SCN Management

Soybeans can be produced profitably on SCN-infested fields with a tailored management program.

SCN can not be eliminated from an infested field if soybeans are ever grown again. Once discovered, a management program should be implemented immediately to minimize SCN reproduction and maximize crop yields. The goal of an SCN management plan is to maintain profitable soybean yields while keeping SCN population densities at low to medium levels.

It is much easier to keep low SCN population densities low than it is to drive high populations down.

SCN management can involve:

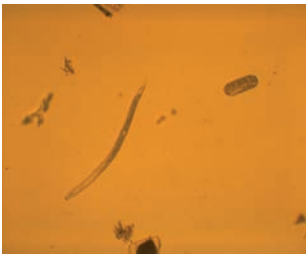
- Growing nonhost crops
- Controlling winter annual weeds
- Applying nematicides
- Growing SCN-resistant soybean varieties

Nonhost Crops

There are many crops on which SCN is unable to feed. These are called nonhost crops. Without a host crop, SCN cannot complete its life cycle and population densities will decline. Thus, growing nonhost crops is one way to manage SCN population densities.

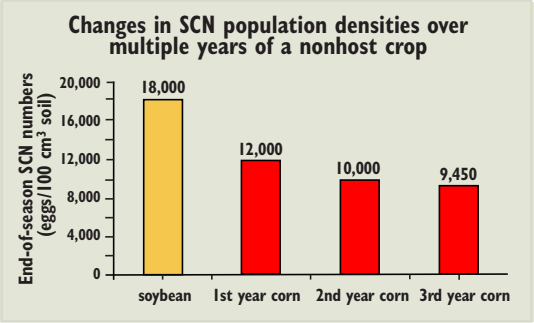
Corn, oats, rye, wheat, sorghum and alfalfa are nonhosts for SCN. Nematode numbers decline similarly when infested soils in Iowa are planted with corn, oats or alfalfa.

The greatest decrease in SCN population densities will occur during the first year a nonhost crop is grown following soybeans. SCN densities will decline only slightly more if a second nonhost crop is grown.



SCN juvenile (left) hatched from an egg (right). The juvenile will starve if it does not feed upon a living host root.

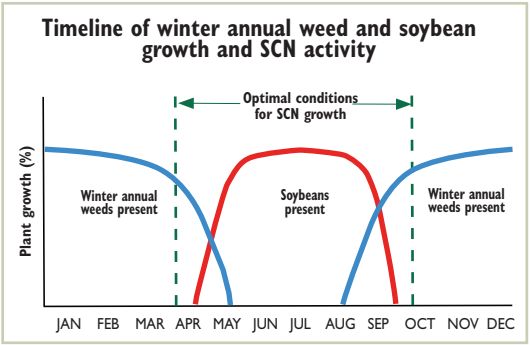
The graph below illustrates how SCN population densities decline in three successive corn crops (red bars) following a soybean crop (gold bar) in Iowa.



Winter annual weeds

Common weeds that occur in Iowa corn and soybean fields during the growing season are nonhosts for SCN. The winter annual weeds purple deadnettle, henbit and field pennycress are moderate to good hosts for SCN. If these winter annual weeds are growing in SCN-infested fields and soil temperatures are greater than 50°F, SCN reproduction and increases in population densities can occur. (SCN cannot develop in roots below 50°F.)

The SCN life cycle takes about 24 days to complete at ideal temperatures (76°F) and can take five or more weeks at colder temperatures. There may be periods in the spring or fall when soil temperatures are warm enough for SCN reproduction to occur on winter annual weeds.



Reprinted with permission from *Winter Annual Weeds and Soybean Cyst Nematode Management* © 2007, Purdue University.

Purple deadnettle seedling (left) and flowering plant (right). Photos by Earl Creech, Purdue University.

Nematicides

There are a few soil-applied nematicides labeled for management of SCN, but this option is not commonly used.

Nematicides generally do not give season-long control. When applied to the soil at planting, the effect of the nematicide may last long enough to provide an economic yield benefit. However, by the end of the growing season, SCN numbers may be as high as, or higher than, they were at planting.

Use of nematicides increases the cost of production. Field-wide applications are often considered uneconomical, although an increase in yield of a few bushels per acre could offset the cost of the nematicide.

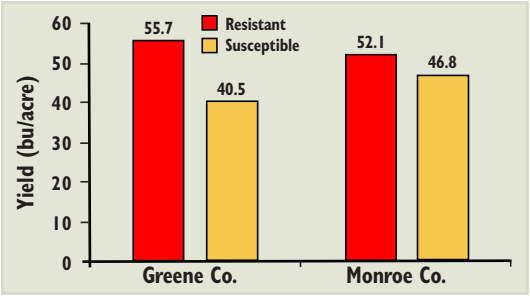
Unpredictable yield responses and inconsistent decreases in SCN population densities are the main reasons why nematicides are not more commonly used.

