

# Species of *Pratylenchus* Associated with *Solanum tuberosum* cv Superior in Ohio

M. J. Brown, R. M. Riedel, and R. C. Rowe<sup>1</sup>

**Abstract:** Seventy-three Ohio fields comprising ca. 440 ha of cv Superior potatoes were surveyed in 1977 for plant-parasitic nematodes. Of eight genera of plant-parasitic nematodes, *Pratylenchus* was found most frequently, occurring in 65% of the soil samples and 84% of the root samples. Populations of *Pratylenchus* were consistently higher than populations of the other nematode genera. The six species of *Pratylenchus* extracted from potato roots, in descending order of frequency, were *P. crenatus*, *P. penetrans*, *P. scribneri*, *P. alleni*, *P. thornei*, and *P. neglectus*. Prevalence of these *Pratylenchus* species in Ohio potato fields suggests that they could be involved with vascular wilt fungi in premature death of cv Superior potato vines known in Ohio as "early dying." **Key Words:** root-lesion nematodes, *Pratylenchus crenatus*, *P. penetrans*, disease interaction.

About 5000 ha of potatoes are grown annually in Ohio, some 10% of which is the cultivar Superior. This early maturing cultivar is well adapted to Ohio growing conditions and suitable for the early fresh market. In recent years, fields of this cultivar have been affected by a disease locally called "early dying." This disease, which occurs sporadically, results in premature senescence of the vines 4-6 weeks before normal maturity. This occurs when the tubers are rapidly expanding, resulting in a significant yield decrease. In New York, Schultz and Cetas (15) have described a similar disease of potatoes (cv Superior), "early maturity wilt," which is caused by the interaction of *Verticillium alboatrum* Reinke and Berth. or *V. dahliae* Kleb. with *Pratylenchus penetrans* (Cobb) Filipjev and Shuurmans Stekhoven. In a commercial cv Superior potato field in Ohio, *P. penetrans* has also been implicated along with vascular wilt fungi in "early dying" (14). These results suggest

that reports from Ohio and New York describe the same disease.

*Pratylenchus penetrans* has been reported frequently from potato fields in northeastern North America, and its pathogenicity and economic importance to potato are well documented (1,2,3,4,6,7,10,11). However, less is known about the effects of other species of *Pratylenchus* commonly reported in surveys of potato (6,8,12,17).

Little is known about the frequencies of occurrence or population densities of *Pratylenchus* species in Ohio potato fields, or about their possible interaction with *Verticillium* in potato plants. This paper reports a survey of plant-parasitic nematodes in Ohio cv Superior potato fields.

## MATERIALS AND METHODS

Seventy-three fields comprising 440 ha in 20 counties were surveyed for nematodes between mid-June and mid-August 1977. Sixty-eight of seventy-three fields were located in the northern third of the state. Each field was divided into 1.6 ha blocks on the basis of cropping history and topography. Ten plants were lifted at random from each block. Roots and soil were removed from each of the rootballs and com-

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<sup>1</sup>Respectively Graduate Associate and Associate Professors, Department of Plant Pathology, Ohio State University, Columbus, 43210, and Ohio Agricultural Research and Development Center, Wooster, 44691.

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bined in one sample representing the block. Cropping history, pesticide use, and soil texture were recorded for each sampling site. From each sample, nematodes were extracted from 10 g of 1-cm-long fresh root sections and from 100 cm<sup>3</sup> of soil. Soil and root samples were incubated separately in Baermann funnels at room temperature for 24 hours. Nematodes in plant-parasitic genera were counted, and *Pratylenchus* from roots were killed by heating and stored in 2% formaldehyde for later identification to species.

## RESULTS

*Pratylenchus*, *Paratylenchus*, and *Tylenchorhynchus* were respectively found in 65, 16, and 15% of the soil samples. Other genera were found less frequently (Table 1). The only kinds of nematodes recovered in large numbers from the roots were *Pratylenchus* and *Meloidogyne*. *Pratylenchus* was found in 84% of the root samples. Although *Meloidogyne* larvae were extracted from 6% of the root samples, no root galls were seen (Table 1).

From the root samples, *Pratylenchus* spp. were recovered overall in the highest numbers. *Pratylenchus* occurred in 69 of the 73 fields sampled, and we were able to identify the species in 54 of these. In descending order in frequency of occurrence, the species found were *P. crenatus* Loof (in 44 fields), *P. penetrans* (in 23 fields), *P. scribneri* Steiner (in 17 fields), *P. alleni* Ferris (in 7 fields), *P. thornei* Sher and Allen (in 6 fields), and *P. neglectus* (Rensch) Filipjev and Schuurmans Stekhoven (in 4 fields). Of the 54 fields, 30 contained more

than one species of *Pratylenchus*. Populations of *P. crenatus* accounted for 75% of 24 fields with monospecific populations. *P. penetrans*, *P. scribneri*, or *P. neglectus* accounted for the remaining 25%.

