Nematode Management

Louisiana Sweet Potato Production

Plant–parasitic nematodes can damage plants in many ways and are considered to be a serious threat to sweet potato production in Louisiana. Nematodes can be problematic in commercial and home garden situations. These pests affect the total production and aesthetic quality of sweet potatoes. Damage occurs underground to the sweet potato roots and often goes undetected until harvest. The reniform nematode *(Rotylenchulus reniformis)* and the root-knot nematode *(Meloidogyne incognita)* are the primary nematode species affecting sweet potato production in Louisiana.

Reniform Nematode

The reniform nematode is currently the most problematic nematode affecting sweet potato production in Louisiana. This nematode is also a serious pest to several agronomic crops and it has spread significantly during the past decade. Reniform nematodes are now present in most sweet potato commercial production areas in the Louisiana. Reniform nematodes overwinter as eggs, juveniles, and pre-adults. The life cycle of this nematode is completed in three weeks or less under ideal conditions and can build up to very high populations during one season.

Damage from this nematode is often difficult to recognize. In most cases, there are no distinct foliar symptoms or abnormalities that can be detected on sweet potato roots. Reniform nematode infestations can result in poor sizing (bulking) of the crop and in a reduced number of market-grade sweet potatoes. Damage from this pest can also manifest as deeply cracked roots, a reduction in the number of feeder roots and in a general discoloration of storage roots. In addition, reniform nematodes are resilient in that they can survive on equipment transferred from one field to the next and are unintentionally spread to other production sites.

Root-knot Nematode

The root-knot nematode can also negatively affect sweet potato production in Louisiana. Root-knot nematodes overwinter as eggs in production fields and under ideal conditions the life cycle is completed in approximately 30 days. One female can lay up to 3,000 eggs.

Root-knot nematodes are very widespread and are considered to be more problematic in areas with sandier soil types. Unlike damage incurred by reniform nematodes, damage from this species is more recognizable and easier to detect. Foliar injury symptoms include a general yellowing and stunting of the plant. Plants affected by root-knot nematodes may also mimic plants expressing nutrient deficiencies. Roots damaged by root-knot nematodes have a rough texture and also can be malformed and cracked. If this nematode attacks the roots early in the growing season, small galls may be visible on the roots. This pest can also enter into enlarging storage roots later in the growing season. Root-knot nematode females are white to yellow and can often be found in corky areas within storage roots. On the Beauregard variety, root-knot nematode is found under raised areas or pimples on the storage roots. Root-knot nematodes are small, but can be seen without the aid of a magnifying glass.

A new species of root-knot nematode *(Meloidogyne enterolobii)* has been found on sweet potatoes in North Carolina. This pest has a similar host range to that of our common species of root-knot nematode, causes very large galls on susceptible hosts, and can break the resistance of sweet potato varieties that are normally resistant to this pest. Although this nematode is not currently thought to be in Louisiana, producers should watch out for any field where they might see the loss of root-knot resistance against this pest.

Management Options

Sampling: All production fields and home gardens should be sampled for the presence of nematodes prior to planting. The best time to sample for nematodes is in the fall following harvest. If fall sampling is not possible, spring sampling is also highly encouraged. If nematode populations are detected and found to be at or above threshold levels, a labeled and recommended nematicide should be applied prior to planting. In addition, producers should consider other management options, including root-knot resistant varieties and crop rotation.

Sampling using Veris cart technology, GPS sample points for reference, and one acre grid overlays can be used to improve accuracy when collecting nematode samples in commercial production fields. Veris apparent electrical conductivity (ECa) can be used as a substitute for soil type and is a helpful tool for locating zones of soil variability in fields, evaluating eroded ridges and identifying other problems in fields.

Thresholds: The threshold level for reniform nematode in sweet potatoes is 1,000 per pint of soil. The threshold level for root-knot nematodes in sweet potato is 150 per pint of soil, although any level may result in quality problems by the end of the growing season.

Resistance: A few commercially available sweet potato varieties, namely Evangeline, Bayou Belle and Bellevue, express resistance to the root-knot nematode. So far these have held up well in the field, but because the root-knot nematode is highly variable, it is possible that populations exist that may attack even the resistant varieties. Furthermore, a species of root-knot nematode new to the southeast, *Meloidogyne enterlobii,* has been found in Florida and North Carolina. Only a few of the major varieties have been screened against this species and all were susceptible. Beauregard and Orleans, the predominant commercial cultivars grown in Louisiana, are susceptible to both the root-knot and reniform nematodes. Currently, there are no varieties that have any resistance to the reniform nematode.

