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Interpreting SCN soil sample results

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Interpreting SCN soil sample results

Abstract

Soil sampling for the soybean cyst nematode (SCN) has increased dramatically in the last couple of years. The Iowa State University (ISU) Plant Disease Clinic processed more than 5,000 soil samples for SCN in 1998 compared with 1,830 in 1997. Several private soil fertility laboratories have begun to offer SCN soil analysis as a service. As growers continue to increase their sampling for SCN and begin to compare results from various fields and various laboratories, there are six questions that may be asked to help them interpret their soil sample results.

Keywords

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Disciplines

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INTEGRATED CROP MANAGEMENT

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[1] **Soil sampling for soybean cyst nematode.**



[2] **Soil core collected for testing for soybean cyst nematode.**

1. Were cysts, eggs, or juveniles counted?

When interpreting SCN soil sample results, it is extremely important to understand what life stage of the nematode has been counted and reported. Most laboratories report the number of eggs, but some report the number of SCN cysts or juveniles in the soil. Cysts are dead SCN females that contain eggs. A cyst may contain 200 or more eggs when it is first formed. Over the course of several years, juveniles (the infective, worm-stage of the nematode) hatch from the eggs within the cysts, resulting in a variable number of eggs per cyst. Cyst and egg counts generally correlate well with each other, and cyst counts can be loosely converted to egg counts by multiplying the cyst count by a factor of 50 to 100 eggs per cyst. Juveniles typically are short lived and their numbers may not be well correlated to the number of cysts or eggs in the soil. Consequently, it is much more informative to have cyst or egg counts done rather than counts of juveniles when monitoring SCN population densities in the soil.

Some laboratories offer both cyst and egg counts, whereas many others only offer egg counts. The processing fee for cyst counts typically is less than for egg counts, but cyst counts do not provide as much information as egg counts because of the variable number of eggs per cyst.

2. What amount of soil was processed?

SCN cyst, egg, or juvenile counts typically are reported per a certain volume of soil. When attempting to compare results of different soil samples, it is important to make sure that results are expressed in similar amounts of soil. Results usually are reported per 100 cc (cubic centimeters or a little less than a half-cup) or 250 cc (about a cup) of soil. To convert from 100 cc of soil to 250 cc of soil, simply multiply the number of cysts or eggs per 100 cc of soil by 2.5. Conversely, to convert the number of cysts or eggs per 250 cc of soil to 100 cc of soil, simply divide the result by 2.5.

3. Why are results so variable?

SCN cannot move more than an inch or so under its own power. Even with tillage, the distribution of SCN in a field usually is aggregated. Because of the aggregation of cysts, results of soil samples may be highly variable. The variability in SCN soil test results is especially pronounced in egg counts because eggs are clustered within cysts. It would not be uncommon for two soil samples collected from the same area (e.g., 20 acres) of a field to have cyst or egg counts that vary from 100 to 300 percent. For example, one sample may contain 8,000 eggs per 100 cc of soil and the other may have 24,000 eggs per 100 cc of soil. Similarly, it would not be uncommon to have results of two subsamples from the same bag of soil vary from 100 to 300 percent.

The result of a soil test for SCN, therefore, is a rough estimate of the actual population density of the nematode in the field. Fortunately, a more precise measure of the SCN population density usually is not necessary to implement sound management practices. The only difficulty arises when egg densities vary among infestation levels that have different management recommendations. Even though variability cannot be eliminated, increasing the number of soil cores and decreasing the area from which a sample is collected makes the SCN soil sample results more meaningful.

4. How do I relate sample results to management options?

The SCN population density in the soil (number of SCN cysts or eggs) can be used to identify if a field is infested with SCN, to determine what management practices are warranted, and to assess the success of implemented management practices. Growers should consult the extension nematologist or plant pathologist at their state's land grant university for the most current SCN management recommendations. Management recommendations usually vary based on the SCN population density in the soil. If you have results of SCN soil tests from a private laboratory and want to determine what the appropriate management recommendations are, be sure to have the results expressed in the same nematode stage (cysts or eggs) and amount of soil (100 or 250 cc) as those used in the management recommendations.

5. Why is a follow-up greenhouse test necessary for samples with low SCN egg counts?

At the ISU Plant Disease Clinic, a follow-up greenhouse test is performed on samples with less than 500 eggs per 100 cc of soil to confirm that the sample is truly infested with SCN. When a soil sample is tested for SCN, 100 cc of soil is processed but the amount of the sample that is observed with a microscope for the presence of SCN eggs is 1 percent of the sample. Consequently, an egg count of 200 means that two eggs were observed under the

microscope. With very low egg counts, it is possible that an egg from a previous sample may have been carried over on the processing equipment. Also, it is possible that a few eggs of non-plant-parasitic nematodes may have been recovered from soil particles during processing.

To double check that a sample with low egg counts is truly infested with SCN, a seedling of an SCN-susceptible soybean variety is transplanted into the soil remaining from the sample after the initial 100 cc of soil has been processed. The seedlings are grown under controlled temperature and light conditions for 28 to 35 days in a greenhouse, then the roots are carefully observed for the presence of SCN females. The presence of one or more SCN females confirms that the sample is infested with SCN. Unfortunately, the absence of SCN females on the roots of the soybeans does not necessarily mean that the sample is not infested with SCN. The remaining soil that was tested in the greenhouse may have not had any SCN cysts and eggs left in the soil or conditions may have been such that SCN eggs in the remaining soil may have not hatched and infected during the follow-up greenhouse test. Resampling for SCN is recommended for fields from which samples with low egg counts but negative greenhouse tests are obtained.

6. Does a negative SCN soil test result prove that the field is not infested with the nematode?

Not finding SCN in a soil sample does not prove that it is not present in the field from which the sample was collected for two reasons. First, the extraction procedures used to recover cysts and eggs of SCN from soil are not 100 percent effective. Consequently, some samples that contain low levels of SCN may not test positive when the soil is processed for the nematode. Second, the distribution of SCN can be variable in a field (see the answer to question 3), and it is possible that soil might have not been collected from the areas of the field that are infested with the nematode. A field from which a sample with a negative SCN test is obtained most likely does not have a substantial SCN infestation, but follow-up sampling is recommended to check for SCN infestations that become established in future years.

There are numerous ISU publications available that contain information about SCN. The biology, life cycle, and recommended management of SCN are described in [Pm-879, Soybean Cyst Nematode](#) [3]. Publication [Pm-1649, Disease-resistant Soybean Varieties for Iowa](#) [4], lists soybean varieties with resistance or tolerance to four major Iowa soybean diseases, including SCN. Publication [IPM-47s, Scouting for Soybean Cyst Nematode](#) [5], illustrates the recommended procedures for scouting for SCN. Finally, [PD-32, Plant Nematode Sample Submission Form](#) [6], is the form that should be submitted with soil samples to the ISU [Plant Disease Clinic](#) [7] for SCN testing. Single copies of each publication are available free of charge from county extension offices or from the Extension Distribution Center (515-294-5247).

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[1] <http://www.ipm.iastate.edu/ipm/icm//iscnsampling.html>

- [2] <http://www.ipm.iastate.edu/ipm/icm//isoilcollect.html>
- [3] <http://www.exnet.iastate.edu/Publications/PM879.pdf>
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