ENY-002

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Peanut Nematode Management[1]

Jimmy R. Rich and Robert A. Kinloch[2]

Nematodes That Attack Peanut

The most serious nematode pest of peanut is *Meloidogyne arenaria* race 1, the peanut root-knot nematode. It can be expected to occur wherever peanuts are grown in Florida. Pod rot, white mold, and other soil-borne diseases may increase when the peanut plant is infected with this root-knot nematode. The lesion nematode, *Pratylenchus brachyurus*, is less troublesome, but it can reduce yields and seriously disfigure the peanut hulls with unattractive brown lesions that lead to pod rotting.

Diagnosis

The presence or potential for nematode problems in peanut is suggested by one or more of the following: 1) Cropping history of the field, e.g. two or more years production of peanut or equally nematode-susceptible crops; 2) Above-ground symptoms including off-color and/or stunted peanut in spots or large areas of a field; 3) Below-ground symptoms such as small knots on roots or root lesions.

Foliar Symptoms

Areas of root-knot nematode infected peanuts are usually round to oblong in shape. The plants are stunted, less green, and will wilt more readily in the heat of the day than plants in less infested areas of the field. Rows of infected plants may never, or not so quickly, meet as those of healthy plants. Above-ground symptoms in a lesion nematode-infected crop are exhibited as a dull yellowing in oval spots in the field. These symptoms may be similar to nutrient deficiencies so care must be taken in diagnosis. Above-ground symptoms of suspected nematode problems on peanut should be verified by soil, root, and pod assays to properly identify a nematode causal agent.

Root Symptoms

All nematodes affecting peanut reduce feeder roots and produce root stunting, but nematodes differ in specific symptoms on roots and pods. Roots should not be pulled but rather carefully dug with a shovel for examination of nematode damage symptoms. Symptoms of peanut root-knot nematodes include galls (knots) on both roots and pods. The presence of galls on the pods appears as single or multiple

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2. Jimmy R. Rich, professor, Department of Entomology and Nematology, North Florida REC, Quincy, FL and Robert A. Kinloch, associate professor, Department of Entomology and Nematology, West Florida REC, Jay, FL, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL.

Figure 1. Root-knot nematode damage, note oval symptom patterns (click on photo to enlarge).

Figure 2. Lesion nematode damage in peanut, a dull yellowing appearance (click on photo to enlarge).

wart-like growths that may or may not be discolored. As root-knot nematode infection progresses, secondary root and pod rotting causes further damage and eventual death of the plants.

Lesion nematode damage is most easily seen on pods, which show distinct light brown lesions. As infection and disease progresses, the lesions become less distinct and turn black in color. Presence of high numbers of lesion nematodes result in extensive root and pod rotting.

Nematode Assay

Nematode problems of peanut can be accurately determined only by examining soil and root samples. Prior to taking samples, contact your county extension agent for information concerning available sampling tools, shipment bags and proper procedures for submitting samples. Samples should not be taken

Figure 3. These few remaining pods are heavily galled by root-knot nematodes (click on photo to enlarge).

Figure 4. Small light brown lesions caused by lesion nematodes on peanut (click on photo to enlarge).

when the soil is dusty dry or soggy wet. Two sampling strategies may be employed – a general survey or samples taken where a nematode problem is suspected in a growing crop. When a problem is suspected in the growing crop, several soil cores from within and immediately around a poor growth site should be taken while the crop is still growing. Include roots and pods with the soil sample. These samples should be handled as described above.

A general survey should be performed every two to three years, and soil samples should be taken soon after the peanut crop has been harvested. A soil core (1-inch wide by 8-10-inches deep) should be taken for every acre in a 10-acre block containing a uniform soil type and cropping history (Table 1). The cores should be thoroughly mixed and a 1-pint sample

extracted and placed in a sealed plastic bag and kept cool (not frozen) before immediate shipment to an advisory laboratory. As possible, send peanut roots and pods with the soil sample. Do not allow samples to be exposed to the sun at any time.

