2016

Root-Lesion Nematodes

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Jackson-Ziems, T. A. 2016. “Root-Lesion Nematodes,” pp. 71-73 in *Compendium of Sunflower Diseases and Pests*, edited by R. M. Harveson, S. G. Markell, C. C. Block, and T. J. Gulya. St. Paul, MN: APS Press.

Root-Lesion Nematodes

Root-lesion nematodes, *Pratylenchus* spp., are among the most commonly encountered plant-parasitic nematodes, with one or more species occurring in almost every field. Their small size (0.4–0.7 mm long) relative to most other plant-parasitic nematodes enables them to survive in almost any soil texture. Their wide host range and distribution make them one of the most damaging nematodes worldwide, ranging from cool temperate to tropical environments. At least eight species of root-lesion nematodes have been associated with sunflower (Table 6).

Symptoms

Root-lesion nematode damage can range in severity from minor to severe, and symptoms may appear similar to those caused by other diseases and disorders. Aboveground, infected plants may exhibit varying degrees of stunting and yellowing. The root damage caused by *Pratylenchus* spp. can

TABLE 6. Characteristics of *Pratylenchus* spp. Associated with Sunflower

Pratylenchus Species	Presence of Males	Confirmed Geographic Distribution	Other Major Hosts
P. alleni	Common	Asia, North America, South America	Chickpea, cotton, potato, soybean, wheat
P. brachyurus	Rare	Africa, Asia, Central America, North America, South America	Alfalfa, cassava, chickpea, common bean, corn, cowpea, cucurbits, several grasses, millet, peanut, potato, rice, soybean, Sudan grass, sweetpotato, strawberry, sugarcane, tobacco, triticale, some vegetables, wheat
P. crenatus	Rare	Africa, Asia, Australia, Europe, North America, South America	Carrots, cereals, corn, forages, potato, rape, sorghum, strawberry, tobacco
P. hexincisus	No	Asia, Europe, North America, South America	Corn, soybean
P. penetrans	Common	Africa, Asia, Australia, Europe, Central America, North America, South America	Alfalfa, barley, cabbage, chickpea, corn, cotton, potato, vegetables, forages, millet, rape, strawberry, sugarbeet, sweetpotato, tobacco, wheat, many more
P. scribneri	Rare	Africa, Asia, Australia, North America, South America	Alfalfa, bean, corn, cotton, grasses, onion, potato, sorghum, soybean, strawberry, sugarbeet, sugarcane, sweetpotato, tobacco, tomato
P. thornei	Extremely rare	Africa, Asia, Europe, North America, South America	Alfalfa, bean, chickpea, corn, grasses, potato, soybean, sugarcane, tobacco, wheat
P. zeae	Extremely rare	Africa, Asia, Europe, Central America, North America, South America	Alfalfa, bean, cereals, chickpea, corn, cotton, cowpea, forages, millet, peanut, potato, rice, sorghum, sugarcane, tobacco, soybean, strawberry, sweetpotato, several vegetables

cause moisture stress, leading to stunting and wilting during hot days in sunflower and other plants. Symptomatic plants are usually evident by the early growth stages and remain unthrifty throughout the remainder of the season. Nematode damage in fields often occurs in random patches that are associated with higher population densities of the nematodes, where there is greater root damage. Feeding by root-lesion nematodes can cause minor to severe necrosis, with brown, discolored lesions developing on roots of sunflower and other crops. Feeding of root-lesion nematodes inside the roots can cause major damage, including cracking and both internal and external rotting. However, the lesions appear similar to those caused by other pathogens and facilitate infection by fungi and bacteria.

