

ROTATING SOURCES OF RESISTANCE FOR SOYBEAN CYST NEMATODE

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

SCN resistance is cross or breed into our current commercial varieties from plant introductions carrying these resistant genes. These crosses introduce new genes into existing soybean varieties. It's the historical way that humans have improved plants – by crossing varieties with desirable genes in hopes of capturing all of the good genes in one offspring. The breeding lines that breeders use to do this are called sources of resistance in the context of soybean cyst nematode (SCN) resistance.



Why Growers Should Rotate SCN Sources Of Resistance

Growers should rotate sources of resistance in soybeans because, just like weed populations build up resistance to a single herbicide, SCN populations can become resistant to a single gene. Greg Tylka, Department of Plant Pathology and Microbiology at Iowa State University, compares it to Roundup Ready[®] soybeans. He says that, over time, there might be one in 1 million weed plants that have resistance to a herbicide.

“But when that’s the only herbicide you’re using, and that one in a million plant is resistant to it, it can build up in numbers over time, and that’s how we see the breakdown of the effectiveness of the herbicide,” Tylka says. “In this context, with SCN resistant soybean varieties, the more sources of resistance that a farmer can use, the less likely it will be for the nematode to overcome any single source of resistance.”

While there are seven officially recognized sources of resistance that have been used in soybean varieties, there is one that is used most often, PI88788. Tylka maintains an updated list of soybean varieties for Iowa, and the only other source of resistance currently on his list is Peking – a highly desirable source of resistance because it’s only available in 14 of 818 varieties tracked. In addition, this number hasn’t fluctuated much over the last eight to 10 years. While Tylka strongly suggests growers rotate between PI88788 and Peking as sources of resistance when possible, it’s not an option for many growers as the Peking source of resistance isn’t widely available.

How Does Rotation Affect Yields?

Although a commonly used source of resistance, the PI88788 varieties do allow SCN to build up. Over time, with continuous use of PI88788 resistance in a field, eventually the nematode numbers may get high enough to where PI88788 doesn’t offer as effective yield protection.

While a PI88788 variety may yield four or five bushels per acre more than a variety with SCN resistance from Peking in a single growing season, over 20 years (or 10 soybean crops), that yield difference may decrease and actually reverse. If the soybean cyst nematode population in the field does build up resistance to PI88788, Peking might yield better in future years. However, that depends on yield potential and protection against other diseases.

“The nematode is so long lived in the soil that I really try to convince farmers to take a long view of things and not just a one year approach,” Tylka says. “But as farmers point out to me, if they don’t mind their economics on a year-by-year basis, they’ll be out of business in 20 years. So it’s a bit of a balancing act between short term economic gains and long term economic sustainability.”

How To Rotate Sources Of Resistance

Tylka says that in the Midwest, growers don’t need any type of soil test to tell them that they should try to use soybean varieties with varying sources of resistance. Enough has been published in scientific journals that show soybean cyst nematode is building up resistance to PI88788 across Midwest states.

Since most farmers simply can’t rotate with Peking seed due to lack of availability, as an alternative, growers should rotate the varieties they grow, even among varieties that just have the PI88788 resistance. This is because SCN resistance actually involves four or five different genes, and each variety that has PI88788 SCN resistance doesn’t necessarily have all of these genes. Although two varieties have the PI88788 source of resistance, they could still select for nematodes in a different way and perform quite differently.

Tomorrow’s Research On Sources Of Resistance

There are a few laboratories in the U.S. that are continually looking for new sources of resistance, but just finding a breeding line that has good SCN resistance isn’t enough, as evidenced by the situation with Peking SCN resistance. New sources of resistance must be usable in a soybean breeding program and not drag down the yields, Tylka says.

There are continually efforts underway to make genetically engineered SCN resistance, which involves altering the genes in the soybean plant to make it resist the nematode. This SCN resistance would be considered GMO resistance, like the herbicide resistance in Roundup Ready soybeans, for example.

“Who knows when those efforts will bear fruit,” Tylka says. “It could be tomorrow or 10 years from now, it could be 20 years from now. Whenever it does, it may revolutionize the soybean cyst nematode situation for farmers.”