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report on
PLANT
DISEASE

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ROOT-KNOT NEMATODE OF HORSERADISH

Root-knot nematodes (*Meloidogyne* spp.) attack thousands of plant species worldwide, including agricultural crops and weeds. The four common species, *M. arenaria*, *M. hapla*, *M. incognita*, and *M. javanica* attack most cole crops. *M. hapla*, thrives at moderate to low temperatures; *M. incognita* has more intermediate temperature requirements; and *M. arenaria* and *M. javanica* do best under tropical conditions. Only *M. incognita* has been reported in horseradish in Illinois. Horseradish production in Illinois is mainly in the southwestern part of the state with moderate temperatures. Not much information on the etiology of root-knot in horseradish is available.

Figure 1. Root-knot of horseradish, caused by Meloidogyne incognita. Note the nematode galls on both main and side roots.

SYMPTOMS

Infection of plant roots by root-knot nematodes results in the formation of swellings (galls) on the roots (Figures 1 and 2). Root galls induced by *M. Incognita* are often 0.2 inch (0.5 cm) or more in diameter. The normal transfer of substances from roots to the plant top is restricted, often resulting in wilt and nutritional deficiencies. Above-ground symptoms include yellowing of foliage, reduced size and number of leaves, wilting in warm weather, and poor yield. In the field, galled roots may be invaded by microorganisms, causing rot of the roots.

DISEASE CYCLES

All common root-knot nematodes species have similar life cycle (Figure 3). Root-knot nematodes survive in infected roots of horseradish, thus the pathogen can be introduce to the field by planting sets saved from infected plants. Root-knot nematodes produce male and female nematodes. Females deposit eggs numbering from a few hundred to 1,500 (generally averaging 300-500 per female) into a gelatinous matrix. The eggs hatch to produce the first-stage larvae that molt to come the second-stage

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larvae, known as the second-stage juveniles. The second-stage juveniles hatch from the eggs, move into the soil, penetrate the host root, and undergo three additional molts to become adults (Figure 3). Under the optimal conditions, root-knot nematodes may complete their life cycle in 3-4 weeks, and may complete five to eight generations in a single growing season. *M. incognita* is inactive at temperature below 50°F (10°C).

Figure 2. Root-knot of horseradish, caused by Meloidogyne incognita.

DISEASE MANAGEMENT

Almost no information on the biology and management of root-knot nematodes in horseradish is available. Most of the following information is adapted from management strategies of root-knot nematodes in other crops for possible consideration for management of root-knot nematodes in horseradish. No horseradish cultivar resistant to root-knot nematodes is known. Screening the existing horseradish cultivars/lines may reveal resistance to root-knot nematodes. Root-knot nematodes are easily spread via movement of infested soil, and this should, therefore, be avoided. Because of the wide host range of root-knot nematodes, developing effective crop rotations for eradication or minimizing nematode populations in the soil is a challenging task. Weed management plays a key role in control of root-knot nematodes. One or two years crop rotations with small grains, grassy hey crops, or resistant vegetable crops are suitable for control of root-knot nematodes. But considering that pieces of horseradish roots remain in the field after harvest and give rise to volunteer horseradish plants for several years, crop rotations may not reliable option for management of root-knot nematodes in horseradish. The application of fumigants or nonfumigant nematicides to soils is an effective management option for control of root-knot nematodes in most of the crops, but using nematicides for control of root-knot nematodes in horseradish fields may not be effective because nematodes are protected inside living roots for a long time. Extensive studies are needed to investigate effectiveness of nematicides for control of root-knot nematodes in horseradish fields.

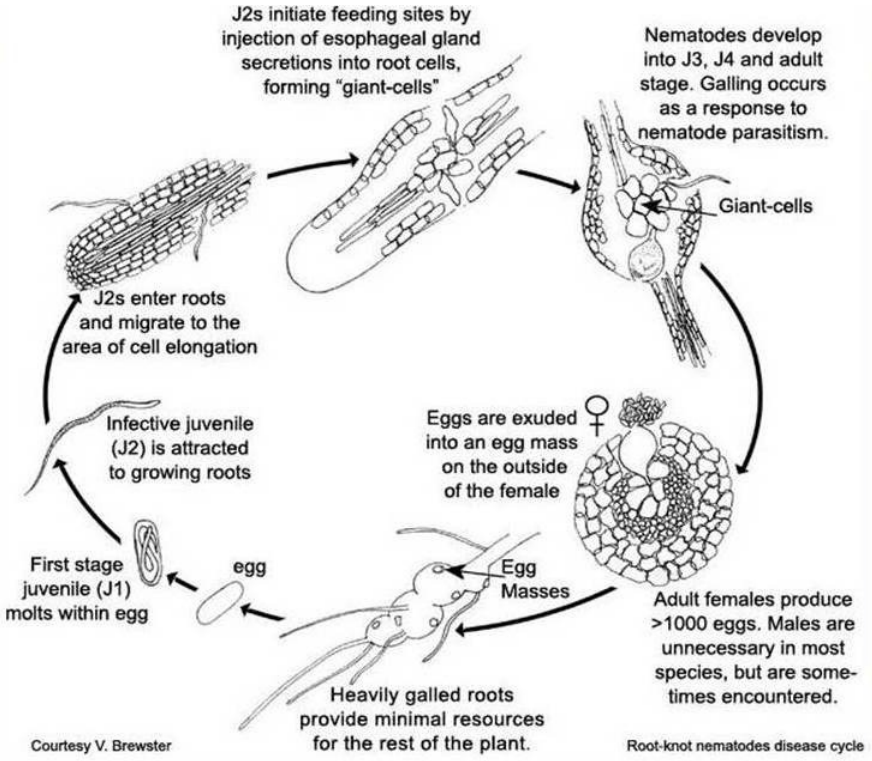

Figure 3. Life cycle of Meloidogyne spp. (Photo courtesy the American Phytopathological Society).