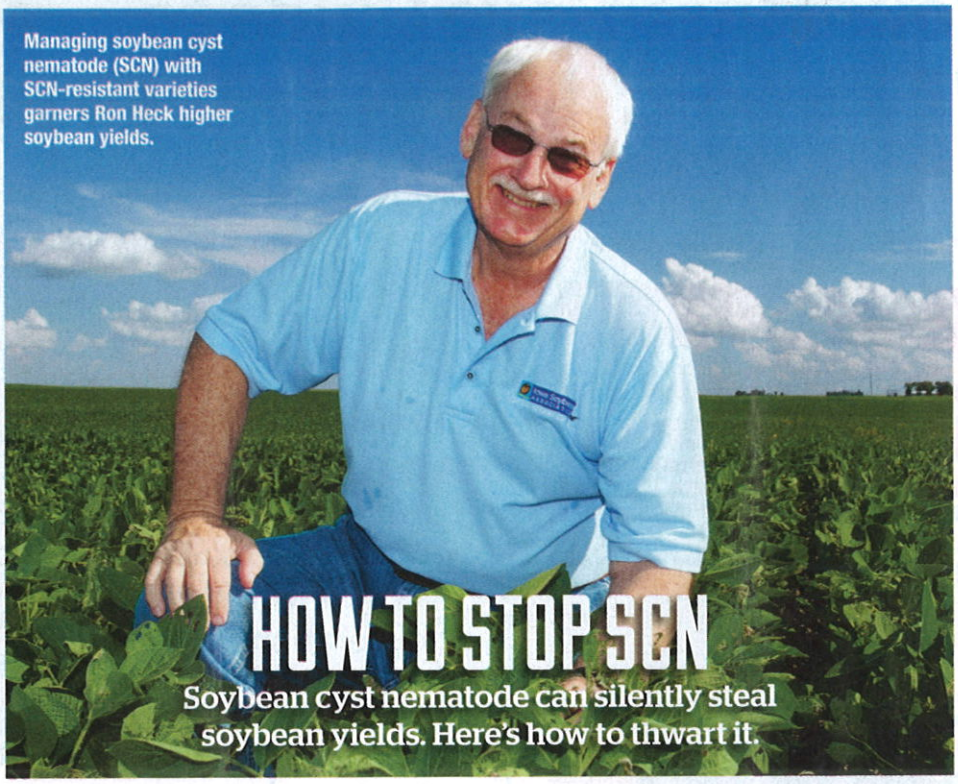

Managing soybean cyst nematode (SCN) with SCN-resistant varieties garners Ron Heck higher soybean yields.

HOW TO STOP SCN

Soybean cyst nematode can silently steal soybean yields. Here's how to thwart it.

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Ron Heck was puzzled.

The Perry, Iowa, farmer had always suspected that some areas of his fields yielded better than others. Still, he never knew how widely his fields varied in yield potential until he started yield mapping in 1994.

"Now, everyone accepts the fact that fields vary," Heck says. "Before yield maps, we never knew how much better some spots yielded than others."

The "why" behind yield variability, though, remained a mystery. Heck took his yield maps with him to a board meeting of the Iowa Soybean Association (ISA).

"Back then, we didn't have the internet or the independent research (ISA's On-Farm Network) that everyone now takes for granted," he says.

Farmers, though, did share in-person observations of their farms. The variability in Heck's fields garnered their attention.

The meeting spurred soybean checkoff funding for yield variability trials. Over the next three years, Heck and other participating farmers learned how soil pH, drainage, weeds, and plant populations impacted yield.

"The bombshell that came out of the whole thing was nematodes," says Heck. "Everyone thought those low spots with yellow beans had iron chlorosis in them. Well, it was not just iron chlorosis, it was nematodes. Those soybeans in potholes were yielding 10 to 30 bushels (per acre) less."

SCN silently steals soybean yields. "With nematodes, you can lose a minimum of at least 10 bushels an acre before you see the difference," he says.

As is the case now, there's a solution: SCN-resistant soybeans. Back then, though, this wasn't as easy as it sounds.

"They were hard to find in 1995," says Heck. "They also had a reputation for not yielding well."

When he could find and plant them, though, Heck's yields rose. He also dashed iron chlorosis. "Occasionally, my beans

Pest Test

Fields that flooded early this spring that farmers eventually planted may have exhibited odd symptoms not linked to nutrient deficiencies or disease.

