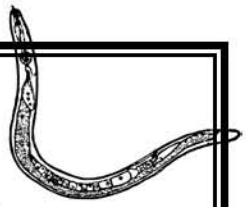
THE UNIVERSITY OF GEORGIA
COOPERATIVE EXTENSION
Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

Plant Susceptibility to Major Nematodes in Georgia



Use this guide to select rotation crops that are non-hosts to damaging populations as one part of a nematode control program. Ideally, the rotation crop should reduce specific nematode populations levels in the soil and not sustain reduced yield or quality because of nematodes present. In order to do this, you need to properly identify the nematodes present in the field through a soil assay, and you need to know which crops are non-hosts to nematodes present in the field.

Nematodes can be correctly identified in the Extension Nematology Laboratory if a soil sample is carefully taken and properly handled. Take soil samples for nematode assay in the root zone to a depth of about 8 inches. Take 25 to 30 cores from each 4 to 5 acres and thoroughly mix the cores together. Place 1½ to 2 pints of the soil in a plastic bag immediately and keep the soil cool. Send the soil with a completed information form to the Extension Nematology Laboratory through your county extension office. Your county extension agent can provide further information on sampling.

After receiving the nematode assay report, use this guide to select rotation crops that are non-hosts to specific nematodes identified as present in each field. Host crops and weeds for each nematode are given in the following tables along with known non-host crops. Lists are incomplete in many cases because information is incomplete. Table 1 (page 2) lists the host status of several major crops to the most important nematode pests in Georgia.

Remember that although crops are listed as hosts for specific nematodes, there may be varieties or cultivars that are resistant or tolerant to certain types of nematodes. This is particularly true for soybean cyst nematodes and for some species of root-knot nematodes. Consult your county extension agent or the appropriate crop specialists to obtain the latest information on resistance.

How Non-Host Crops Reduce Nematodes

Nematodes that damage crops must have living plant tissue to feed on in order to mature and reproduce. Thus, if a non-host plant is grown, nematode populations will be reduced through starvation and lack of reproductive capabilities. The length of time nematodes will live without a suitable host plant to feed on varies with the kind of nematode and the prevalent environmental conditions.

For example, the soybean cyst nematode can live several years protected in its cyst in the absence of a host plant; most nematode populations, however, can be reduced below threshold levels in one or, at the most, two years if a suitable host plant is not available for feeding. At lower temperatures in late fall, winter and early spring, nematodes survive well as eggs, larvae and even adults in the absence of a host plant. With warmer soil temperatures, many nematode eggs hatch and nematodes become more active, use up food reserves, and die if they cannot feed on a suitable plant.

Problems Using Rotations

Although crop rotation is a major part of the total program necessary to minimize losses from nematode pests, the practice is not always totally effective. Some reasons why rotations fail include:

MIXED NEMATODE POPULATIONS OFTEN OCCUR IN A FIELD. It is not difficult to select a non-host crop when only one major nematode occurs in a field, but usually more than one kind is present. A crop that is a non-host to one kind of nematode may be a host to another in the same field. So while reducing one kind of nematode, the rotation crop maintains or builds up another kind that will damage the crop or crops grown the following year.

A SPECIES OF ROOT-KNOT NEMATODE THAT HAS NOT BEEN IDENTIFIED OCCURS. As you study this guide, note that four different species of root-knot nematodes are present in Georgia, each with a different host range. Of these, southern, peanut and Javanese are the most important. The Extension Nematology Laboratory will identify root-knot nematode species upon request – provided fresh, heavily-galled roots are sent in and a complete cropping history is furnished for the field in question.

UNCONTROLLED GRASSES AND BROAD-LEAF WEEDS MAY SUPPORT NEMATODE POPULATIONS EVEN THOUGH A NON-HOST CROP IS BEING GROWN. Although the crop selected for rotation is not affected by the nematodes, infestation of grass- or weed-hosts may cause the buildup of nematodes capable of attacking subsequent crops. Weed-hosts for each nematode are included in Table 2 (page 3). Good weed control is important with rotation as part of an effective nematode control program.

This guide and the *Guide to Interpreting Nematode Assays* (available from your county extension office) can be used to develop a total nematode control program for most nematode problems in major field crops grown in Georgia.

How to Use This Guide

Look first at Table 1 to determine which nematodes affect each major field crop. A non-host crop may be selected from this table.

If additional study of host plants or non-host plants is desirable, turn to the page on the specific kind of nematode that has been identified on your farm. Select a non-host crop that will best fit your farming operation but will not build up nematode populations identified as present in the field to damaging levels. Although information is not available for all nematodes on all plants, remember that each of the more economically important crops grown in Georgia is damaged more by some nematodes than by others. Maintain close communication with your county extension agent or specialist in order to make the appropriate decision on crop rotation for your specific situation.

