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NEMATODE PESTS
Sugar-Beet Cyst Nematode

http://hdl.handle.net/1813/43302
Page: 750.10
Date: 1-1979

COOPERATIVE EXTENSION. NEW YORK STATE. CORNELL UNIVERSITY

The Sugar-Beet Cyst Nematode, an Important Pest of Red Beets and Cabbage

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The sugar-beet cyst nematode, *Heterodera schachtii,* was first discovered on red beets in Syracuse in 1961 and near Lyons, New York, in 1970. This nematode is now known to be distributed throughout the red beet- and cabbage-growing areas of New York. High populations have caused considerable economic losses on 2 farms, and very light infestations are known to occur on approximately 20 additional farms. The sugar-beet cyst nematode is a major limiting factor in the production of sugar beets in the United States and other countries of the world. Sugar-beet industries have been eliminated where control measures were not practiced.

In commercial fields in New York, this nematode has damaged red beets and cabbage. Other hosts include broccoli, Brussels sprouts, cauliflower, rhubarb, spinach, and related weeds such as shepherdspurse, wild radish, mustard, and dock.

High nematode populations caused considerable damage in greenhouse, growth chamber, and field experiments. Infected beet plants exhibit no foliage symptoms to permit positive identification with the presence of this nematode. The first evidence above ground is stunted top growth in a small area of the field (fig. 1). If a host crop is grown repeatedly on an infested field, the area in which growth is poor gradually enlarges, and additional affected areas appear (fig. 2). Eventually poor-growth areas appear throughout the field. A similar pattern of spread occurs in cabbage fields. Cabbage heads grown in nematode-infested soils are smaller in size (fig. 3) and are less firm (fig. 4).

Roots from infected plants are stunted and discolored (fig. 5).

Eggs (up to 400-500) of the sugar-beet cyst nematode, enclosed in protective brown cysts, survive up to 7-8 years in soil in the absence of host plants. These leathery, lemon-shaped cysts (fig. 6) are approximately 0.7 mm (1/40 in.) in length. Roots of host plants release chemicals that

Figure 1. Nematode injury in beet field

Figure 2. Extensive nematode damage

Figure 3. Smaller cabbage head grown in nematode-infested soil

Figure 4. Cabbage heads grown in nematode-infested soils are less firm.

Figure 5. Infected plant roots are stunted and discolored.

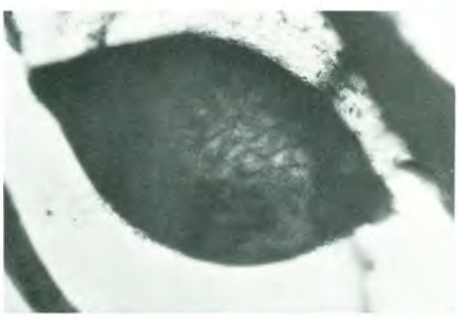

Figure 6. Brown cyst with nematode eggs inside

cause larvae to hatch from eggs, leave the cysts, and move to roots (fig. 7). This wormlike stage enters roots, becomes swollen while developing inside roots, and finally breaks through the surface (fig. 8). When first evident on the root surface, the females are white in color. Later, while still attached to roots, they become dirty white in appearance and eventually turn brown. When roots die, mature brown cysts fall loose into the soil.

One sure sign that a field is infested with the sugar-beet cyst nematode is the presence of swollen immature females of this nematode attached to the surface of the roots (fig. 8). These are first seen about 4-6 weeks after planting. Roots must be carefully dug with a trowel or shovel and handled gently to prevent jarring loose the white or cream females. Extension personnel should be contacted for positive identification. The presence of this nematode can also be detected by extracting cysts (fig. 6) from the soil and identifying them under a microscope.

It has been shown that this nematode moves only a few inches a year by itself. **It** is primarily transferred from field to field or farm to farm by movement of contaminated soil on farm implements, vehicles, or other tools and by animals. Also, high winds and flood water contribute to spread of this nematode. Furthermore, it may be moved along with transplants started in infested soil. Chances of spread are enhanced because low numbers of this nematode may be present in a field for several years before popUlations increase to levels sufficiently high to cause yield loss or even to be detected by sampling. Thus, spread may occur from a field before it is known that the field is infested.

Figure 7. Eggs and larvae

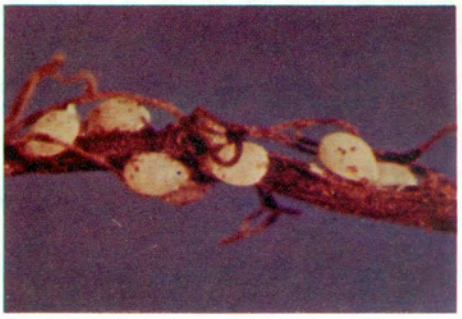

Figure 8. White female larvae on roots

Shortly after this nematode was first discovered in New York, it was recognized that an important means of spread was by the return of soil and debris (tare soil) to farms from beet-processing stations. Such tare soil normally includes soil from several other growers. This practice of returning soil from processing stations was voluntarily discontinued and should never be done again.

Because there are no resistant varieties, soil fumigants are ineffective under New York's soil and weather conditions, and only nonvolatile nematicides have been approved by EPA for cabbage and none for beets, the use of crop rotation to control this nematode assumes great importance. Another reason for using crop rotation is that most New York State fields are only lightly infested; thus rotation is the only practical control measure available. Field studies have shown that this nematode builds up to damaging levels when host and non host are alternated on a 1:1 basis. A rotation that includes two or more nonhosts to one host is necessary to prevent crop loss.

Integrated control methods involving rotation and chemicals probably will be developed as more research is done and more nematicides are cleared for use on cabbage and beets. Control recommendations will be made available when practical.

Photographs are by G. A. Catlin, N.Y.S. Agricultural Experiment Station at Geneva.

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