"It may be that soybean cyst nematode (SCN) has moved into those areas," says Kaitlyn Bissonnette, a University of Missouri Extension field crop pathologist. "Where soil has moved (via flooding), the (SCN) numbers are not as they once were. You may see increases or rarely decreases in SCN numbers. The most important thing is to sample the fields."

Fields that were submerged by water for long periods won't bail you out from SCN infestations, either. "SCN can survive under water 600 days or more," she says.

Sampling protocol remains the same as in other years. The smaller the area sampled, the better. However, this adds cost, as each SCN sample typically costs $20 to $25.

Kaitlyn Bissonnette

She says 40-acre segments are a good compromise, and farmers can break a flat field into rectangular or square sampling segments.

"In Missouri and other states with more hilly areas, think about how you sample fields with grassy waterways or hillsides," she says. "Farmers will want to break up those fields into management zones. Samples should be taken in zig-zag patterns, in ideally 10- to 20-acre segments." SF

Photography: Gil Gullickson

Pale soybeans are one symptom of soybean cyst nematode.

will turn yellow, but they grow out of it," he says. In his fields, SCN was an extra soybean stressor that would pull those areas prone to iron chlorosis over the yield cliff.

"The bad spots that turned yellow and die now routinely make 70 bushels (per acre)," says Heck. "Beans on the sidehills, where nematode counts were moderate to high, used to look fine. When I managed them for the nematodes by planting resistant varieties, yields rose 20 bushels per acre."

Don Kyle

Resistance to Resistance

Like all resistant tools, though, SCN-resistant soybeans have their limitations. Over 95% of SCN-resistant varieties share the same source of resistance: PI88788. Repeated use of the same control measure time after time – whether for weeds, insects, or SCN – spurs resistance. Over time, the continuous planting of soybeans with the PI88788 resistance source has caused SCN to resist SCN-resistant varieties.

"There are yield consequences to this," says Melissa Mitchum, a University of Georgia nematologist working in the Center for Applied Genetic Technologies and Institute of Plant Breeding, Genetics, and Genomics. She cites research done by Greg Tylka, Iowa State University (ISU) Extension nematologist, showing that SCN populations can increase in aggressiveness with repeated plantings of SCN-resistant soybeans with the PI88788 source.

"Farmers planting PI88788 (soybeans) are selecting for resistant nematodes and, consequently, are losing yields despite the fact they are planting (SCN-) resistant soybeans," she says.

Enter Peking-based resistance. Soybean varieties exist with the Peking resistance source that enables farmers to diversify SCN-resistance sources.

Peking-based resistance has also dodged its yield drag rap. "Some of our top-yielding varieties have Peking resistance," says Don Kyle, a Corteva Agriscience soybean breeder. Another bonus is they can also lower nematode numbers, thus, slashing the likelihood of future infestations, says Kyle.

Heck notes it can be difficult to grow soybeans in the prairie pothole region. Having a sound SCN management strategy, though, is key. He rotates his soybeans every other year with corn and plants a different variety with PI88788 resistance each soybean cycle. In the fourth cycle, he plants soybeans with Peking-based resistance.

"It has worked for me," he says. "In quite a few years, my best yield was from Peking beans. After more than 20 years, the last SCN tests I took turned out very low or not detectable." SF

Genetic Breakthroughs

Researchers have identified the major genes that control the majority of SCN resistance in major soybean cultivars: Rhg1 and Rhg4.

"Finding those genes and knowing what they are has opened up a huge amount of information that we didn't know and understand," says Melissa Mitchum, a University of Georgia nematologist. "We know what the genes are and which ones differ. We are starting to understand how they function to confer resistance to SCN. It's also allowed us to place markers on those genes that we've been able to get to our breeders so they can streamline the breeding process."

University of Illinois researchers have also identified two genes from wild soybean (*Glycine soja*) that they have pyramided with the PI88788 resistance source into high-yielding varieties. This not only identifies novel resistance, but enables researchers to use them in pyramiding (adding to) current sources of resistance, Mitchum points out.

These findings can be used by seed companies to incorporate new resistance sources into their soybean varieties to get to farmers, she adds.

"It's now in the hands of the seed companies," says Greg Tylka, an Iowa State University Extension nematologist. "They are the folks who deliver new sources of resistance and new varieties to farmers. We hope that happens and it happens quickly." SF