

# SOYBEAN MANAGEMENT GUIDE



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# INTRODUCTION



*PICTURED ABOVE AND ON THE COVER: DAMAGED SOYBEAN PLANTS CAUSED BY SOUTHERN ROOT-KNOT NEMATODE.*

**SOUTH CAROLINA SOYBEAN FARMERS** face many unique production-management challenges. One of the most significant remains plant-parasitic nematodes, the most prevalent of which is the southern root-knot nematode (SRK). The pest has from the earliest days of soybean production been especially problematic to farmers in the South, where it has reduced yields for years.

Other native nematode species such as reniform, Columbia lance, soybean cyst nematode, and sting and lesion nematodes continue to cause problems for South Carolina soybean farmers, but are not as prevalent as the SRK.

For nematodes of all kinds, prevalent or not, effective management practices can help mitigate the damage they cause. However, checkoff-funded research shows that one size does not fit all: Just because a farmer detects nematode infestation in one field doesn't mean it's present in another. Therefore, fields must be sampled one at a time to figure out what management programs are most effective for each.

# SOUTHERN ROOT-KNOT NEMATODE



*PICTURED ABOVE: GALLING CAUSED BY SOUTHERN ROOT-KNOT NEMATODE.*

## OVERVIEW

**SOUTHERN ROOT-KNOT NEMATODE** continues to be the most prevalent nematode problem in South Carolina soybean fields. This pest can cause significant yield losses to susceptible soybean varieties.



# SOUTHERN ROOT-KNOT NEMATODE

## SYMPTOMS

Symptoms of this nematode include oval patches that run parallel to the row. Plants can be severely stunted and can present galls on the roots ranging in size from one-fourth to one-half inch in diameter. The roots can be very stunted, especially on the taproot. Plants will wilt prematurely even when soil moisture remains adequate. Interveinal necrosis (internal decay) will often be present on the leaves, and plants infected by this nematode typically have higher levels of the fungal root pathogens such as southern blight (white mold) or red crown rot.

## MANAGEMENT

Many resistant variety options continue to be available, especially in Maturity Groups VI, VII and VIII. Resistance has not been complete, and the addition of an in-furrow or seed treatment nematicide may increase yields. Nematicide treatments often will not provide acceptable control on southern-root-knot-nematode-susceptible varieties.

Rotation with peanuts will help reduce levels of this nematode. Rotation with corn or cotton will maintain or build southern-root-knot-nematode populations.

# COLUMBIA LANCE NEMATODE



*PICTURED ABOVE: THIS PHOTO DEMONSTRATES THE DAMAGE THAT CAN BE CAUSED BY THE COLUMBIA LANCE NEMATODE.*

## OVERVIEW

**COLUMBIA LANCE NEMATODE** has been common in coarse textured soils throughout the Coastal Plains of South Carolina, Georgia and North Carolina. This nematode continues to be very common in South Carolina soybean and cotton fields. Although it normally does not kill soybeans, it will prune the taproot, resulting in very stunted plants. It also appears to inhibit nitrogen uptake and nodulation, resulting in plants with a distinctly yellow cast.

# COLUMBIA LANCE NEMATODE

## SYMPTOMS

Columbia lance nematode symptoms typically include oval patches that run parallel to the rows. Plants can be severely stunted with abbreviated taproots and secondary roots. Plants will wilt prematurely even with adequate soil moisture.

## MANAGEMENT

There are no soybean varieties known to be truly resistant to Columbia lance nematode. However, some varieties appear to be tolerant because they can sustain yields even when infected to a greater degree than other varieties. The use of in-furrow or seed treatment nematicide to tolerant varieties may increase yields.

Rotation with peanuts will help reduce levels of Columbia lance nematode. Rotation with corn or cotton will maintain or build Columbia lance nematode populations.

# RENIFORM NEMATODE



*PICTURED ABOVE: SHOWS RENIFORM NEMATODE LARVAE FEEDING ON SOYBEAN ROOTS.*

## OVERVIEW

**RENIFORM NEMATODE** has become increasingly common throughout the southern U.S. and occurs in many soil types. In South Carolina, it occurs on cotton and soybeans from the Santee/Orangeburg area up to the North Carolina border. It has not been seen in South Carolina counties that border the Savannah River. Symptoms generally can be much more subtle than those for the other nematodes. Chlorosis and stunting have not been as common, and when they do occur, remain more uniform throughout the field. Reniform nematode normally does not kill soybeans. However, it is capable of causing significant yield losses.

# RENIFORM NEMATODE

## SYMPTOMS

Reniform nematode has a very high reproductive rate and can be more uniformly distributed through a field than the other nematode species. Stunting can be gradual and hard to detect from the edge of the field. Roots usually appear to be severely stunted.

## MANAGEMENT

Varieties resistant to reniform nematode are available in several maturity groups. No complete resistance exists; however, the addition of an in-furrow or seed treatment nematicide and resistant varieties may increase yields.

Rotation with peanuts or corn will help reduce levels of reniform nematode. Rotation with cotton will maintain or build reniform populations.

# SOYBEAN CYST NEMATODE



*PICTURED ABOVE: THIS PHOTO SHOWS DAMAGE CREATED BY SOYBEAN CYST NEMATODE.*

## OVERVIEW

**SOYBEAN CYST NEMATODE** may be the best known of the soybean nematodes in the United States. However, its distribution in South Carolina has been somewhat limited, since corn, cotton and peanuts do not host them. It occurs in many soil types although damage can be worse in sandier soils.