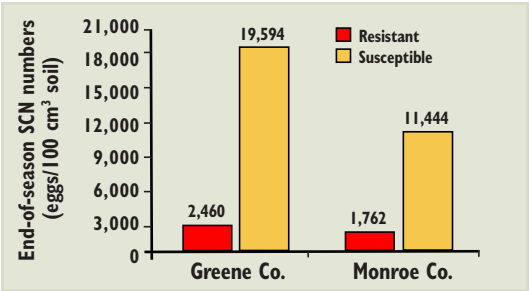
In the future, site-specific application of soil-applied nematicides to manage SCN may make this option more economical. Also, nematicide seed treatments are being developed that may protect the soybean plant from SCN during a portion of the growing season.

SCN-Resistant Varieties

SCN-resistant soybean varieties pay dividends twice – first by producing good soybean yields on SCN-infested fields and secondly by preventing increases in SCN population densities.

Below are averages from SCN-resistant (red bars) and SCN-susceptible (gold bars) soybean varieties at two locations in Iowa that illustrate the dual benefits of resistance.





How does SCN resistance work? SCN juveniles penetrate the roots of SCN-resistant varieties, but are not able to feed in the roots. Subsequently, the SCN juveniles starve inside roots of resistant varieties.

SCN juveniles after eight days in resistant (top panel) and susceptible soybean roots. Photos by Ben Matthews.

Note in photos on previous page how much larger the developing SCN juveniles are in the susceptible roots than in the resistant roots after eight days.

Different soybean breeding lines (called sources of resistance) have been used to develop SCN-resistant varieties. Some breeding lines are called "plant introductions" (abbreviated "PI") and are assigned identifying numbers.

Sources of SCN resistance available to Iowa growers include PI 88788, Peking, and PI 437654, which is also referred to as Hartwig resistance or the branded CystX® resistance. Each source of resistance has several genes that provide SCN resistance to the plant. Not all of the resistance genes from a source need to be in a soybean variety for the variety to be resistant to SCN. Soybean varieties with the same source of resistance will not necessarily have the same level of resistance to SCN.

Resistance to SCN in soybean varieties is not 100 percent effective; a few SCN females will develop on roots of resistant varieties. Exactly how many SCN females develop on a resistant

soybean variety depends on the resistance genes in the variety and also the genetic makeup of the SCN population in the field.

The HG type test ("HG" represents *Heterodera glycines*, the scientific name for SCN) is designed to give practical information about how well an SCN population in a field can reproduce on the various sources of SCN resistance (refer to section labeled HG Type Test for more information).

SCN-resistant soybean varieties pay dividends twice — good yields and control of SCN population densities.

But not all SCN-resistant soybean varieties provide the same level of nematode control, not even varieties with the same source of resistance.

Rotate resistance

Recent survey results show that SCN populations (HG types, formerly called races) with greater than 10 percent reproduction on the commonly used PI 88788 source of SCN resis-

tance are widespread in Iowa and other states. Some SCN populations have been found with reproduction exceeding 50 percent on PI 88788.

To delay SCN populations developing the ability to reproduce on SCN-resistant soybean varieties, producers should grow varieties with different sources of resistance in different years. This is similar to using herbicides with different modes of action in different years to control weeds and avoid the development of herbicide-resistant weeds.

If it is not possible to obtain seed of an SCN-resistant variety with a source of SCN resistance different from what had been previously been used, rotate among different SCN-resistant varieties with the common source of SCN resistance, PI 88788.

Selecting an SCN-resistant variety

Choose a variety that yields well in various SCN-infested fields. Yield data from non-infested fields are not useful for predicting yields of soybean varieties in SCN-infested fields.

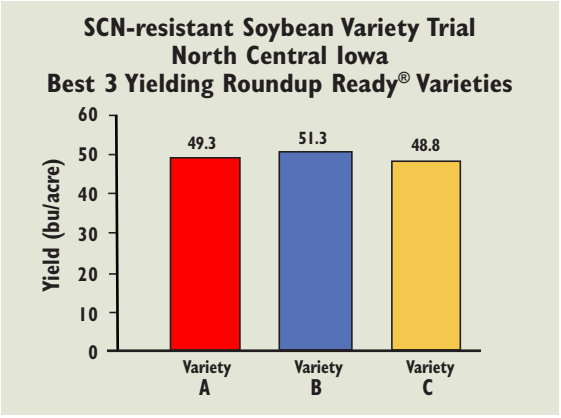
If possible, choose a soybean variety with a source of SCN resistance other than what has been grown previously. Remember to choose

SCN-resistant varieties with other needed defensive traits, such as tolerance to iron deficiency chlorosis or resistance to sudden death syndrome or Phytophthora root rot.

