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EXTENSION

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2000 Florida Cotton Production Guidelines: Cotton Nematode Management¹

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The major nematode pests of cotton in Florida are the cotton root-knot nematode (*Meloidogyne incognita*), the reniform nematode (*Rotylenchulus reniformis*), and the sting nematode (*Belonolaimus longicaudatus*). These nematodes are damaging pests of the crop and are limiting factors in cotton production. In addition, they are important for increasing the incidence and severity of Fusarium wilt on cotton. Though the root-knot nematode may be found in all soils where cotton is grown, the reniform nematode is found mostly in fine-textured soils with less than 70 percent sand, and sting nematode is essentially confined to soils with more than 80 percent sand. Root-knot nematodes are known to infest at least 60 percent of cotton fields in the Florida panhandle, whereas the incidence of reniform nematode is closer to 15 percent in the same area. The incidence of sting nematode is not clearly known but this nematode is more likely to be found with cotton when grown in the deep sandy soils of the peninsula. Co-incident field infestations, where more than one of the problem nematodes are present, occur in several fields.

The presence or potential for nematode problems in cotton could be suspected by one or more of the following: 1) Cropping history of a field, e.g. two or more years production of cotton or equally nematode-susceptible crops; 2) Above-ground symptoms including off-color and/or stunted cotton in spots or large areas of a field; 3) Below-ground symptoms such as small knots on roots or stunted and swollen root tips. However, soil samples must be taken to accurately determine that a nematode problem is present and are needed for reliable identification of the responsible nematode species. Only when sufficient numbers of the suspected nematode are extracted from soil samples can a nematode disease be diagnosed and appropriate management procedures implemented.

Soil Sampling

Nematode problems of cotton can be determined only by soil sampling. Samples are best taken anytime between October, when problem sites are still apparent, until March when soil temperatures start to increase and nematode population densities start to decline in the absence of suitable plant hosts. Prior to taking soil samples, contact your county extension

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agent for information concerning available sampling tools and shipment bags and proper procedures for submitting samples. Two sampling strategies may be employed. A general survey should be performed every three to four years and soil samples taken soon after cotton has been harvested. A soil core (1-inch-wide x 8-10-inches-deep) should be taken for every two-three acres in a twenty acre block containing a uniform soil type. The cores should be thoroughly mixed and a one pint sample extracted and placed in a sealed plastic bag for immediate shipment to an advisory laboratory. In a more definitive strategy where a nematode problem is suspected, several soil cores from within and immediately around a specific site should be taken while the crop is still growing and processed as described above. Samples should not be taken when the soil is dusty dry or soggy wet.

See <http://edis.ifas.ufl.edu/SR011> for more information on nematode sampling and sample care.

Management

Crop Rotation

Crop rotation is the primary practice for managing nematode soil population levels on seasonally planted crops. Rotation crops should include crops that are non-hosts or poor hosts of the problem nematode infesting the soil (Table 1). Identification of the nematode species will dictate the choice of rotation crop and length of rotation interval required. One year of a summer planting of a non-host crop is usually sufficient to reduce populations of root-knot nematodes to below damaging economic threshold soil densities. Peanut, a non-host, is an excellent choice for rotating with cotton to manage cotton root-knot nematode. However, a precautionary note should be given for interpreting nematode soil test results for fields in peanut / cotton rotations. Planting peanut will encourage the development of possible indigenous populations of *Meloidogyne arenaria* race 1, the peanut root-knot nematode. These will not affect the yield of a subsequent planting of cotton which is a non-host of *M. arenaria*. Crops in the grass family such as millet, sorghum, maize, and forage grasses are generally poor hosts and recommended in rotations. These fore-mentioned

crops are also non-hosts of the reniform nematode and are suitable rotation crops for management of this nematode. However, depending on pre-determined soil population densities of reniform nematode, taking cotton out of production for two or more years may be necessary to bring reniform nematode populations below economic threshold densities as populations of this nematode do not decline as rapidly as those of root-knot nematode. Peanut, but not crops in the grass family, is also recommended for short-term rotations for managing sting nematode on cotton. Soybean and many vegetable crops are moderate to good hosts of the three nematode pests of cotton. They should be selected carefully prior to use in rotation with cotton.

Crop Destruction and Weed Management

Cotton roots may survive a long time after boll harvest. In years when there is a delay in the onset of cool soil temperatures (< 59°F), nematodes can feed and reproduce on these and associated weed roots, thus increasing nematode soil population densities surviving through to the next planting season. Therefore, cotton stalks must be cut and soil must be tilled through the stubble zone immediately after harvest to destroy these breeding sites. When soils warm in the spring, weeds that are hosts to the problem nematodes may provide sustenance such that nematode soil population densities may become elevated prior to cotton planting. Consequently, it is advantageous to have a winter cover crop provide competition against weeds. This crop must be a poor or non-host of the problem nematode. Winter cereals are suitable for managing root-knot and reniform nematodes in this regard but are less effective for soils infested with sting nematode.

Resistant Varieties

There are no cotton varieties with resistance to any of the three problem nematodes. However, since nematodes are aggravating factors in Fusarium wilt disease, only varieties with excellent Fusarium resistance should be grown in fields known to be infested with root-knot, reniform, or sting nematodes.

