COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

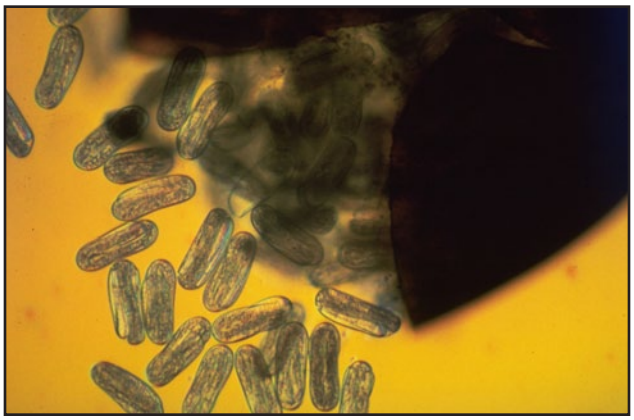
Plant Pathology Fact Sheet PPFS-AG-S-24

# 2015 Soybean Cyst Nematode (SCN) Management Recommendations for Kentucky

**Donald E. Hershman**
*Extension Plant Pathologist*

## How to Interpret and Use the Results of SCN Soil Analyses

The SCN soil analysis result which accompanies this publication, along with the information below, can help you determine your production options for the specific field represented by the sample you submitted. Assuming the sample collected and submitted to the SCN laboratory was representative of the field situation, the number of SCN eggs per ½ pint (approximately 250 cc dry basis) of soil, as determined for the sample, is a reasonable indicator of the potential impact of SCN on yield of a SCN-susceptible soybean variety. Use the table on the next page to determine the specific yield loss potential for the field in question. This information will also help in determining which of the following management options you should consider.



An SCN cyst can contain hundreds of eggs.

## SCN Management

### SCN-Resistant Varieties

SCN-resistant soybean varieties are an essential tool in the management of SCN. Although some of the early resistant varieties lagged behind susceptible varieties in yield, newer resistant varieties adapted for use in Kentucky do not suffer the same yield penalty. In fact, in the absence of SCN, it is common for modern SCN-resistant varieties to out-yield the best susceptible varieties in university research trials.

Due to the major emphasis soybean breeders have placed on developing SCN-resistant varieties over the last 20 years, most soybean varieties sold in Kentucky now have some level of resistance to SCN. In fact, it is often hard to find a Roundup Ready soybean variety that is NOT resistant to SCN. Most of the resistant soybean varieties sold in Kentucky (and elsewhere) have PI88788 in their pedigree. PI88788 is a black-seeded plant introduction from China that has

TABLE. DETERMINING THE CROP YIELD LOSS POTENTIAL BASED ON SCN SOIL TEST RESULTS.

| SCN EGGS PER ½ PINT OF SOIL | POTENTIAL YIELD LOSS OF A SCN-SUSCEPTIBLE VARIETY* |
|---|---|
| 0 | 0% |
| 1 – 500 | 0 – 5% |
| 501 – 1000 | 5 – 15% |
| 1000 – 3000 | 15 – 20% |
| 3001 – 5000 | 20 – 40% |
| 5000 + | 25 – 60% |

***Note:** *A greater yield loss potential is associated with crops being impacted by other stresses, such as other pests, drought, herbicide injury, etc. Healthy crops are capable of compensating for some SCN damage; thus, the lower yield loss potential at the same SCN population. Thresholds are based on the best available information. Actual yields achieved at specific SCN levels may vary from the above due to the occurrence of random factors that impact crop yield, both positively and negatively.*

been used as the main source of SCN resistance in almost all, if not all, soybean breeding programs over the past 25 years. Heavy use of PI88788 is due to its demonstrated effectiveness against historical SCN populations in the U.S., and its ease of use in breeding programs.

There has always been a range of effective SCN resistance in soybean varieties due to differences in the breeding programs. However, most resistant soybean varieties with PI88788 in their background have historically performed well in Kentucky. Data now suggest that many SCN populations in Kentucky (and elsewhere in the U.S.) are adapting to PI88788. This means that many of the populations of SCN we now encounter in Kentucky have the ability to reproduce on resistant varieties with PI88788 in their background. As you might expect, not all resistant varieties are impacted similarly by these adapting SCN populations. Recent data, in fact, suggest that many resistant varieties can still produce very high yields despite allowing limited SCN reproduction. Selecting the best resistant variety is not easy because of a general lack of industry standards for developing and marketing SCN-resistant varieties. For help with selecting SCN-resistant varieties, go to the UK Soybean Cyst Nematode Web site (http://www.uky.edu/SCN). The University of Illinois "VIPS" link on this Web site is especially helpful for determining levels of effective SCN resistance for many soybean varieties sold in Kentucky. Of course, many of the larger seed companies are also excellent sources of this information.

In order to retain the usefulness of SCN-resistant varieties over the long term, it is essential to use them properly. The ideal approach is to alternate planting resistant varieties that represent different sources of SCN resistance. Using this approach will slow adaptation of existing SCN populations to current sources of resistance. However, the number of available varieties that represent sources of SCN resistance other than PI88788 is small. In addition, getting seed for available varieties is often difficult or even impossible. This situation is slowly changing, but for the time being, it is difficult to alternate sources of SCN resistance.