Study weed-hosts of major nematodes as given in Table 2 (page 3). Remember that good weed control can be an important part of a nematode control program.

Table 1. Field Crops that Are Hosts or Non-Hosts to Major Nematodes

Crop	Southern root-knot	Peanut root-knot	Javanese root-knot	Sting	Soybean cyst	Reniform	Lance	Stubby root	Lesion *(P. brachyurus)*	Ring *(C. xenoplex)*
Tobacco	+	+	+	-	-	+	-	+	+	
Corn	+	+	+	+	-	-	+	+	+	-
Peanuts	-	+	-	-	-	-	-	+	+	+
Soybeans	+	+	+	+	+	+	+	+	+	-
Cotton	+	-	-	+	-	+	+	+	+	-
Small grain	+	+	+	+	-	-	+	+	+	+
Grain sorghum	+	+	+	+	-	-		+	+	-
Alfalfa	+	+	+	+	-*			+	+	
Lespedeza	+	+	+	+	+	+		+		-
Coastal Bermudagrass	-	-	-	+	-					

+ = host - = non-host

For additional information on crop-hosts or non-hosts, see the pages on particular kinds of nematodes.

*One plant introduction line showed susceptibility. All other varieties or lines tested were immune or resistant.

Table 2. Weeds that Are Hosts or Non-Hosts to Major Nematodes

Crop	Southern root-knot	Peanut root-knot	Javanese root-knot	Sting	Soybean cyst	Reniform	Lance	Stubby root	Lesion *(P. brachyurus)*	Ring (*C. xenoplex)*
Nutgrass	+	+	+	+			+			
Crabgrass	+	+	+	+					+	-
Sicklepod *(C. obtusifolia)*	+	+			+ -		+			-
Horseweed	+			-						
Morning glory	+	+		+			+			-
Lambsquarter	+	+	+	+						-
Pigweed	+	+	+				+			
Beggarweed	-	-	-	+		+				
Cockebur				+		+				
Texas panicum		-								
Ragweed	-	-	-	+						-
Bermudagrass	+	+	+	+			+	+		+
Johnsongrass	-			+			+			-
Bahiagrass	+	+	+	+		-		+		-
Prickly sida		+								
Mexican teaweed	+									

+ = host - = non-host

For additional information on weed-hosts, see the pages on particular kinds of nematodes.

Kinds of Nematodes

Southern Root-Knot Nematode – *Meloidogyne incognita*

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
cotton corn soybeans tobacco grain sorghum peaches sunflower wheat oats rye barley alfalfa bahiagrass **vegetables:** (okra, tomatoes, snap and lima beans, cucumbers, lettuce, carrots, beets, pumpkin, cantaloupe, onions, peppers, cabbage, sweet potatoes, Irish potatoes)	nutsedge (yellow and purple) barnyard grass dandelion crabgrass Penn. smartweed spiny pigweed redroot pigweed pokeweed chickweed horseweed spurge Mexican teaweed annual morning glory tall ironweed lambsquarter black nightshade sicklepod *(C. obtusifolia)*	peanuts strawberry Coastal bermudagrass Coastcross I jimsonweed marigolds *(T. patula)* johnsongrass horsenettle ragweed beggarweed Sericea lespedeza (cv. Serala 76 and Interstate 76) Vetch (cv. Cahaba white, Nova II, Vanguard and Vantage)	While damage is usually most severe in sandy to sandy loam soils, root-knot nematodes may also cause severe damage in clay soils.

Peanut Root-Knot Nematode – *Meloidogyne arenaria*

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
peanuts tobacco soybeans sunflower alfalfa bahiagrass peaches grain sorghum wheat oats rye barley **vegetables:** (peppers, eggplant, Irish potatoes, beets, tomatoes, onions, cucumbers, squash, cowpeas)	pigweed lambsquarter sicklepod *(C. obtusifolia)* prickly sida jimsonweed crabgrass morning glory (tall, small flower, cypress-vine, bigroot)	Texas panicum Florida beggarweed cotton Ccoastal bermudagrass sweet potato strawberry coffee senna *(C. occidentalis)* hemp sesbania marigolds *(T. patula)*	While damage is usually severe in sandy to sandy loam soils, root-knot nematodes may also cause severe damage in clay soils.

Host suitability is based on research and field observations.