Crop rotation: Crop rotation is a viable management option for both the reniform and the root-knot nematode. When a rotation crop is selected as a management option, that crop should be planted for two consecutive years, following sweet potatoes. Cotton and soybeans are preferred hosts of the reniform and root-knot nematode and should be avoided as rotation crops with sweet potatoes when possible. Corn, grain sorghum and fallow fields are not preferred hosts of the reniform nematode and are considered good rotation schemes for managing this pest; however, corn and a number of grain sorghum varieties are hosts for root-knot nematode. Winter wheat is a host to root-knot nematode. If winter wheat is used in a rotation, plant it closer to the end of the recommended planting date (November 15) for all locations within Louisiana. Soil temperatures are not as favorable for the nematode at this time and will lessen the potential for buildup on wheat. Home gardeners should be aware that most vegetables are susceptible to root-knot nematode with some varieties of either tomato or Southern pea being resistant. A few vegetables appear to be resistant to the reniform nematode including beets, broccoli, corn, okra, peppers, radishes, spinach, turnips, and watermelon.

Chemical control options: There are times when producers have no choice but to use a nematicide to manage nematodes that are present in their fields. Fortunately, several nematicides are labeled for use in commercial sweet potato production. Home gardeners cannot use any of these nematicides and must use other management options. There are three fumigants available including Telone II, Vapam HL and K-Pam HL. All of these fumigants must be applied before planting. Vapam HL and K-Pam HL are general fumigants and require application at least 21 days prior to planting to prevent injury to the crop. Telone II requires a waiting period of 7-10 days before planting. Telone must be applied to a depth of at least 12 inches beneath the row or soil level.

Mocap is also labeled for use in sweet potato to manage nematode populations. This product should be applied on a 12-15 inch band in the row.

AgLogic 15G or aldicarb is also labeled to use on sweet potato at the rates of 10 -20 pounds per acre. It needs to be applied in a 12-inch band over an open furrow and covered immediately during bed formation. Please read and follow all label instructions for all chemical management options.

Table 1. Screening Data from 2010

	Egg Mass Index	Gall Index	Eggs Per Plant
Susceptible			
Beauregard	2.8	5	440,000
Orleans	2.3	4.8	440,000
Intermediate			
Bayou Belle	0.5	3	90,000
Resistant			
Covington	0	2.5	50,000
Jewel			
Highly Resistant			
Bellevue	0	0	2,300
Bonita			
Burgundy	0	0	4,600
Evangeline			
Murasaki-29			

Table 1. Reactions of major sweet potato varieties to race 3 of the southern root-knot nematode, *Meloidogyne incognita*. Data are from greenhouse screening in 2010: gall and egg mass indices are on a scale of 0 = none up to 5 = more than 100 per plant.

Table 2. Host potential of several crops to nematodes in Louisiana.

Crop	Reniform	Root-knot
Sweet potato	Yes	Yes
Cotton	Yes	Yes
Corn	No	Yes
Wheat	No	Yes
Soybean	Yes*	Yes*
Grain sorghum	No	Yes**
Fallow	No	No

*Most varieties are susceptible to reniform or root-knot nematode. Occasionally, there are some varieties that may have some resistance.
**Grain sorghum varieties that are currently grown in Louisiana have been found to range from moderately susceptible to moderately resistant to root-knot nematode.

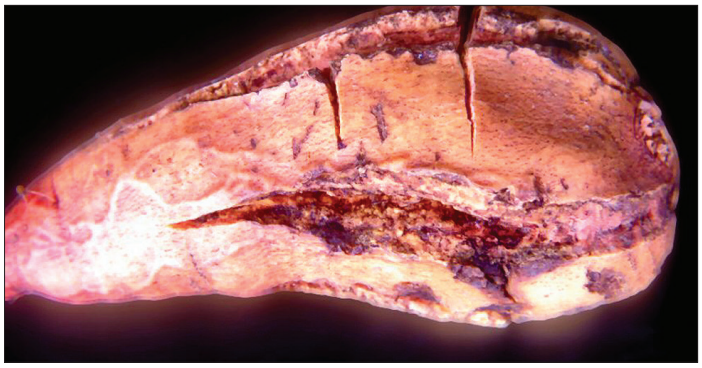

Figure 1. Cracking of the Centennial variety due to root-knot nematode.

Figure 2. Root-knot galls visible on sweet potato roots.

Figure 3. Root-knot nematodes (stained red) developing inside a sweet potato root.

Figure 4. Numerous raised areas or pimples on storage root associated with root-knot nematode. Slight cracking of the storage root is also evident.