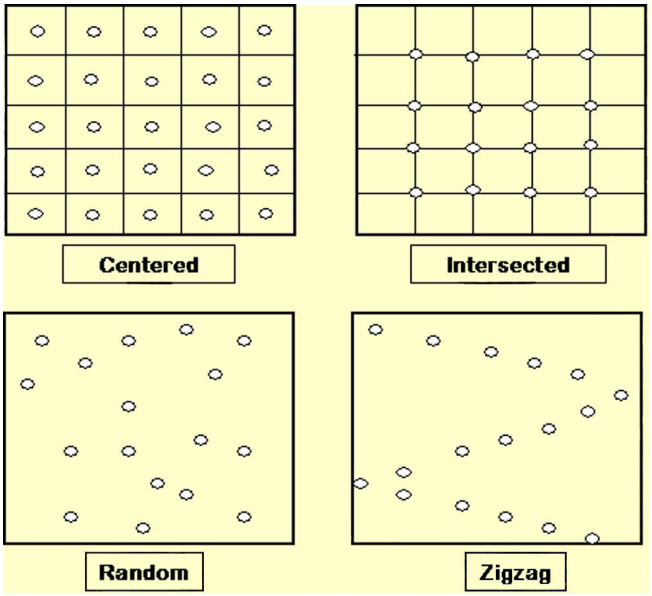

Figure 5. Ten acre sampling patterns. Take 10 to 20 cores (click on photo to enlarge).

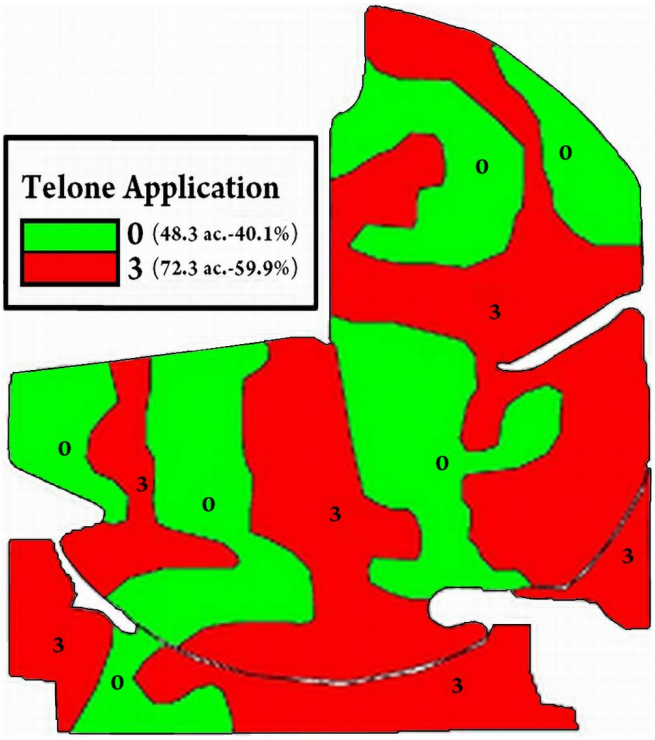

Figure 6. Depicts areas of a 120 acre field requiring treatment with the nematicide Telone II (in red) and areas not requiring treatment (in green) (click on map to enlarge). Map courtesy of Debbie Waters.

Management

Crop Rotation

Where practical, crop rotation is an excellent practice for managing plant-parasitic nematodes. Rotation of a peanut crop with non-hosts, or less susceptible hosts, to root-knot nematodes is recommended. Grasses such as bahiagrass, bermudagrass, millet, and sorghum are among the most effective crops in reducing soil populations of peanut root-knot nematodes and should be grown for at least one year, preferably two years, before planting fields to peanut. Though some root-knot nematode reproduction could be expected on field corn, this crop is considerably less susceptible than peanut and is generally effective in the reduction of root-knot nematode soil populations. It is a suitable crop to grow in a year following a root-knot nematode-infected peanut crop. Cotton is not a host for peanut root-knot nematodes and is a very good rotational crop with peanut. Favorably, peanut is not a host for the southern root-knot nematode that infects cotton. Thus a two-year monoculture of peanut and cotton is helpful in maintaining the root-knot nematode pests of both crops at manageable population levels. Peanut should not be grown in years following root-knot susceptible crops such as lupine or other winter legumes nor following summer legumes as soybean or cowpea which are highly susceptible to root-knot nematodes.