# SOYBEAN CYST NEMATODE

## SYMPTOMS

Normally soybean cyst nematode does not kill plants of susceptible soybean varieties, but it can cause stunting and disrupt water uptake and nodulation, thus resulting in chlorosis and yield losses.

## MANAGEMENT

Rotation with peanuts, corn or cotton will help reduce levels of SCN.

# STING/LESION NEMATODE



*PICTURED ABOVE: THIS PHOTO SHOWS A STING NEMATODE UNDER A MICROSCOPE.*

## OVERVIEW

**STING/LESION NEMATODE** Sting and lesion nematodes can also occur in soybeans in South Carolina, although they appear to be much less important than the other species. They represent the two ends of the nematode spectrum in many ways. Sting nematode can be a very large nematode, occurs only in very extreme sandy soils and can be capable of causing severe root stunting and subsequent stunting above ground. Lesion nematodes can be much smaller, occur in a wide range of soil types and normally cause minimal root or above-ground stunting.

# STING/LESION NEMATODE

## SYMPTOMS

Legion nematodes produce characteristic necrotic lesions (darkened areas of dead tissue) on the surface and throughout the root. The lesions turn reddish brown to black.

Sting nematodes damage occurs to the roots of the plant. Plant can be most susceptible during the first weeks after planting. Roots will appear short and stubby with dark, shrunken lesions, particularly on the tips.

## MANAGEMENT

Normally soybean cyst nematode does not kill plants of susceptible soybean varieties, but it can cause stunting and disrupt water uptake and nodulation, thus resulting in chlorosis and yield losses.

# NEMATODE SAMPLING

**TYPES OF SAMPLES:** There are two types of nematode samples. Diagnostic samples can be taken anytime during the growing season and used to determine if nematodes have been the cause of dead, stunted or chlorotic (yellow) plants. The best way to diagnose is to take samples of soil and roots from the dead or dying area of the field, and then more soil and root samples near where plants begin to show symptoms. Predictive samples, those taken at harvest to determine nematode populations the following year, can be taken in the fall from fields that may or may not be showing any symptoms. These soil samples will be sent to the Nematode Assay Lab, and the results will tell you what species remain present and at what levels.

**HOW TO TAKE PREDICTIVE SAMPLES:** Predictive samples should be taken after the crop has matured. It's easiest to take them after harvest, when it's easier to drive across fields to pull them. Soil cores should be taken 1 inch from the plant stems, and you should feel roots snap as you push the core sampler into the ground. Cores should be 8 to 10 inches deep. A sample should represent 5 to 10 acres or any defined section of a field. Fields should be divided by previous crop or distinct differences between areas in soil texture or drainage.

# NEMATODE SAMPLING

**STORING AND SHIPPING SAMPLES:** Samples should be placed in a plastic bag and kept in a cooler or refrigerator until shipping. It's best to ship samples on a Monday or Tuesday so they will not sit over the weekend in a hot warehouse or truck.

**INTERPRETING YOUR RESULTS:** Nematode sample results can be interpreted using economic thresholds. Above a certain threshold level, we know we might be likely to see damage and yield losses caused by the nematode species. For instance, in the chart below, if you have more than 100 southern root-knot nematodes per 100 ml of soil, we would predict that you will experience at least a 10 percent yield loss. By comparison, only four sting nematodes could cause comparable yield loss.

**Thresholds for common nematode species on soybeans based on predictive samples taken in the late fall:**

NEMATODE SPECIES	THRESHOLD VALUE/100 ML SOIL
Southern root-knot	100
Soybean cyst	50
Reniform	100
Columbia lance	75
Sting	4
Lesion	150

# NEMATODE SAMPLING

## HOST RANGES:

NEMATODE SPECIES	SOYBEAN	CORN	COTTON	PEANUT
Southern root-knot	Host	Host	Host	Nonhost
Soybean cyst	Host	Nonhost	Nonhost	Nonhost
Reniform	Host	Host	Host	Nonhost
Columbia lance	Host	Host	Host	Nonhost
Sting	Host	Host	Host	Host
Lesion	Host	Host	Host	Host

This table shows which crops can be hosts for which nematode species.

## OVERVIEW

The most important nematode species of soybean in South Carolina are **southern root-knot**, **soybean cyst**, **reniform**, **Columbia lance**, **sting** and **lesion**. These nematodes are all capable of causing significant yield losses, 10 percent or greater, in soybeans.

**Southern root-knot nematode** numbers can be reduced only by growing peanuts for one or more seasons. Levels of Southern root-knot nematode will be steady or increase under corn or cotton.

**Soybean cyst nematode** numbers can be reduced by growing corn, cotton or peanuts.

**Reniform nematode** numbers can be reduced only by growing peanuts.

**Columbia lance** numbers can be reduced only by growing peanuts.

**Sting and lesion nematodes** can reproduce and increase their numbers on corn, cotton and peanuts.

**FARM LEADERS** of the national soybean checkoff initiated the Information and Technology Transfer project, a collaborative effort between the soybean checkoff, numerous state soybean boards and their respective land-grant universities to distribute checkoff-funded and other critical production research information to help soybean farmers improve their profitability. The United Soybean Board/soybean checkoff neither recommends nor discourages the implementation of any advice contained herein, and is not liable for the use or misuse of the information provided.

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