Javanese Root-Knot Nematode – *Meloidogyne javanica*

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
soybeans tobacco corn oats barley grain sorghum wheat rye bahiagrass alfalfa sunflower lespedeza vetch clovers cowpeas **vegetables:** (okra, cantaloupe, tomatoes, watermelon, carrots, squash, beans, beets, onions, egg-plant, Irish potatoes, lettuce, cabbage)	pigweed crabgrass lambsquarter nutsedge (yellow and purple) common bermudagrass	peanuts cotton pepper strawberry sweet potato Coastal bermudagrass ragweed beggarweed marigold *(T. patula)*	While damage is usually most severe in sandy to sandy loam soils, root-knot nematodes may also cause severe damage in clay soils.

Northern Root-Knot Nematode – *Meloidogyne hapla**

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
peanuts tobacco soybeans strawberry alfalfa sunflower peaches **vegetables:** (tomatoes, onions, sweet potatoes, snap & lima beans, squash, pepper, eggplant, lettuce, cucumbers, mustard, cantaloupe, carrots, turnips, Irish potatoes)	morning glory sorrel curled dock knotweed lambsquarter Florida beggarweed sow thistle pigweed dandelion	Coastal bermudagrass corn oats rye wheat barley cotton watermelon okra ragweed Coastcross I Sericea lespedeza (cv. Serala 76, Interstate 76)	While damage is usually most severe in sandy to sandy loam soils, root-knot nematodes may also cause severe damage in clay soils.

*Least prevalent root-knot nematode species in Georgia.
Host suitability is based on research and field observations.

Soybean Cyst Nematode – *Heterodera glycines*

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
soybeans	low hop clover	corn	Severe damage may be found in soils ranging from light sandy to heavy clay soils.
snapbeans	hemp sesbania	cotton	
Sericea lespedeza	common perslane	peanuts	
Vetch, common	sicklepod *(C. obtusifolia)*	grain sorghum	
Lespedeza (common & Korean)	coffee bean *(Casia tora)*	oats	
	chickweed (common, mouse-eared)	tall fescue	
	cranesbill	barley	
	henbit deadnettle	rye	
	wild soybeans	wheat	
	mullein	tobacco	
	pokeweed		

Lance Nematode – *Hoplolaimus columbus**

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
cotton	redroot pigweed	sweet potato	Found primarily in sandy to sandy loam soils.
soybean	sicklepod *(C. obtusifolia)*	pepper	
corn	purple nutsedge	tomato	
turfgrasses:	tall morning glory	carpetgrass	
(bermudagrass, zoysia, millet, St. Augustine, centipede	crotalaria	ryegrass	
	yellow nutsedge	bahiagrass	
vegetables:	johnsongrass	tall fescue	
(lima & snap beans, watermelon, okra, Southern peas/cowpeas, cucumbers, cantaloupe)	barnyard grass	cocklebur	
	common bermudagrass	peanuts	
	spiny pigweed		
small grain (wheat, barley)	goosegrass		

Host suitability is based on research and field observations.
*Host plants of another species, *Hoplolaimus galeatus,* include cotton, corn, alfalfa, red and white clover, hairy vetch, most major turfgrasses and crabgrass.

Sting Nematode – *Belonolaimus* ssp.

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
cotton soybeans corn milo pearl millet sorghum sunflower Coastal bermudagrass crimson clover white clover Kobe lespedeza strawberry **turfgrasses:** (centipede, zoysia, bermudagrass, ryegrass, fescue, St. Augustine) **small grains:** (rye, wheat, oats, barley) **vegetables:** (peppers, squash, cucumbers, lettuce, beans, cowpeas, eggplant, Irish potatoes, carrots, turnips, tomatoes, sweet potatoes, onions, cantaloupe)	**grasses:** (crabgrass, johnsongrass, dallisgrass, bahiagrass, nutsedge, bermudagrass) **broadleaved:** (morning glory, ragweed, cocklebur, Florida beggarweed, curled dock, sorrel, dandelion, jimson weed, lambsquarter)	peanuts (Georgia only) tobacco watermelon horseweed okra asparagus sandbur pokeweed buckhorn Coastal bermudagrass	Distribution is limited to sandy soils of a coarse texture.

Host suitability is based on research and field observations.

Reniform Nematode – *Rotylenchulus reniformis*

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
cotton soybeans sunflower clover: crimson, red, white hairy vetch **vegetables:** (okra, squash, cabbage, beets, carrots, tomatoes, lettuce, lima and snap beans, cowpea, eggplant, Irish potatoes, onions, cantaloupe, watermelon, sweet potatoes, cucumbers, pumpkin)	black nightshade hairy vetch coffee weed *(Cassia tora)* *Crotalaria spectabilis* purslane annual sow thistle beggarweed cocklebur	barnyard grass common bermudagrass St. Augustinegrass dallisgrass mustard okra oats peanuts onion pepper, sweet and hot spinach turnip sorghum corn	Does not appear to be seriously affected by soil type. Has been found in Georgia on sandy, sandy loams, clay loams and clay soils.

