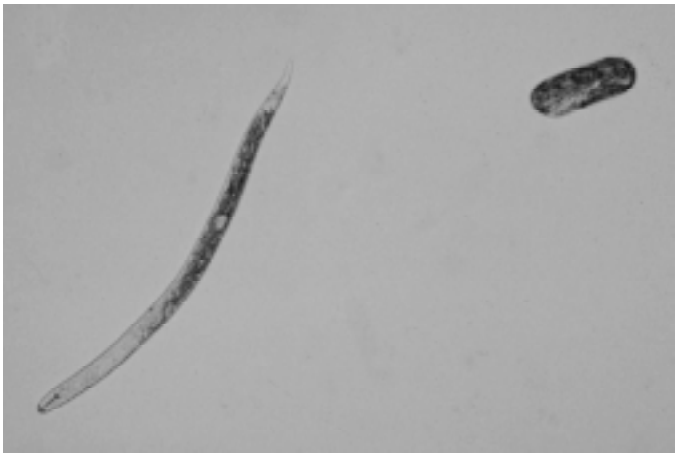
Interpreting SCN soil sample results

Several private soil fertility laboratories now offer soybean cyst nematode (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 several questions that may be asked to help interpret soil sample results.

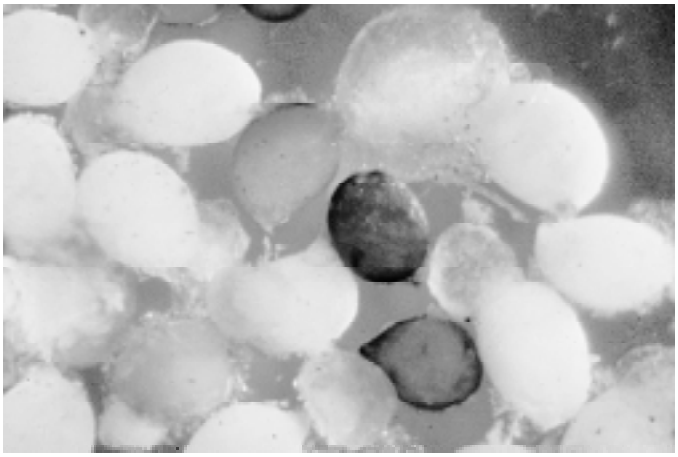
1. Were cysts, eggs, or juveniles counted?

When interpreting SCN soil sample results, it is extremely important to understand what life stage of the nematode was 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 microscopic, 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 that for egg counts, but cyst counts do not provide as much information as egg counts because of the variable number of eggs per cyst.



Hatched juvenile (worm) and egg of SCN.



Adult females (white) and cysts (tan and brown) of SCN.

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, divide the result by 2.5.

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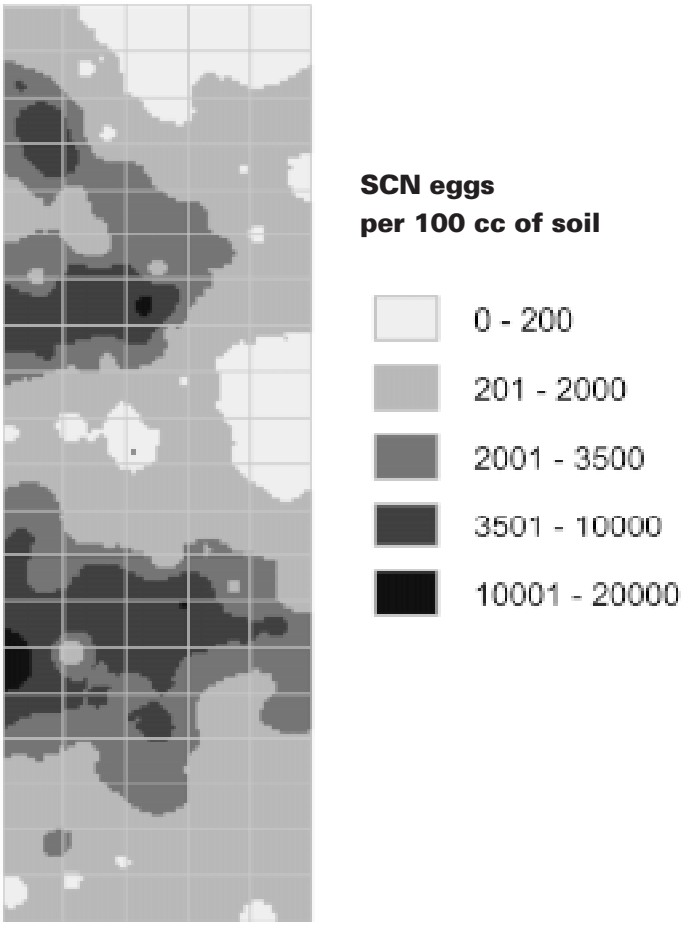
3. Why are results so variable?