In lieu of alternating sources, the next best thing is to plant a different SCN-resistant variety each time soybean is grown in an infested field. In other words, do not plant the same SCN-resistant variety two or more times in a row. Failure to heed this warning could result in the development of SCN populations that can damage most of the resistant varieties that are currently on the market. According to current research results from Missouri and Illinois, simply planting a different variety can virtually eliminate this as a possible problem. Regardless of the situation, however, nearly all resistant varieties will out-yield

a SCN-susceptible variety if SCN populations exceed the damage threshold (see TABLE).

Some newer SCN-resistant varieties are derived from the highly resistant PI437654, which was first made available in the public variety 'Hartwig'. Because PI437654 is highly resistant to almost all SCN populations at this time, there is a very good chance that it may eventually displace PI88788 as the main source of SCN resistant in most soybean breeding programs.

Most SCN scientists are discouraging producers from exclusive (or even frequent) use of any variety that is derived from PI437654 due to concerns that SCN populations will eventually adapt to them. In fact, several SCN populations have already been identified that are capable of reproducing on PI437654. These SCN populations are able to reproduce on ***any and all soybean varieties, regardless of the source of SCN resistance***.

In time, this scenario could begin to play out in producer fields and it could (at least for the short term) eliminate the value of resistance in managing SCN. It could happen! Admittedly, the probability of this happening is low, and would take widespread adoption and years of use of PI437654 resistance for that scenario to become a reality. Still, most SCN scientists have opted to take the conservative approach because of the catastrophic consequences if "super populations" of SCN developed that were capable of reproducing on PI437654.

## Non-Host Crops

Alternating non-host crops with different SCN-resistant varieties is the basis of an effective, long-term SCN management program. Planting a non-host crop (such as corn, alfalfa, or forage grasses) reduces SCN populations by 50% to 80% in Kentucky, depending upon the starting SCN population and the soil conditions during the growing season and post-season periods. Populations may be further reduced by planting a resistant variety.

## SCN-Susceptible Varieties

In the past, many SCN scientists recommended that producers periodically plant SCN-susceptible soybean to reduce the potential for SCN population shifts to occur in fields. The theory is that occasionally allowing for unrestricted nematode reproduction (i.e., on a susceptible variety) promotes genetic diversity and stability within the SCN population. The idea is similar to the reason why non-Bt corn refuge must be planted when growing Bt corn for the control of European corn rootworm.

Not all nematologists are in agreement that planting a susceptible variety is necessary or effective for managing SCN, or that it is even a good idea; nevertheless, some nematologists continue to make this recommendation. I am presenting it here as an option to consider. However, never plant a susceptible variety when the SCN populations are high enough to reduce yields.

## Cultural Practices and Weed Control

Providing a crop with the best possible growing conditions will reduce stress and limit yield loss due to SCN. Maintain optimum soil fertility to optimize plant growth and development. Control weeds and other pests to reduce overall plant stress.

Certain common weeds, especially chickweed and henbit, are known hosts of SCN. These weeds are winter annuals that frequently persist in fields spanning the period from fall to late spring. Therefore, there is limited potential that allowing these weeds to develop unchecked in fields may increase SCN populations compared to fields where these weed hosts are either present at low populations, or are eliminated by fall tillage or a herbicide application.

However, there is no evidence from field studies that either of these weeds (or any other weed for that matter) will significantly increase SCN populations. This is because low soil temperatures during most of the lifespan of the winter annual weeds are unfavorable for SCN development. Similarly, the risk that SCN populations will be increased on annual weed hosts is very low because of the short time those weeds exist in fields (such as, following harvest in the fall or prior to planting in the spring).

There is some evidence that wheat residue can somewhat limit SCN reproduction when soybeans are double-cropped behind wheat. Because this effect is not evident until the end of the season, damage to soybean plants will still occur if SCN levels (at planting) exceed the damage threshold. However, the so-called "residue effect" may help in the long term management of SCN by keeping populations in a field lower than they otherwise would be (in the absence of wheat residue).

### Nematicides

Nematicides are recommended only when a producer cannot rotate to a non-host crop or when SCN populations cannot be controlled with available resistant varieties. It is a "last resort" option because of high cost, safety concerns, and inconsistency in results.

### Periodically Test Fields for SCN

Very few producers periodically monitor SCN population changes in their fields over time. Most just assume that what they are doing is working. The simple fact, however, is that in many cases, SCN populations are NOT being effectively managed. To monitor the effectiveness of SCN management decisions, have SCN analyses conducted for all SCN-infested fields at least once every 4 to 6 years. More frequent sampling may be necessary when specific management questions exist. Instructions for sampling fields and submitting samples for SCN analysis can be obtained from your local county Extension office and on the Web.

## Additional Resources

The University of Kentucky resources listed below are available at County Extension offices as well as on the Internet.

- Soybean Cyst Nematode Website (University of Kentucky)
http://www.uky.edu/SCN
- Kentucky Integrated Crop Management Manual for Field Crops: Soybeans, IPM-3 (University of Kentucky)
http://www.uky.edu/Ag/IPM/manuals/ipm3soy.pdf
- Sampling Soybean Fields for Soybean Cyst Nematode Analysis, PPFS-AG-S-09 (University of Kentucky)
http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-AG-S-9.pdf
- Soybean Cyst Nematode Management Guide (North Central Soybean Research Program) *1.62 MB file*
http://www.ncsrp.com/pdf_doc/SCN_Management.pdf
- Value of Wheat Residue in Soybean Cyst Nematode Management Programs, PPFS-AG-S-08 (University of Kentucky)
http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-AG-S-8.pdf

***Reviewed November 2014***

*Photo by Richard Chapman, University of Kentucky*