How and When Do I Sample for Soybean Cyst Nematode (SCN)?

Managing nematodes begins with knowing the nematode species and population present in the field. This information can be determined by thoroughly sampling each field close to harvest and sending the samples to a nematology laboratory for analysis.[1]

Why should I care about Soybean Cyst Nematode (SCN)?

Soybean cyst nematode *(Heterodera glycines)* is the number one cause of soybean yield loss and has spread to most of the important soybean producing areas of North America and Canada[1] (Figure 1). Growers may suffer declining soybean yields over the years and not even be aware of an SCN presence. SCN does not always produce visible symptoms on a stand, and when it does, the symptoms often resemble other issues that can stem from diseases, nutrient deficiencies, or other stresses.

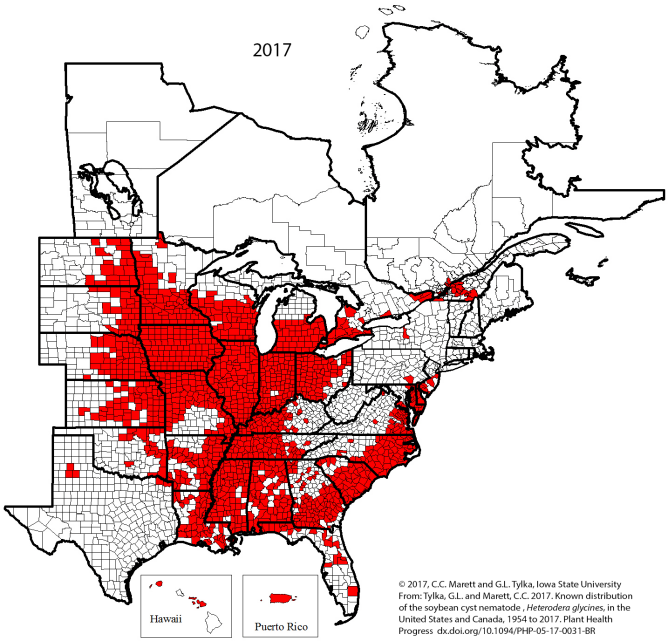

Figure 1. Map of known distribution of soybean cyst nematode in the United State and Canada from 1954 to 2017. Known infested counties are indicated in red. (C. C. Marrett and G. L. Tylka, Iowa State University, 2017).

What is SCN?

SCN is a plant-parasitic nematode, which is a microscopic roundworm. SCN has three stages: egg, juvenile, and adult. After hatching, juvenile worms enter soybean roots to feed. There they become either male or female. Adult males leave the soybean root in the worm form, whereas females swell to a lemon shape and become immobile. As they grow, the female nematodes no longer fit within the root and begin to break through the root surface. The heads remain embedded while their white bodies bulge from the root (Figure 2). The males fertilize the females whose bodies then turn yellow with age and brown when they die. The brown cysts, which contain eggs that can remain protected in the cyst for several years, drop off roots and become the overwintering stage.

Figure 2. White bodies of female SCN protruding out from soybean roots.

How does SCN affect soybean plants?

Several other crops and weeds can serve as hosts to SCN, but soybean plants provide especially favorable conditions for SCN development. SCN feed on plant roots removing nutrients and disrupting water and nutrient uptake, which hinders root growth and can reduce the number of nodules formed by nitrogen-fixing bacteria. The level of symptoms and impact on yield loss from SCN during a particular growing season is dependent on the amount of moisture available. The damage to soybean root systems is more severe during drought stress or when

moisture is less available. Symptoms on heavily-infected plants include poorly developed roots resulting in stunted plants with yellowing foliage. Whether symptoms are evident or not, yield reduction results from reduced pod and seed development on infected plants.

Visible SCN Damage: SCN cannot be easily diagnosed based on foliar symptoms as their appearance is quite variable ranging from no visible symptoms to plant death. Symptoms that appear tend to mimic other common issues in soybean production – nutrient deficiencies, herbicide injury, and environmental stresses. Seeing the white or yellow adult female SCN or cyst on a root is the only unique visible sign of infection on the roots. Visible symptoms (noted above) appear less often in high-yield environments that have adequate moisture; however, SCN can still reduce yield by 15-30% or more in those fields[2].