Unfortunately, rotations are of little value for reducing lesion nematode soil populations as this nematode has a very wide host range. Lesion nematodes increase rapidly on grass crops and can cause damage on a following peanut crop. In most peanut fields, however, the root-knot nematode is the most damaging and should be given priority for management purposes.

Volunteer Peanut and Weed Management

Volunteer peanut and weed growth after harvest and the following year maintain and sometimes increase nematode populations in the soil. In years when there is a delay in the onset of cool fall soil temperatures (<59°F), nematodes can feed and reproduce on these volunteer peanut and weed roots. This increases nematode soil population densities

surviving through to the next planting season. Then when soils warm in the spring, weeds and volunteer peanuts may allow nematode soil population densities to increase prior to planting a rotation crop or another peanut crop. The use of winter cover crops is helpful to provide competition against volunteer peanuts and spring weeds and also the cover crop planting process helps destroy those plants growing in the fall. Cover crops, however, must be a poor or non-host of the problem nematode. Winter cereals are most suitable for managing root-knot nematode in this regard but are less effective for soils infested with lesion nematodes.

Use of crop rotation systems that include bahiagrass have been increasing, and this perennial grass is a non-host for nematodes affecting peanut. However, weeds must be managed in the bahiagrass or nematode populations will be maintained in such a system resulting in damage to the following peanut crop. A two-year bahiagrass rotation is sufficient to manage plant-parasitic nematodes in a future peanut crop providing weeds in the bahiagrass planting are controlled early and regularly in the first year bahiagrass and this continued through the life of the rotation.

Figure 7. Weeds in bahiagrass pastures harbor nematodes for future crops (click on photo to enlarge).

Peanut Nematode Resistance

The incorporation of nematode resistance into peanut varieties adapted to Florida production is relatively new. Only one cultivar, Tifguard, is available that contains resistance to the peanut root-knot nematode and also has good resistance to tomato spotted wilt and other diseases prevalent to Florida growing conditions. The variety has good yield potential and contains a single dominant gene which provides excellent resistance to the peanut root-knot nematode. The cultivar was only released for widespread planting in 2009 so growers should use test plantings to determine performance of this variety under their growing conditions. Growers may encounter the variety names NemaTam and COAN that have root-knot nematode resistance. Indeed, the same nematode resistance is incorporated into these two varieties but both are very susceptible to tomato spotted wilt and are not recommended for Florida. Peanut breeding programs in the southeast are incorporating the nematode resistance into other varieties so more will be available in the near future.

The resistance in Tifguard and other varieties that will be developed is the same single dominant gene. As such, continuous planting of peanut containing this gene in the same fields will eventually lead to resistance breaking nematode biotypes. This can be delayed or prevented by utilizing proper crop rotation including planting non-resistant peanut in the rotation as well. Secondly, this resistance does not reduce damage from lesion nematodes which are a major problem in peanut production in the central peninsular production area of Florida.

For further information on nematode resistance in peanut, go to: http://edis.ifas.ufl.edu/ng046

Chemical and Biological Control Agents

Nematicides and a biocontrol agent approved for use in peanut production are listed in Table 1. Before using nematicides, growers should determine that problem nematodes are present to justify the expense of treatment. This can only be achieved by submission of soil samples for nematode analysis or prior year field diagnosis.

The soil fumigant, Telone II, has been shown to be the single most effective nematicide for managing root-knot and lesion nematodes in peanut. To avoid delayed peanut emergence, early stunting, or stand reduction, growers should apply this fumigant at least one week prior to planting. Unlike non-fumigant nematicides, Telone II can also be applied two to three months or more before planting. Caution,

however, is needed so as not to mix treated and non-treated soil during field operations prior to or at planting. Telone II is applied in the row with single or dual injection chisels to a depth of at least 12 inches beneath the row. Deeper application is acceptable but Telone II should not be injected into a clay subsoil. Applications shallower than 12 inches have sometimes led to poor nematode management. Following soil treatment the chisel slits should be immediately sealed, and the soil surface packed with suitable bedding equipment, disc harrows, or rollers. Telone II should not be applied when the soil is dusty dry or wet.

