

Soybean Cyst Nematode: A Big Problem That's Getting Bigger

Soybean cyst nematode (SCN) is a devastating and yield-limiting pest of the soybean worldwide. Syngenta, as a pioneer in controlling this pathogen, offers their second SCN Education Series to help educate growers and retailers on the best practices for reducing damage and increasing soybean yields. Clariva[®] Complete Beans seed treatment, a combination of separately registered products from Syngenta, includes a revolutionary ingredient with a unique, direct mode of action that is lethal to soybean cyst nematodes, delivering immediate and long-lasting protection of plant root systems resulting in significant yield benefits.

If you've done any reading on soybean cyst nematode (SCN), chances are very good that you have encountered Greg Tylka, plant pathologist and director of the Iowa Soybean Research Center at Iowa State University. Since Iowa is one of the states at the center of SCN territory, Tylka has immersed himself in research and education about the most damaging pathogen to soybeans in the U.S. Considered a national leader on SCN education and management, Tylka is well-placed to share his concerns about the decreasing effectiveness of SCN-resistant varieties and about the impact of SCN on soybean yields.

And indeed, a map of the U.S. shows SCN in 30 states, including, somewhat surprisingly, Hawaii, and also the U.S. territory of Puerto Rico.

"I think many growers have become complacent about SCN," Tylka says. "And [in my opinion] we are on the verge of a new crisis.

"We've had SCN resistant varieties for a couple of decades, and they have worked and kept things in check, but it's kind of slipping away from us now. I wish everybody just woke up tomorrow with a renewed interest and concern about SCN. Because given how widespread it is throughout the U.S. and how widespread the buildup is against the common source of resistance, I think we're really vulnerable. I call it a train wreck in slow motion, because we don't see it happening very quickly, but every year it just gets progressively worse and worse. And we don't know what we're going to do when it reaches crisis proportions."

Asked about when that might happen, Tylka says it will

likely be different for every state and even for every county within the state.

"Put it this way, nobody is heading in a good direction," he says. "Everybody's sliding toward the edge of the cliff; it's just that some might be farther away from the edge than others. Parts of North Dakota and South Dakota that are just finding it out are the farthest from the cliff. But they have their own problems, because they don't have many SCN resistant varieties available that are adapted for their area. SCN was never found up there before, and they grow different soybeans with shorter growing seasons than what we do in Iowa and the middle of the Midwest."

Almost all commercial varieties with SCN resistance use a single source of resistance since they generally yield better than varieties that use another source of resistance, such as Peking. But like antibiotics and glyphosate, use of one product for a long time leads to development of resistance and loss of efficacy. Tylka says while the number of SCN resistant varieties available to Iowa farmers has increased from about 25 in 1991 to 818 in 2014, all but 15 (less than 2%) of the varieties in 2014 had PI88788 as the source of resistance.

"I ask farmers, 'What do you think would happen if we used a single herbicide for 20 years to control weeds in our soybean fields?'" Tylka says. "They all start chuckling, because they know I'm alluding to the breakdown of the effectiveness of glyphosate. It's exactly the same thing. We've had one 'active ingredient' for SCN resistance for 20+ years."

Yield Versus Resistance: The Crossing Point

“When soybean breeders use other sources of resistance, such as Peking, it dings the yield a little bit. With PI88788, somehow the resulting progeny of the breeding effort still maintain high yield. But, given that now the nematode is overcoming PI88788, one has to ask where you are going to lose more yield – from the ‘Peking yield ding,’ if you will, or from loss of yield because the nematode is now more easily able to reproduce and cause damage to SCN resistant soybean varieties with PI88788. That’s literally where we are at right now. Eventually there will be a crossing point. Farmers want to grow what is purported to be the high-yielding PI88788 varieties, but those varieties may no longer be high-yielding if the field has an SCN population that has built up resistance against PI88788.”

Tylka says a good Peking SCN resistant variety might yield anywhere from one to four bushels less than a really good PI88788 variety when grown in a field with an SCN population that’s well-controlled by PI88788. But he indicates that less than half of the SCN populations he encounters in Iowa these days are

controlled well by PI88788.

“But what happens when you grow those two types of resistance in a field that now has a nematode that has built up on PI88788?” he says. “It’s that crossing point.”

Use A MultiPronged Approach

There are solutions, but none are a magic bullet, Tylka says. And if seed companies can’t sell varieties with new sources of resistance because the yield is a bit less, they won’t bring them to market. Growers need to approach SCN from multiple directions, he says.

“Farmers should desperately look for soybean varieties with other sources of resistance besides PI88788,” he says. “They should sample their fields and get a feeling for what their SCN egg counts are in every field. And they should consider the new nematode-protectant seed treatments, such as Clariva[®] Complete Beans from Syngenta. Finally, they should be growing other things in their crop rotation that are not SCN hosts, like corn. In the South, they can grow three, four and five different crops, and they are way better [off] than in much of the Midwest where we’re just alternating between corn and soybean.”

Why SCN Is So Serious

Soybean cyst nematode (SCN) is the most damaging pest of soybeans for three reasons: its incredible longevity in the soil, its high reproduction rate and the impact it has on the plant, directly and by making other diseases worse. Greg Tylka, plant pathologist and director of the Iowa Soybean Research Center at Iowa State University, says there’s no other pathogen he is aware of that can live as long in the soil.

A farmer who decides to stop growing soybeans for five years may still only see a 50 percent reduction of SCN. The eggs are encased by the dead female body (the cyst), and are well-protected against environmental stresses. Just one female nematode produces several hundred eggs, and even as far north as northern Minnesota, SCN can complete three generations in a growing season. Further south they may complete five or six. And finally, SCN severely disrupts the growth of the plant by reducing the uptake of nutrients and moisture from the soil. But for reasons still not completely understood, the presence of SCN in a field will actually make damage from other pathogens such as sudden death syndrome (SDS) or brown stem rot (BSR) more severe.

“We’re not really sure of the reasons,” Tylka says. “Some think that it’s due to the nematode creating wounds that allow the SDS and BSR fungi to enter. But it doesn’t seem to be that simple. The nematode attaches to the vascular tissue inside the root and really changes the physiology of the plant. For example, those plants will have fewer nitrogen fixing nodules. So it’s probably doing something physiologically to the plant that really allows or favors the SDS or BSR fungus.”