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 precise measure of the SCN population density usually is not necessary to implement



Variability in SCN egg population densities among half-acre cells of a 50-acre study area in Boone County, Iowa.

Soil probe containing one of multiple soil cores needed to test for SCN.

sound management practices. The only difficulty arises when egg densities from samples collected from different parts of the same field 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 make 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.

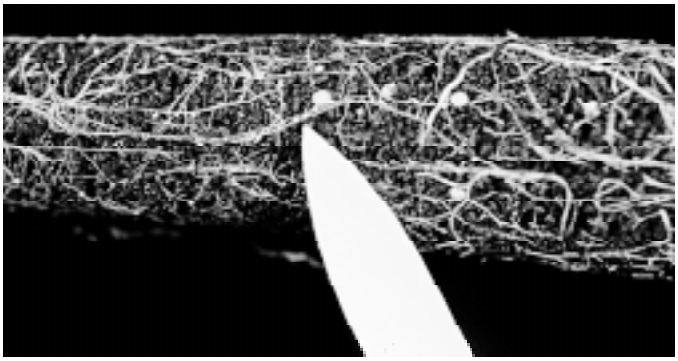
5. Why is a follow-up greenhouse test necessary for samples with low SCN egg counts?

At the ISU Plant Disease Clinic, a follow-up greenhouse test is performed on samples with 150 or fewer eggs per 100 cc of soil to confirm that samples are truly infested

with SCN. Such a follow-up test is necessary because although 100 cc of soil is processed, the amount of the sample that actually 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 a low egg count 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 seedling is 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 SCN females confirms that the sample is infested with SCN. Unfortunately, the absence of SCN females on the roots of the soybean does not necessarily mean that the sample is not infested with SCN. SCN cysts and eggs may not have been present in the remaining soil that was tested in the greenhouse, or conditions may have been such that eggs in the remaining soil did not hatch and infect the susceptible soybean. Resampling for SCN is recommended for fields from which samples with low egg counts and negative greenhouse tests are obtained. About 40 percent of samples at the ISU Plant Disease Clinic with 1 to 150 eggs per 100 cc of soil test negative for SCN in the follow-up greenhouse test.

Soybean seedlings growing in temperature-controlled water bath used to conduct the follow-up greenhouse test of soil samples with low SCN egg counts.



Three white SCN females (at knife tip) on roots of soybean plant in follow-up greenhouse test of soil samples with low SCN egg counts.

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 may become established in future years.

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For More Information

Listed below are SCN publications available from Iowa State University Extension.

Title	Description	Publication No.
Soybean Cyst Nematode	Bulletin describing the biology and management of the SCN (with full-color photographs)	PM 879
Disease-resistant Soybean Varieties for Iowa	Annually updated list of public and private soybean varieties with resistance or tolerance to four major Iowa soybean diseases, including SCN	PM 1649
Plant Nematode Sample Submission Form	Form for submitting SCN soil samples to the ISU Plant Disease Clinic (also contains sampling guidelines)	PD 32
Scouting for Soybean Cyst Nematode	Full-color publication illustrating the proper ways to scout for the SCN	IPM 47 (poster size) IPM 47s (page size)
Evaluation of Soybean Varieties Resistant to Soybean Cyst Nematode in Iowa	Annually updated report of the ISU SCN-resistant soybean variety trial results	IPM 52

Single copies of each publication are available free of charge from county extension offices or from the Extension Distribution Center (515-294-5247). All of the above publications are available on the ISU SCN Quick Facts Web site at www.scnfacts.org