Disease Cycle and Epidemiology

Pratylenchus spp. are usually migratory endoparasites, but they may also feed as ectoparasites. Root-lesion nematodes remain vermiform throughout all life stages. Males occur only in some species, and reproduction of *Pratylenchus* spp. is believed to be mostly by parthenogenesis. The entire life cycle is completed in 25–65 days, depending on the species, moisture, temperature, and host plant, so several generations can be produced during a growing season. Eggs, juveniles, and adults overwinter in soil or inside roots. *P. penetrans* can produce up to 35 eggs per female and deposit them singly or in groups inside or near roots at a rate of 1–2 per day. Nematodes hatch as second-stage juveniles (J2) and progress through the remaining two juvenile stages to adults in either the soil or roots. Individuals can enter and leave the plant roots during any of their juvenile or adult stages.

Feeding by *Pratylenchus* spp. is in parenchyma cells, and the nematodes move mostly lengthwise through the cortical tissue, creating and enlarging lesions. Nematode movement and feeding causes collapse of the cell walls and the development of cavities and root discoloration; roots become brittle and dysfunctional. Several nematodes may aggregate together in lesions. Individuals may exit the root to infect other healthy roots, mainly near the zone of elongation and root branches.

Nematode migration through soil is as little as 2 cm over several days, so dissemination to new, distant areas is more likely through the movement of infested soil or infected plant material. In the absence of living crop or weed hosts, the nematodes survive best as eggs, where they are well protected. *Pratylenchus* spp. can also suspend their metabolic activity (cryptobiosis) during unfavorable weather conditions, including undergoing anhydrobiosis (dormancy induced by desiccation), surviving for up to 2 years.

TABLE 7. Other Nematode Species Associated with Sunflower

Common Name	Scientific Name(s)
Sting nematode	*Belonolaimus longicaudatus*
Reniform nematode	*Rotylenchulus parvus*
	Rotylenchulus reniformis
	Rotylenchulus unisexus
Spiral nematode	*Helicotylenchus dihystera*
	Helicotylenchus pseudorobustus
	Scutellonema brachyurum
Pin nematode	*Paratylenchus projectus*
Stubby-root nematode	*Paratrichodorus allius*
	Paratrichodorus minor
	Paratrophurus anomalus
	Trichodorus christiei
	Trophurus sp.
Stunt nematode	*Quinisulcius acutus*
	Tylenchorhynchus nudus
Dagger nematode	*Xiphinema americanum*

Management

When economical, the use of nematicides offers the most effective management of root-lesion nematodes. Treatments of nematicides such as aldicarb, carbofuran, and fenamiphos have reportedly reduced population densities of several nematode species. However, the high cost, toxicity, and specialized equipment needed to apply some of these nematicides might make them impractical for use in sunflower.

In general, *Pratylenchus* spp. have wide host ranges, making them difficult to manage with crop rotation. Identification of *Pratylenchus* to species level is difficult and not routinely included in nematode analyses. However, knowing the species present in an area can be helpful when planning crop rotation sequences to include nonhost crops for root-lesion nematode management. (A summary of some important hosts for *Pratylenchus* species is given in Table 6.) Their wide host ranges may make weed control important (including volunteer and weedy sunflower species) during crop rotation, because numerous weed hosts have been reported for *Pratylenchus* spp.

Resistant cultivars that suppress nematode reproduction reportedly occur in some sunflower varieties for at least some *Pratylenchus* spp. However, these may not be commercially available or known.

Some benefits from managing *Pratylenchus* spp. in other crops have been reported with the use of certain organic amend-

ments and cover crop species, such as some *Brassica* spp. However, some plants used for their benefits as cover crops or allelopathic effects may be hosts for *Pratylenchus* spp. and should be carefully considered to avoid inadvertently increasing nematode population densities.

For additional information, see the Selected References earlier in the section "Diseases Caused by Nematodes."

(Prepared by T. A. Jackson-Ziems)

Other Nematodes

Numerous other nematode species are confirmed to be associated with sunflower and are listed in Table 7. Less is known about their impact on sunflower and management.

For additional information, see the Selected References earlier in the section "Diseases Caused by Nematodes."

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