Cotton Nematode Management and Prevention

Nematodes are microscopic roundworms that are found throughout cotton-growing areas. Potential yield loss by nematode infestations can result in millions of dollars lost. In 2016, it was estimated that nematode damage led to a 4.3% reduction in yield for U.S. growers.[1] Often this loss is attributed to poor soil conditions, nutrient deficiency, disease, or other environmental conditions. Nematode damage limits nutrient and moisture uptake by the plant and opens the plant to infection by fungal and bacterial pathogens.

Nematodes can complete their lifecycle (egg, four juvenile stages, adult) in one month or less, producing several generations during a growing season. Mature females of root-knot and reniform nematodes can produce hundreds of eggs, leading to rapid growth of population densities.[2] There are four major nematode species that attack cotton: root-knot (*Meloidogyne* spp.), reniform (*Rotylenchulus reniformis*), lance (*Hoplolaimus* spp.), and sting (*Belonolaimus longicaudatus*) nematodes. Root-knot and reniform nematodes cause the most damage to cotton.[1]

Predictive Sampling

Predictive soil sampling is essential for developing a nematode management plan. Cotton nematodes spend their entire life in the soil and are classified by where they live while feeding on the plant. Endoparasitic nematodes, like root-knot nematodes, live within the root structure, while ectoparasitic nematodes, such as sting nematodes, live in the soil outside of the root.[2] This is important to understand when sampling for nematodes.

Nematode presence is typically highest around harvest; therefore, it is recommended to sample within one month prior to harvest, immediately after harvest, or after the last irrigation. Samples should be taken with adequate soil moisture; however, if low soil moisture conditions persist two weeks after harvest, sample immediately. Take samples at a 45° angle, six to nine inches deep and four to five inches from the planted row (Figure 1). Targeting the root zone ensures the inclusion of root fragments, increasing the likelihood of collecting endoparasitic nematodes in the sample.[3] Soil should be sampled in a random pattern, mixed together, and packaged according to assay laboratory directions. Sample size should be limited to 20 acres or less and segregated by soil type, drainage, and crop history. Store samples out of direct light and at room temperature. Send samples to the diagnostic lab soon after sampling (within a week), and ideally at the beginning of the week to ensure that the sample arrives in the conditioned lab prior to the weekend.[4]

Figure 1. Soil probe position when sampling for nematodes.

Lab results will estimate the risk of nematode problems for the following year's crop. Understanding the nematode species present and the population can determine if a management plan should be started. General threshold levels at the time of sampling can help when developing a management plan (Table 1).[4]

Table 1. Damage thresholds (number of nematodes) per 100 cm³ soil as affected by sampling date, soil type, and tillage

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	October Sand to Sandy Loam	January Sand to Sandy Loam	October Clay Loam	January Clay Loam	Pre-plant (turned or disked)
Root-knot	100	50	130	75	40
Reniform	250	150	500	400	50
Lance	75	50	175	100	34
Sting	5	1	10	1	1

Source: Mueller, J., Kirkpatrick, T., Overstreet, C., Koenning, S., Kemerait, B., and Nichols, B. 2012. Managing nematodes in cotton-based cropping systems. Cotton Incorporated. https://www.cottoninc.com/wp-content/uploads/2015/12/2012-Managing-Nematodes.pdf.

Planning for Prevention

Host Avoidance

Rotation. Rotate to non-host crops to interrupt the nematode lifecycle and reduce populations (Table 2). Peanut is not a host for root-knot, reniform, or lance nematodes. Corn is not a host for reniform nematodes, and soybean can be an option if nematode-resistant products are planted.

Table 2. Nematode hosts and non-hosts in a cotton cropping system.

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	Cotton	Corn	Sorghum	Peanut	Soybean
Root-knot	Host	Host	Host	Non-host	Host*
Reniform	Host	Non-host	Non-host	Non-host	Host*
Lance	Host	Host	Host	Non-host	Host
Sting	Host	Host	Host	Host	Host

*Soybean products that are root-knot and reniform nematode resistant are available.

Source: Mueller, J., Kirkpatrick, T., Overstreet, C., Koenning, S., Kemerait, B., and Nichols, B. 2012. Managing nematodes in cotton-based cropping systems. Cotton Incorporated. https://www.cottoninc.com/wp-content/uploads/2015/12/2012-Managing-Nematodes.pdf.

Weed management. Maintain post-harvest weed control. Many common weed species are also nematode hosts:

- Root-knot: nutsedge, select pigweed, horseweed, teaweed, select morningglory, tall ironweed, black nightshade, and common Bermudagrass.
- Reniform: sicklepod, Carolina geranium, morningglory, pigweed, and purslane.
- Lance: morningglory and pigweed.
- Sting: nutsedge and ragweed.[4]

Product Selection

Cotton variety selection. Depending on the species of nematode found in the field, nematode resistant (NR) varieties can provide an effective way to reduce nematode damage throughout the growing season. NR varieties have been developed for fields that are moderately to highly infested with root-knot nematodes. They contain a native breeding trait that not only resists root-knot nematodes, but also suppresses reproduction, leading to population reduction compared

to planting a susceptible variety. NR varieties have been bred to combine high yield potential with root-knot protection whether in root-knot-free or infested fields.

Nematicides. There are several options available for growers to consider and include prior to and at planting.

- Seed treatments. Acceleron® Seed Applied Solutions ELITE with Poncho®/VOTiVO® provides broad-spectrum nematode control for up to 75 days after planting.
- Fumigants. Cotton growers with heavy nematode pressure may combine seed treatment nematicides with fumigants like Telone® II fumigant applied preplant.[5] Chemical application timing and additional safety precautions may limit flexibility during the growing season.
- In furrow, at plant. Velum® Total insecticide uses two active ingredients to control nematodes and early-season insects and can be applied either in-furrow or through low-pressure chemigation. AgLogic™ 15G insecticide is a granular aldicarb product that can help to reduce insect and nematode damage.[5] AgLogic 15G insecticide is similar to Temik® 15G insecticide, which was widely used for effective control of thrips and nematodes in cotton. AgLogic 15G insecticide, Temik® 15G insecticide and Telone II insecticide are Restricted Use Pesticides, may not be registered in all states, and may not be available in your state.

Sources

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[3] Woodward, J.E. and Wheeler, T.A. Nematode sampling instructions for cotton producers on the Southern High Plains of Texas. Texas A&M Extension. http://www.plainscotton.org/rkh/NematodeSampling.pdf.

[4] Mueller, J., Kirkpatrick, T., Overstreet, C., Koenning, S., Kemerait, B., and Nichols, B. 2012. Managing nematodes in cotton-based cropping systems. Cotton Incorporated.

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[5] Jones, M.A., Greene, J., Marshall, M., Mueller, J.D., and Smith, N.B. 2017. South Carolina cotton growers guide. Clemson University Cooperative Extension Service. EC 589.

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Web sources verified 10/07/19.

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