Table 3. Labeled Nematicides for sweet potatoes in Louisiana. *Please read and follow all label directions.*

Nematode species	Nematicide	Rate per Acre	Timing and Method of Application
Reniform Root-knot	Telone II	*See manufacture's label for rates	Apply at least 12 inches deep, seven-10 days prior to planting
	Mocap 15G	20-26 lbs /acre 1.6 – 2.1 lbs / 1,000 row feet. See manufacturer's label for additional detail.	Apply in a 12-15-inch band (42 in. row spacing). Incorporate 2-4 inches. Application timing is two to three weeks prior to planting.
	Mocap EC	5.1-6.9 fl oz. /1000 row feet. See manufacture's label for additional detail.	Apply in a 12-15 inch band (42 in. row spacing). Incorporate 2-4 inches. Application timing is two to three weeks prior to planting.
	AgLogic 15G	10-20 lbs/acre	Apply in a 12iinch band over open furrow or soil surface and cover immediately during bed formation. Plant transplants in center of treated zone.
	Vapam HL	*See manufacture's label for rates	Must be applied at least three weeks prior to planting.
	K-Pam HL	*See manufacture's label for rates	Must be applied at least three weeks prior to planting.

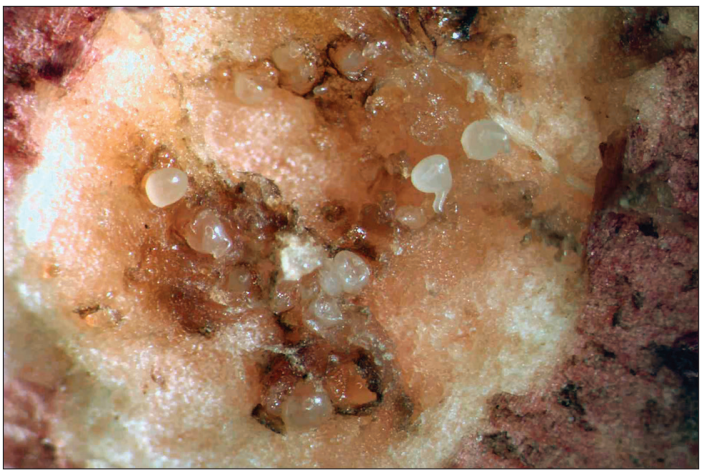

Figure 5. A number of white root-knot females evident beneath one of the raised areas (pimples) and several females teased out and visible on the cut surface.

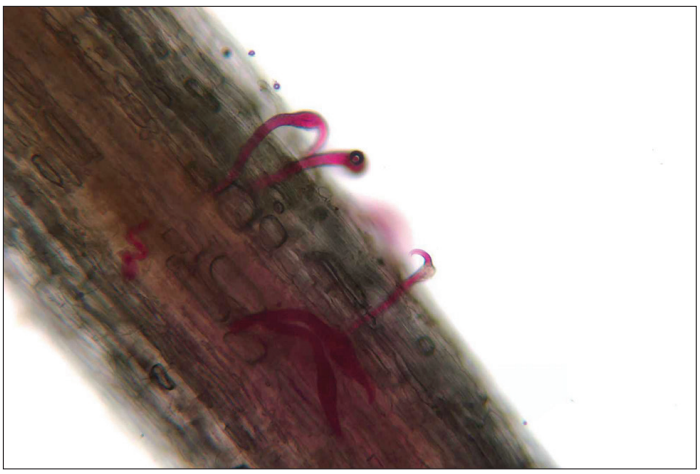

Figure 6. Reniform nematode females (stained red) are visible in a small root.

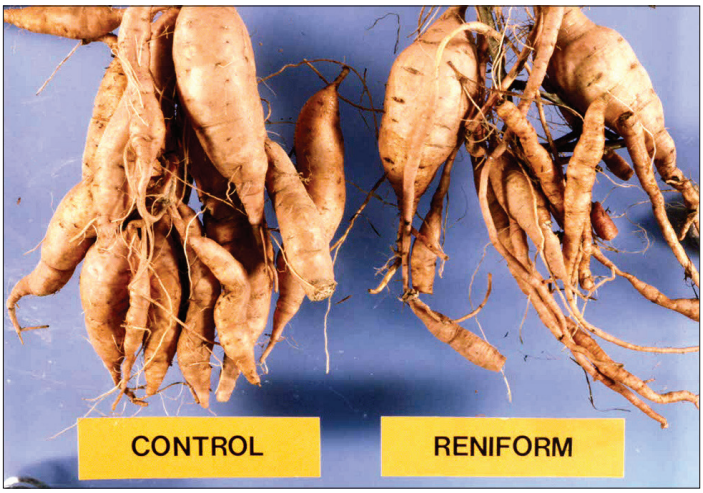

Figure 7. The delay in development of storage roots caused by reniform nematode.

Figure 8. Delay in vine development of a very susceptible breeding line in association with reniform nematode. The row on the right was fumigated compared to the untreated row on the left.

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