Nematicides

Three nematicides are available for use in Florida cotton production: Telone II, Temik 15G, and NemaCur 15G. Before using nematicides growers should ascertain that problem nematodes are present to justify the expense of treatment. This can only be achieved by submission of soil samples as described above. In University of Florida (UF/IFAS) research, Telone II has shown relatively consistent efficacy for nematode control in cotton. This soil fumigant (1,3-D) is used to reduce initial nematode soil population densities prior to cotton planting. Application of the fumigant usually results in significant cotton yield responses in nematode-infested soils. UF/IFAS research over the last few years has shown an average increase of approximately 35 and 50 pounds of cotton lint per acre for each gallon of Telone II applied per acre to reniform and root-knot nematode-infested soil, respectively. Telone II is applied with a single injection chisel to a depth of at least 14 inches beneath the row, seven to ten days prior to cotton planting. Deeper application is acceptable but Telone II should not be injected into clay subsoil. Applications shallower than 12 inches have sometimes led to poor nematode control. A range of rates from three to six gallons of Telone II / acre is recommended. The 3 gallons / acre rate is satisfactory for control of reniform and sting nematodes, but greater than 4 gallons / acre is necessary in root-knot nematode problem fields. The fumigant should not be applied when the soil is dusty dry or wet. Sealing the chisel application soil slits immediately after application by bedding, press wheels, culti-packing, fluted coulters or similar devices is necessary to prevent premature escape of Telone II fumes.

The non-fumigant nematicides (Temik and NemaCur) are applied as 15 percent granular formulations incorporated into two or more inches of soil in a narrow band (four to six inches wide) immediately prior to or at-planting. There have been no UF/IFAS evaluations of the effectiveness of NemaCur for management of cotton nematodes. Recent evaluations of Temik 15G for management of root-knot and reniform nematodes in cotton have shown significant yield responses in only three out of eight tests. Though responses have varied widely over

the years, evaluations of cotton yield responses to Temik applications in root-knot infested soil provide an average increase of 10 pounds lint per acre for each pound of Temik applied per acre. In addition to Federal label regulations, there are special regulations required by the Florida Department of Agriculture and Consumer Services governing the use of Temik: a report of intended application of Temik shall be posted to them on their form N. IN-120 at least 30 days before application; Temik cannot be applied closer than 300 feet from a drinking water well; any wells within 300 feet of or in a treated area shall be posted to be unfit for human consumption; fields to be treated with Temik shall be posted conspicuously at least 24 hours before application and for a minimum of 30 days afterward. In addition, there are labeling restrictions concerning furrow width applications and rotational restrictions governing the delays required before planting certain other crops following Temik soil treatments. There are similar rotational restrictions in effect for the use of NemaCur nematicide.

Table 1. Recommendations of crops for use in rotation to manage nematode pests of cotton.

Crop	Root-knot nematode <i>Meloidogyne incoginta</i>	Reniform nematode <i>Rotylenchulus reniformis</i>	Sting nematode <i>Belonolaimus longicaudatus</i>
Bahia grass	Recommended	Recommended	Not suitable
Corn	Recommended ¹	Recommended	Not suitable
Field pea	Not suitable ²	Not suitable	Not suitable
Millet	Recommended	Recommended	Not suitable
Peanut	Recommended	Recommended	Recommended
Snap bean	Not suitable ²	Not suitable	Not suitable
Soybean	Not suitable	Not suitable ²	Not suitable
Sudan grass	Recommended	Recommended	Not suitable
Tobacco	Not suitable ²	Not suitable	Recommended
Tomato	Not suitable ²	Not suitable	Not suitable
Watermelon	Not suitable	Not suitable	Not suitable
Winter oats	Recommended ³	Recommended ³	Not suitable
Winter rye	Recommended ³	Recommended ³	Not suitable
Winter wheat	Recommended ³	Recommended ³	Not suitable
¹ Some corn varieties are known to be very susceptible to root-knot nematode.			
² Some varieties of these crops are resistant to the nematode and may be suitable for rotation.			
³ Recommendation is for management of host weeds. Planting of winter crop will have little or no influence on nematode populations under subsequent cotton.			

Table 2. Label rates and recommendations of nematicides for the management of nematodes on cotton.

Label rates	Recommendations ¹
Telone II at 9-12 gallons/acre broadcast.	3 to 6 gallons/acre row treatment via single injection chisel 7 to 10 days before planting (26.5 to 53 fl. oz./1000 ft row). This is the primary recommended nematicide for use in severely nematode-infested cotton fields in Florida.
Temik 15G at 3.5 to 10 pounds/acre. (4.5 to 12 oz./1000 ft row).	7 pounds per acre in a 4 to 6 inch band at planting. (9 oz./1000 ft row). <i>Note Florida special regulations.</i>
Nemacur 15G at 6.5 to 9.8 pound/acre. (5.4 to 10.8 oz./1000 ft row).	Insufficient data for recommendation.
¹ Please consult labels for pesticide handling and use restrictions.	

Table 3. Retail costs of nematicides.

Trade name	Common name	Unit	Price¹
Telone II (Dow Agrosiences)	1,3-dichloropropene	gallon	\$12.00
Temik 15G (Aventis)	aldicarb	pound	\$3.30
Nemacur 15G (Bayer)	fenamiphos	pound	\$3.30

¹ Suggested retail prices as of January 2000.