

Root Knot Nematode of Cotton

NC STATE EXTENSION

Cotton Disease Information

Pathogen

Root knot nematodes are microscopic roundworms that are widely distributed throughout North Carolina on many crops and cause varying degrees of damage to cotton. Root knot of cotton is caused by *Meloidogyne* species, including the southern root knot (*M. incognita*), northern root knot nematode (*M. hapla*), and the most recently introduced the guava root knot (*M. enterolobii*). The guava root knot nematode is an invasive species that has been found in the southeastern United States, with official reports in Florida and North Carolina. Other official reports include Brazil, Mexico, Malawi, South Africa, and West Africa (Senegal, Ivory Coast and Burkina Faso). China, Vietnam, Central and South America, France, and Switzerland. It is also widely distributed in the Caribbean islands, including Cuba, Puerto Rico, Tobago, Trinidad, Guadeloupe and Martinique.

Host Range

Root knot nematodes have a very extensive host range including a number of rotational fields crops used in North Carolina. This includes tobacco, soybean, sweetpotato, corn, many vegetable crops, potatoes, and numerous weed species. Because of this wide host range, it is difficult to manage root knot nematode with crop rotations, though some rotation may be possible with peanut. Peanuts are poor hosts for *M. enterolobii* and *M. incognita*. Cotton is not economically affected by *M. arenaria*, which could be a good rotation with peanut.

Life Cycle and Favorable Condition for Disease

Root knot nematodes are present in the soil, and infect new plants at the growing root tips. Eggs are produced en masse by endoparasitic females that are surviving in the roots of host plants. The juveniles hatch from eggs, move through water films in the soil, and invade roots at the root tips. Most of these juvenile nematodes become spherical-shaped females that remain in the root tissues. Nematode presence in the root stimulates the surrounding tissues to enlarge and produce the galls typical of infection by this nematode. Mature females can lay hundreds of eggs on the root surface, which hatch in warm, moist soil to continue the life cycle.

The length of the life cycle depends on temperature and varies from 4-6 weeks in summer to 10-15 weeks in winter. Nematode eggs will also not hatch unless there is enough moisture in the soil. Consequently, soil moisture conditions that are optimum for plant growth are also ideal for the development of root-knot nematode.

Symptoms and Signs

Root knot nematode infestations can be identified in the field since the nematodes produce galls on the root system of cotton plants. Galls are swelling tissue of the root system associated with the feeding of the nematode inside the root.

Aboveground symptoms can be observed under moderate to high pressure situations. Damages can be observed in patches. Plants in these affected patches may be chlorotic and/or stunted. Foliar symptoms may also be related with a secondary infection cause by fungi or bacteria after the root damage caused by the nematodes.

Identification

In places of decreased vigor, plants may be dug from the soil to find root galls. Soil and plants may also be sent to the Plant Disease & Insect Clinic to be examined. When sending samples include an accurate crop history, information about fertility, herbicides, and cultural practices to aid in diagnosis. To identify the level of pressure in a given field, soil samples can be taken and sent to a diagnostic laboratory for quantification of nematode populations.

Soil samples should be taken from 4-5-acre plots when attempting to diagnose large fields as nematode populations are not evenly distributed. Using a soil probe collect 20 to 30 soil cores at a depth of 6 to 8 inches from each area in a zig-zag or grid-like pattern.

Traditional soil assays cannot differentiate between nematode species due to the similarities of physical morphology. Nematode species identification can be obtained through a molecular assay at a diagnostic lab, but must be requested when a sample is submitted. When requesting a molecular assay, include roots that have distinct root galls when submitting a sample.

General Management

Sampling is best conducted in the fall, prior to Thanksgiving, when nematode populations are at their highest. It is valuable to know what damage to manage for when selecting a plan for a given field.

Exclusion and Sanitation: Nematodes can be moved in soil on equipment, vehicles, or shoes that have entered an infested field. Equipment from nematode infested fields should be sanitized before moving to unaffected fields. Workers should also sanitize shoes between working nematode-affected fields. Working in fields with high populations of nematodes last will reduce the time commitment needed for sanitation of equipment.

Crop Rotation and Resistant Varieties: Host resistance is the most cost-effective management tool for managing nematodes. There is resistance available in cotton varieties for southern root knot nematode, but no host resistance is available for the guava root knot nematode

(*M. enterolobii*). Crop rotation can also decrease the nematode population. Rotation with peanut may reduce the impact of the southern root knot nematode and the guava root knot nematode.

Chemical Management

Chemical management options help to reduce populations of nematodes within the field and prevent infection of host plants. The products in the table below have a label for use in cotton. These are not product recommendations, but serve as examples of control measures. For accurate application methods in compliance with federal regulations, please refer to the label.

Nematicides for Control of Cotton Nematodes¹

Nematicide	Amount/acre	Precautions/Remarks
Aeris	--	Imidacloprid plus thiodiocab seed treatment.
AVICTA Complete Park	--	Abamectin plus thiomethoxam seed treatment.

Poncho Votivo	--	Clothianidin plus <i>Bacillus firmus</i> I-1582 seed treatment.
Acceleron NemaStike SP	--	Tioxazafen seed treatment.
Aldicarb (AgLogic)15G	5 to 7 lb	Apply in-furrow and immediately cover with soil by mechanical means.
1,3-dichloropopene (Telone II)	1.5 to 6 gal	Inject Telone 1 to 2 weeks before planting 8 to 12 inches deep.
Vydate C-LV ³	8.5 to 17 fl oz	Broadcast Vydate at 2nd to 5th true leaf stage.
Metam-sodium (Vapam)	3 to 12 gal	Inject Vapam 2 to 3 weeks before planting 8 to 12 inches deep.
Velum Total	14 to 8 oz	Liquid applied in-furrow. Very limited data available, but this product is a commercial option.

¹See label for proper PPE, rates, and restrictions associated with each chemical. Chemical treatments listed are not exhaustive, and several seed treatment and in-furrow chemical options are available from different chemical companies.

²See restrictions for soil type and water proximity on label

³Vydate for root-knot and reniform nematode only.

Useful Resources

- APS resource for [Root Knot Nematode](#) has more detailed information about root knot nematodes
- The [NCSU Plant Disease and Insect Clinic](#) provides diagnostics and control recommendations
- The [Extension Plant Pathology Portal](#) provides information on crop disease management
- The [Cotton Production Guide](#) has descriptions of diseases and controls, updated annually
- The [Agricultural Chemical Manual](#) produced by NC State University has a more up-to-date list of chemicals available for disease control

Authors

Lindsey Thiessen

Assistant Professor & Extension Specialist Entomology & Plant Pathology

Yara Rosado Rivera

Research Assistant Entomology & Plant Pathology

Publication date: Jan. 18, 2019

North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, veteran status or disability. In addition, the two Universities welcome all persons without regard to sexual orientation.

This publication printed on: Feb. 01, 2019

URL of this page