The non-fumigant nematicide, Temik 15G, has been approved for use to manage nematodes on peanut. In heavily root-knot nematode-infested fields, a broadcast application of Telone II may be followed by an application of Temik 15G at peg initiation. In addition, a split application of Temik 15G with a band or in-furrow application at planting followed by a band application at peg initiation is acceptable usage in Florida under a State Label. Irrespective of the mode of application growers must be aware of several use restrictions governing Temik 15G:

- Application must not exceed 20 pounds per acre.
- Peanut must not be harvested within 90 days of application.
- Hay must not be fed to livestock and livestock must not be allowed to graze in treated areas.

In addition there are restrictions on planting any crops not listed on the Temik label in soil treated with Temik within ten months after the last application.

In addition to the Temik label, The Florida Department of Agriculture and Consumer Services has issued specific regulations governing the use of Temik including permitting requirements and application distances from water wells (http://www.doacs.state.fl.us/onestop/aes/temik.html)

The biocontrol agent, NemOut, is a formulation of spores of the fungus, *Paecilomyces lilacinus,* and this product has shown a moderate level of nematode suppression in University of Florida trials. It should only be used in conjunction with other recommended nematode management practices including good crop rotation and weed control. NemOut contains live spores so handle carefully to help maintain product viability including keeping it away from high heat conditions (i.e. back of pickup trucks, etc.). For best activity of the product, NemOut should be used both an in-furrow and as an at-pegging treatment.

Some key points to consider when using the product are:

- It is a non-restricted use pesticide that has no posting or pre-harvest use limitations.
- NemOut should be applied in a minimum of 20 gallons of water per acre in moist soil or prior to a rain or followed by an irrigation.
- It should not be mixed with any other materials at application.
- For extended storage before use, the product should be maintained in a cool environment of 70 degrees F or kept under refrigeration until it is used. It is a wettable powder so follow label mixing instructions; 50 mesh screens and agitation in the mixing and spray system are required.

Table 1. Nematicides that may be used for nematode management of peanut in Florida.

Nematicide	Rate	Application[1]
Telone II	5.9-7.8 gal. / acre	Single chisel injection per row. (52-70 fl. oz. / 1000 ft row / outlet). Apply 7-10 days before planting.
	5.9-7.8 gal. / acre	Two chisels set 10-12 inches apart per row. (26-35 fl. oz. / 1000 ft. row / outlet). Apply 7-10 days before planting.
	6-9 gal. / acre	Broadcast applications may be made in fall or winter, or in spring but at least 7 days before planting. (17-26 fl. oz. / 1000 ft. / outlet). Apply 7-10 days before planting.
Temik 15G	10 lb. / acre	Apply in a 6-12 in. band or in furrow at planting. (11 oz. / 1000 ft. row in 36 in. spacing).
	10 + 10 lb. / acre	Split application with first applied in 6-12 in. band or furrow at planting (11 oz. / 1000 ft. row) and second in 12-18 in. band at peg initiation (11 oz. / 1000 ft. row).[3]
Vydate L	1-2 qt. / acre	Apply twice in 20-40 gallons of water as foliar spray 3 and 6 weeks after emergence as a supplement to one of the recommended initial soil treatments
NemOut	0.3 + 0.3 lbs./ acre	Apply in a minimum of 20 gallons of water as a spray in the seed furrow at planting and at post-planting as a 12-inch wide banded spray at the base of the plants applied up to 6 weeks after emergence, followed by an irrigation or prior to a rain.

[1] Please consult labels for handling and use restrictions.
[2] Allowed in Florida by a "State Label" which grower must possess for application, read the label for special requirements such as irrigation after 'at-pegging' treatment.