Technology Development & Agronomy by MONSANTO

Agronomic SPOTLIGHT

Managing Soybean Cyst Nematodes

- Soybean cyst nematode (SCN) infestations can cause yield potential losses of up to 30% without exhibiting aboveground symptoms.
- Soil root examination and soil assays are necessary for an accurate diagnosis of SCN populations and races.
- Once SCN becomes established, it cannot be completely eradicated; however, several management practices should be considered to help reduce the population.

Effect of SCN on Soybean

Soybean cyst nematode is the most yield-limiting pest of soybean in the United States.[1,3] Infestations may not be detected for several years because yield reductions often happen slowly and symptoms can be easily confused with other diseases and management problems. Symptoms of SCN infestations include irregular patches of stunting, yellowing plants, and the presence of the white female nematodes on roots (Figure 1). Symptoms are usually more severe during agronomic and environmental stress, as SCN infestations reduce the plant's ability to tolerate water and nutrient deficiencies. Nematode feeding creates entry wounds that make soybean roots more susceptible to soil-borne pathogens such as Phytophthora root rot, Pythium root rot, Rhizoctonia root rots, Cylindrocladium black root rot (red crown rot), and southern stem blight. At high levels of infestation, SCN can severely compromise the tap root and secondary root development may be stunted. This type of nematode can also reduce nodule formation on the root system, which can reduce the plant's ability to fix nitrogen.

Life-cycle & Biology

Soybean cyst nematodes are microscopic, parasitic round worms that attack the soybean root system. Female eggs overwinter in the soil inside a brown cyst, which is the former body of an adult female. In the spring and early summer the eggs hatch and white juveniles penetrate young soybean roots and begin to feed. Two to five generations of SCN can be produced per year, depending on the length of the growing season, temperature, and moisture levels. Nematode feeding stimulates the development of nurse cells, which become physiological sinks that take energy away from the roots, leaves, and eventually grain production.

Figure 1. White bodies of female SCN protruding out of soybean plants.

As female SCN juveniles grow inside the roots, they become lemon-shaped. The body of the female eventually breaks through the root system where she is fertilized by the male (Figure 1). Eventually, fertilized females die, detach from the root system, and turn to brown cysts with many eggs that will be ready to hatch the following spring. Eggs are protected from the environment and may remain viable for several years.

Management

Once present in a field, SCN is not likely to be totally eradicated. However, the goal is to manage population densities, which can help minimize yield loss. The use of the following agricultural management practices can help promote plant health and minimize stress:

Resistant Soybean Products. Resistant soybean products can be an economical means of managing SCN. Soybean plants with SCN resistance will not provide complete control. Resistant soybean products limit reproduction of SCN but are still attacked by these nematodes. A resistant soybean product planted after a susceptible product may be damaged by SCN, but can still out-perform a susceptible product in infested fields as shown in Figure 2.

Figure 2. Soybean cyst nematodes devastate susceptible soybean plants (L) while resistant plants thrive (R).

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The difference between SCN resistance and SCN tolerance is that the former allows less SCN reproduction, while tolerant soybean products do not resist SCN reproduction, but yield may be less affected than it would be with susceptible products.

Crop Rotation. One of the most effective methods of managing SCN is crop rotation. Planting a non-host crop, such as corn or sorghum, for only one year can significantly reduce SCN populations. However, two years of a non-host crop may be necessary to reduce SCN populations to acceptable levels, particularly in sandy soils. Rotation is recommended even if resistant products are planted. Resistant products should suppress the population density of SCN so a susceptible soybean product can be grown every third or fourth year in the same field.

Heterodera glycines (HG) Types. In the past, SCN populations were given a race designation in order to provide growers with soybean product recommendations that provided resistance to the specific race of SCN in their field. The practice of giving SCN a race designation has been replaced by the HG (*Heterodera glycines*) Type test. The goal of the HG test is the same, to indicate which sources of soybean resistance would be good for a specific field being tested.

Seed Treatments. Seed treatments, such as Acceleron® Fungicide Seed Treatment Products with Poncho®/VOTiVO®, offer early-season protection against SCN and other nematode species, by making young soybean roots unattractive to the nematodes. This early-season protection allows soybean roots under heavy SCN pressure to grow and proliferate at a fast enough rate to withstand the potential for infection later in the season.

Agricultural Practices. Optimum soil fertility, proper seedbed preparation, water management, weed control, and any other agricultural practices that reduce plant stress can help protect yield potential.

Proper weed control is especially important when managing SCN. Some weeds can serve as alternate SCN hosts and can further increase SCN population densities in the field. In greenhouse trials, some weeds, including purple deadnettle and henbit, were shown to be just as efficient of a host as a susceptible soybean product.[4]

Plant pathologists have also noted that damage to soybean plants by SCN tends to be greater in early planted soybean than in late planted soybean, because the SCN population density declines from spring to early summer. Since a later planted soybean crop tends to yield less than an earlier planted crop, you may consider planting the land most subject to SCN damage last.

Soil Sample Collection

The first time a field is checked for SCN, samples should be taken from areas where SCN is likely to become established. These areas can include field entrances, along fence lines, where soybean yields have been low, where weed control was poor, where flooding occurred, and in high pH soils. If sampling is done in an area with suspected high levels of SCN damage, it is recommended to sample near the edge of that area. The center of the heavily damaged area may have a low population density, since the SCN may have moved on to healthier plants.

Once SCN have been identified in a field, that field should again be tested. Testing is important before SCN-susceptible soybean products are planted or if resistant soybean products are grown in a rotation test for SCN once every three years. The ideal time to collect samples for SCN is as close as possible to soybean harvest because SCN population densities are the highest at this time.

Below is a general procedure for taking soil samples. Contact your local testing facility for specific recommendations:

- For approximately every five acres of a field, collect around 20 soil cores, 6-8 inches deep in a zig-zag or “W” pattern across the sample area.
- Thoroughly mix together all core samples from a sample area.
- Place the required amount of mixed soil (based on the local testing facility’s recommendations) in a plastic bag and label.
- Store the samples in a cool area, away from heat and sunlight. Do not air dry the samples.
- Collect separate samples where soil texture or cropping history varies from other areas of a field.
- Root samples may also be required.
- Samples can be shipped to the nearest testing facility.

Sources:
[1] SCN management guide - fifth edition. Plant Health Initiative, North Central Soybean Research Program. http://www.soybeanresearchinfo.com/. [2] Koenning, S. Management of soybean cyst nematode. North Carolina State University. Soybean NO-6. http://www.ces.ncsu.edu/. [3] Wrather, A. and Mitchum, M. 1993 to 2014. Soybean cyst nematode: diagnosis and management. University of Missouri. http://extension. missouri.edu/. [4] Allison, J.B. 2014. Winter annual weeds and soybean cyst nematodes. Virginia Cooperative Extension. www.ext.vt.edu/.
Web sources verified 10/23/14.

For additional agronomic information, please contact your local seed representative.