Stubby-Root Nematode – *Paratrichodorus christiei*

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
corn cotton peaches tomato wheat, oats tall fescue clover: crimson, red, white vetch soybeans alfalfa, ryegrass azalea sudangrass onion lespedeza mustard, turnip cabbage lettuce barley pearl millet peanuts, beans eggplants squash, okra sweet pepper Coastal bermudagrass	Research is not available.	asparagus jimsonweed *Crotalaria spectabilis* tobacco rye spinach strawberry cucumber bahiagrass	Stubby-root nematodes may be found in a wide range of soil types but cause greatest damage to plants in lighter-textured, sandy to sandy loam soils.

Host suitability is based on research and field observations.

Ring Nematode – *Criconemella ornata*, xenoplax**

Crop-Host Plants		Weed-Host Plants	Non-Host or Poor-Host Plants
Host plants on which nematodes are maintained or increased:			
C. ornata	*C. xenoplax*	*C. xenoplax*	*C. ornata:* peaches
peanuts	peaches**[1]	curly dock	*C. xenoplax*
corn	grapes[1]	perennial ryegrass	small grains
centipedegrass[1]	rotundifolia holly[1]	vetch	bahiagrass: pensicola, Argentine, P-22
St. Augustinegrass[1]	helleri holly[1]	hairy vetch	broadleaf signalgrass
soybeans	soybeans	cowpea	Carolina geranium
cotton	grain sorghum	**trefoil:** (dwarf English, birdsfoot, big, narrowleaf birdsfoot)	peanut
bermudagrass[1]	cowpea	**clover:** (ball, crimson, rose, subterranean)	cotton
		striate lespedeza	bermudagrass
		partridge pea	orchardgrass
			purslane
			alfalfa
			fescue: tall, hard, annual

Ring nematodes have a well-developed spear for feeding on roots. They build up to high numbers around the roots of susceptible host plants. However, with annuals, research has not shown a consistent growth and/or yield response from control of ring nematodes. With certain grasses and woody perennials, ring ssp. may build up to damaging levels over long periods of time.

* Other species may be present in the state but are not commonly found.
** Published research indicates that this species of ring is involved in peach tree short life.
[1] Injury to roots and reduced growth reported.

Lesion Nematode – *Pratylenchus brachyurus* (Pb)

Crop-Host Plants	Weed-Host Plants	Non-Host or Poor-Host Plants	Favorable Soil Types
peanuts cotton soybeans corn tobacco alfalfa oats rye wheat barley clover: red, crimson, ladino strawberry millet common vetch watermelon sorghum cucumber pepper cowpea Irish potato tomato coastal bermudagrass	crabgrass bermudagrass bahiagrass beggarweed ragweed goosegrass *(E. indica)*	Research is not available.	May be found in soils ranging from sandy to heavy clay.

Host suitability is based on research and field observations.
In Georgia at this time, control recommendations are made for *P. brachyurus* (Pb) on peanuts. This species may also damage cotton, tobacco and soybeans.
P. zeae (Pz) builds up to high numbers on corn, soybeans, small grains, grain sorghum and members of the grass family.
P. vulnus (Pv) can cause damage on peaches and woody ornamentals.

Other nematode species that occur in Georgia and may cause damage occasionally are listed below. The full effect of these genera has not been clearly demonstrated.

Peltamigratus spp.	Found in high numbers associated with problem soybean fields or turf.
Scutellonema spp. (Spiral nematodes)	Found in high numbers associated with problem soybean fields.
Helicotylenchus dihystera (Spiral nematodes)	Found in high numbers sometimes associated with problem fields of soybeans. However, a clear cause-effect relationship between number of spiral and injury to soybeans has not been established. The species may be found associated with cotton, corn, turf, ornamentals and many other crops. Except for isolated cases, spiral nematodes are not considered of economic importance in Georgia.
Tylenchorhynchus spp.	These nematodes have been reported as important pathogens on turf, ornamentals, field crops and many other plants, but are only occasionally found in high populations in Georgia. Pathogenicity data for Georgia situations are incomplete.
Xiphinema spp.	Found in low to high populations around many plants ranging from turf to field crops to fruit trees to ornamentals. Their pathogenic role in plant damage in Georgia has not been established.

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Learning for Life

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