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Nematode Control Suggestions for Vegetables

Nematode surveys, grower sampling, and Extension troubleshooting samples have shown that varied populations of several plant parasitic nematodes occur on farms in Delaware. Damaging levels of several nematodes have been established. When nematode counts are at or above these threshold levels, consider implementating control measures for susceptible crops. Many cultural practices (rotation, fallow, resistant and tolerant varieties, etc.) will reduce nematode populations. However, at times, such practices are not possible or feasible. When this is the case, consider using chemicals (nematicides) for nematode control.

Threshold Levels*

Damaging Nematode	Fall Sampling	Spring Sampling
Root-Knot	500+	50+**
Lesion	400+	200+
Root-Knot	200+	25+
+	+	+
Lesion	300+	150+

**Above threshold levels per 250cc (1 cup) soil sample.*
*** Spring sampling for root knot is discouraged because of very low recovery from soil at this time of year. False negatives or under reporting root knot are common in the spring.*

NOTE: Stunt, spiral, stubby-root, lance, dagger, and pin nematodes have also been detected in samples assayed from vegetable fields. At present it is not known if control measures are needed for these nematodes on vegetables in Delaware. Most nematologists would agree that populations above 1,000 would be troublesome.If control is considered advisable, recommendations for control of these nematodes will be indicated on assay report forms.

Non-chemical Management of Nematodes

Prevention of spread. Plant-feeding nematodes move only short distances – a few inches to a few feet – under their own power. Typically, nematodes are spread by the movement of infested soil and/or infected plants. Sanitation and good cultural practices are the best preventive measures against nematodes. Obtain nematode-free transplants from reputable sources. Wash soil from machinery and tools before using them at another location. Nematodes may also be spread by wind, water, soil erosion, and animals.

Crop rotation. Rotation of crops is an effective and widely used cultural practice to reduce nematode populations in the soil. To be most effective, crops that are poor hosts or

nonhosts of the target nematodes should be included in the rotation sequence.Root-knot and lesion nematodes have such a wide host range that a practical rotation plan to reduce these nematode populations for vegetable crops cannot be recommended at the present time. The exception to this is the use of root-knot resistant soybeans in a rotation. A few root-knot resistant cultivars are available.

Cover crops. Some plants commonly used as cover crops are naturally suppressive to certain nematode species, but no single crop is effective against all nematodes. The cover crop plant may be a nonhost and, therefore the nematodes starve, thus reducing their populations as with fallow. Nematodes invade the roots of certain other cover crop plants, but they fail to reproduce. Yet, other "antagonistic" plant species exude chemicals from their roots which are toxic to nematodes, including marigold and asparagus.

Soil amendments and green manures. In general, the incorporation of large amounts of organic matter into the soil reduces populations of plant-feeding nematodes. The decomposition products of some plants kill nematodes. These include butyric acid, which is released during the decomposition of rye and timothy, and isothiocyanates, released during the decomposition of rapeseed and other mustards in the genus Brassica. Maximum benefit of these"natural" nematicides is obtained when the plant material is incorporated into the soil as green manure. Green manure treatments are not equally effective against all plant-parasitic nematodes and therefore it is important to consult with a diagnostic lab or extension agent to make sure the treatment is appropriate for the nematode being controlled. For example, rapeseed is effective against dagger nematodes but not lesion nematodes. Also keep in mind that varieties of the same green manure crop can differ in the amount of toxic chemical components in their cell walls and therefore differ in the amount toxic by-products released during decomposition. For dagger nematode control, two years of rapeseed green manure is desirable, but it may be possible to get the same benefit by growing two crops of rapeseed within one year. The following timetable is suggested for producing two rotations of rapeseed within one year:

• Prepare seedbed and plant rapeseed by late April or early May. (Plant only recommended winter rapeseed varieties.)

• Turn under green rapeseed by early September. Prepare seedbed and plant second crop by mid-September.

• The second crop should be turned under in late spring after soil temperatures reach 45°F or higher.

• Ideal conditions for incorporating the cover crop are similar to those required for obtaining the maximum benefit from fumigation (i.e., the soil should be above 45°F and moist).

• Alternatively, planting dates may be reversed so that the first planting is in the fall followed by a second crop planted in the spring. This would end the rotation cycle in fall of the following year. Some rapeseed varieties are more effective at suppressing nematode populations than others, and some varieties will not over-winter or they bloom too early in summer to be useful. The winter varieties 'Dwarf Essex' and 'Humus' work well for both spring and fall planting dates. If planted in the spring, these varieties grow vigorously to crowd out weeds and do not go to seed.

Tips:

• Rapeseed requires a firm, smooth seedbed that is free of weeds, heavy residue, and large clods.

• Seed may be drilled or broadcast. Seed at a depth of 3/8 inch and avoid planting too deep! If seed is broadcast, a cultipacker may be used to cover seed.

• A seeding rate of 7–8 pounds per acre works well.

• Rapeseed is sensitive to broadleaf herbicide carryover.

• Fall-planted rapeseed should have 8–10 true leaves and a 5- to 6-inch tap root with a 3/8-inch diameter root neck before the ground freezes.

• Sulfur is necessary for rapeseed to produce nematicidal compounds. Some soils may be deficient in sulfur. A soil test for sulfur may be beneficial. Keep in mind that some biofumigant crops like rapeseed and sorghum-sudangrass are hosts for nematodes and it is not until incorporated into the soil as green manure that they will suppress nematode populations.

Plant nutrition and general care of the plant. The harmful effects of nematodes on plants can be reduced by providing plants with adequate nutrition, moisture, and protection from stress. These tactics sometimes may be of limited usefulness, because, if susceptible crops are grown continuously, the nematode population may increase to levels that cause serious damage.

Resistance. Some vegetable varieties are available with resistance to root-knot nematode; e.g., tomato, pepper, and sweet potato. Some of these resistant varieties have limited horticultural use in our area. Check with seed company and Extension horticulturists for current variety suggestions.

Integrated management practices. Each of the practices mentioned above reduces the soil population of plant-feeding nematodes to varying degrees. Each practice has limitations. The degree of nematode control achieved depends on environmental factors, as well as the particular nematode and crop being considered. Maximum benefit is realized when several of these practices are employed in an integrated crop management program. Because the host range of different nematodes varies, the selection of cover crops, rotation crops, and green manures will be determined by the kinds of nematodes present. No single practice is a cure-all for all nematode problems.

Chemical Control Measures – Nematicides

Usually chemical control options for nematode control in soybeans are not economical. See the fact sheet PP-50 Soybean Cyst Nematode (SCN) Management Recommendations for Delaware for more information on SCN control. The use of resistant cultivars of soybean for soybean cyst nematode and root-knot nematode are encouraged and provide the most economical control.

Caution: The information and recommendations in these fact sheets were developed for Delaware conditions and may not apply in other areas. Author:
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