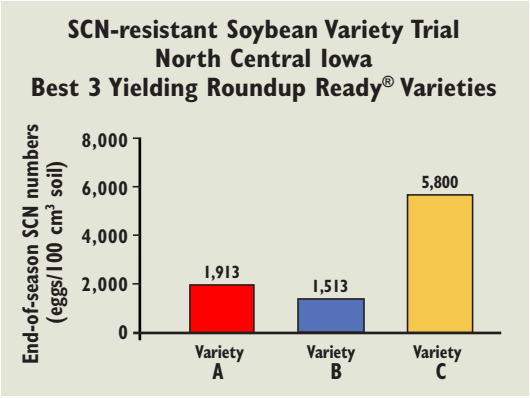
Don't let SCN numbers creep up

Even the highest-yielding SCN-resistant soybean varieties can vary significantly in the amount of nematode control they provide.

In the graph below, the yields of the top three SCN-resistant soybean varieties in a variety trial conducted in an SCN-infested field were not significantly different. At harvest, there were significant differences in SCN egg population



densities in the soil among the three resistant varieties (below).



Soybean varieties labeled as resistant to SCN vary greatly in yield and in control of SCN. Both are determined by the genetics of the soybean variety and also the genetics of the SCN population in the field. The results of an HG type test indicate how well a population will be controlled by the various sources of resistance used to develop soybean varieties. There is no comprehensive testing of all SCN-resistant soybean varieties to give an indication of those with the most effective resistance.

Integrated SCN Management

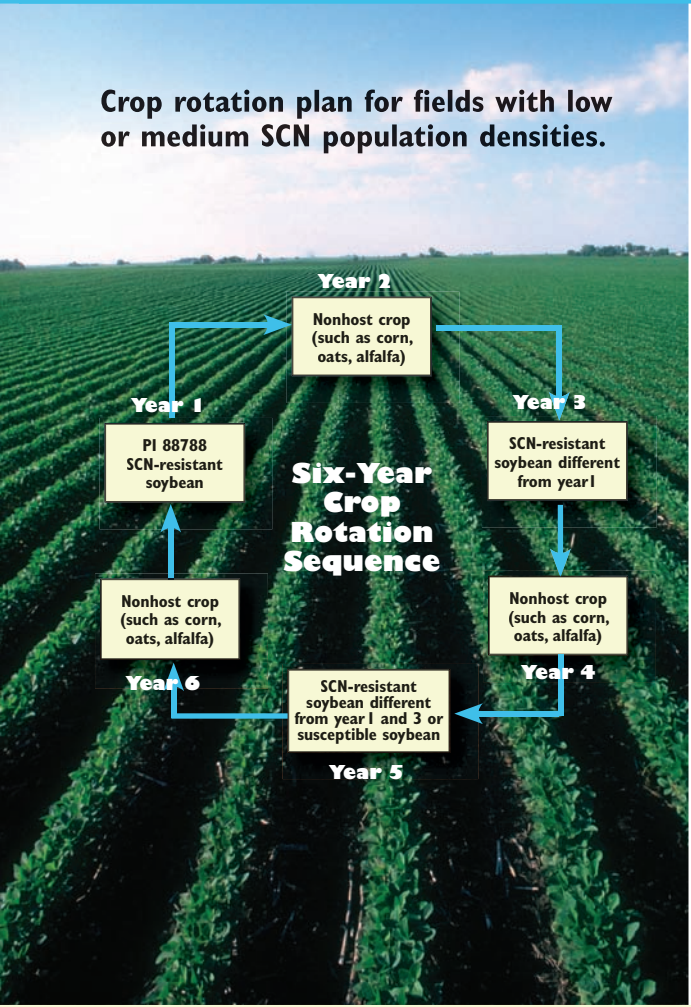
The most effective SCN management program integrates as many different management strategies as possible to maintain high soybean yields while preventing increases in SCN population densities. It is much easier to keep low SCN population densities low than to try to drive high numbers back down.

Such a management program would usually include scouting for early detection and growing nonhost crops in rotation with SCN-resistant soybean varieties.

On the next page is a six-year crop rotation sequence recommended by Iowa State University for fields with low or medium SCN population densities. The rotation begins with year one in the upper left of the diagram.

If SCN population densities are high, grow several years of corn or some other nonhost crop until fall soil sampling results reveal that SCN population densities have decreased to the medium level (Page 26).

Crop rotation plan for fields with low or medium SCN population densities.



Growing soybean varieties with different sources of resistance will best discourage build-up of SCN populations with increased reproduction on resistant soybean varieties. But if varieties with different sources of SCN resistance are not available, grow different SCN-resistant varieties derived from the common source of SCN resistance, PI 88788.

An integrated management program also includes control of winter annual weeds that can serve as hosts for SCN. Nematicides may also be used during years that soybeans are grown in SCN-infested fields.

Integrated SCN management should always include soil sampling, nonhost crops and SCN-resistant soybean varieties.