Disease Interactions: Openings from SCN feeding on roots create entry points for many other soil-borne pathogens. Interactions of SCN with other soybean pathogens can amplify the negative effects of both. Sudden death syndrome (SDS) and brown stem rot (BSR) are two examples of this interaction. When dealing with interactions of SCN with other pathogens, it is recommended to address the SCN problem first because it will always be present, whereas other diseases may not develop every year.

How can I tell if my farm has SCN?

Aside from visually verifying the SCN adult females on soybean roots, the only other way to determine the presence of SCN is through a nematode soil assay, which can also determine their population density in the soil. Soil samples can be collected at any time but are best done close to harvest as SCN numbers tend to be the highest at plant maturity. Nematode soil assays can be used to determine the presence of SCN in a field or to help determine whether your SCN management plan is working.

The first time a field is sampled for SCN, soil should be pulled from areas where SCN is more likely to become established such as: areas of poor soybean yield in previous seasons, along fence lines, near the field entrance, high pH areas, and areas that have poor weed control or have been flooded in the past. If there is an area of the field that appears to have heavy SCN damage, it is better to sample near the edge of the damage instead of the middle as SCN tend to move toward healthier plants once the damage is done. After a field is determined to be infested with SCN, annual sampling is no longer needed. These fields should be sampled every 3 years or before a SCN-susceptible soybean product is grown.

Recommendations for Taking a SCN Soil Sample

- Each sample should represent no more than 10-20 acres.
- Use a cylindrical probe to collect samples to a depth of 6-8 inches.
- Pull 10-20 soil cores in a zig-zag or “W” pattern across the sample area.
- Testing areas should be determined by similarity in soil texture and cropping history, which may require sampling different parts of a field separately.
- Mix cores for a representative sample in a container.
- Place the required amount of composite soil in a labeled plastic bag and keep the sample cool and out of the sunlight until it is shipped to the lab.
- Depending on the facility and test, root samples may also be requested.

What are HG types in SCN populations?

In the past, SCN populations were given a race designation to provide soybean growers with recommendations for soybean products conferring 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 and which would be poor.

If your farm has experienced less than ideal yields from a SCN-resistant soybean product in an infested field or if you observe many SCN females on roots of a resistant soybean product during the growing season, you may consider having an HG type test conducted. Soil sampling may differ slightly for HG type testing, so be sure to follow your lab’s sampling guidelines.

What management practices can I implement if my farm has SCN?

Once SCN is established, it cannot be eradicated completely, but management can help to reduce the population. The key management practices should: improve soybean health and yield, keep SCN numbers low, and help preserve the yield potential of resistant products.

- Resistant products lessen the ability of the SCN to complete its life cycle, typically by allowing less than 10 percent of the reproduction that occurs in susceptible products. If the same resistant product is used repeatedly, the population in that area will build up a tolerance or adaptation to that product. To hinder SCN populations from developing the ability to reproduce on SCN-resistant soybean products, growers should rotate sources of resistance over the years.
- Crop rotation provides benefits to an operation regardless of the presence of SCN. Using a non-host crop, such as corn, cotton, alfalfa, wheat, or sorghum, will eliminate the food source for SCN and can help to reduce populations.
- Control of winter annual weeds is also important as some species, including henbit, field pennycress, and purple deadnettle, are good hosts for SCN. If these weeds are growing and soil temps are above 50, reproduction and population increase of SCN can occur.
- Good crop management practices to improve soybean plant

health, such as proper fertility, irrigation, and weed, insect, and disease control, will better equip plants to survive SCN damage; however, these practices in and of themselves do not decrease SCN numbers.

- Seed treatments offer early-season protection against SCN, as well as other nematode species, by making young soybean roots unattractive to the nematodes. This early-season protection allows the soybean roots to grow and proliferate fast enough to withstand potential infection later in the season under heavy SCN pressure situations.

Sources

[1]Pedersen, P. 2005. Managing soybean cyst nematode. Iowa State University. http://crops.extension.iastate.edu.

[2]Niblack, T. and Tylka, G. 2010. Soybean cyst nematode management guide, 5th edition. Plant Health Initiative, North Central Soybean Research Program; Tylka, G.L. 2012. Soybean cyst nematode field guide, 2nd edition. CSI 0012. Iowa State University Extension and Outreach; Wrather, A. and Mitchum, M. 2010. Soybean cyst nematode: Diagnosis and management. G4450. University of Missouri Extension Division of Plant Sciences.

(Sources Verified 6/28/19)

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