Soil insecticide/nematicide treatment had a direct effect on the population size of *Pratylenchus* spp. In fields treated with aldicarb or carbofuran, populations of root-lesion nematodes were one-fifth to one-tenth those in similar untreated fields.

Distribution of *P. crenatus* did not appear to be restricted by soil texture or previous crop. However, higher populations (up to 1200/10 g fresh root) were associated consistently with silt loam fields under wheat-potato rotation. Although *P. penetrans* was detected also in nearly all soil textures and following a wide variety of crops, populations were consistently low in silt loam fields with wheat-potato rotations. The highest populations of *P. penetrans* (up to 1440/10 g fresh root) were found consistently in sandy soils previously cropped to potatoes. *Pratylenchus scribneri* was detected in almost all soil types but was detected most frequently in fields that had been in continuous potato production or had been cropped to potatoes at least the preceding year. The highest populations of this species (600-1000/10 g fresh root) were found in a field with sandy soil and high organic matter content that had been in continuous potato production for 10 years.

## DISCUSSION

Of the two published surveys for plant-parasitic nematodes in potato fields of northeastern North America, Ohio results

TABLE 1. Occurrence and population sizes of genera of plant parasitic nematodes in 145 soil samples and 148 root samples collected from Ohio cv Superior potato fields.

	Percent of soil samples infested	Population/100 cm <sup>3</sup> soil		Percent of root samples infested	Population/10 g root	
		Maximum	Median		Maximum	Median
<i>Helicotylenchus</i>	6	80	20	3	60	20
<i>Hoplolaimus</i>	6	50	20	<1	30	—
<i>Meloidogyne</i>	7	1,560	80	6	4,660	80
<i>Paratylenchus</i>	16	170	30	4	50	20
<i>Pratylenchus</i>	65	980	75	84	1,440	110
<i>Tylenchorhynchus</i>	15	600	30	4	90	40
<i>Xiphinema</i>	3	10	10	—	—	—
<i>Tylenchus</i>	6	160	20	—	—	—

compare most closely with those of the Prince Edward Island survey. There are some differences, however. *Pratylenchus penetrans* and *P. crenatus* were reported to occur sympatrically in soil samples from fields on Prince Edward Island (8). *Pratylenchus crenatus* was found in 94% of the surveyed fields, while *P. penetrans* was found in 66%. Soil population densities of *P. penetrans* were generally higher than *P. crenatus*. Our results agree, in that *P. crenatus* was found in more Ohio fields than *P. penetrans*, 81 and 42% respectively. However, monospecific populations of *P. crenatus* and *P. penetrans* were comparable in size, and where the two species were sympatric, *P. penetrans* dominated in muck or sandy soils, while *P. crenatus* dominated in silt loam soils.

In the Wisconsin survey (6), which encompassed all soil types and several potato varieties, *P. penetrans* was found in all potato areas surveyed except one and was the species associated with damage to potato. *Pratylenchus crenatus* was widespread, but was not associated with damage to potato, and the highest populations were found in sandy soils. *Pratylenchus neglectus* (= *P. minyus*), *P. thornei*, and *P. vulnus* Allen and Jensen were rare and were only extracted from soil. While *P. neglectus* and *P. thornei* were not common in Ohio, they were extracted from potato roots. Our results differ from those of the Wisconsin survey in that *P. crenatus* dominated over *P. penetrans* and the highest populations of *P. crenatus* occurred consistently in silt loam soils.

Townshend et al. (17) compiled distribution maps for species of *Pratylenchus* in northeastern North America using a combination of personal survey experience and data from many past nematode surveys by other workers. They reported that *P. penetrans*, *P. crenatus*, *P. neglectus*, and *P. hexincisus* Taylor and Jenkins occurred commonly throughout the area. In our study, the first three species were commonly found. *P. hexincisus* was not found, although 4 fields had been previously rotated to corn. In addition, *P. alleni* and *P. thornei* were found in Ohio, two species which Townshend et al. listed as rare.

Silty textured soils in the wheat-potato

rotations in Ohio probably affected the kind of *Pratylenchus* predominating here. Townshend (16) reported that *P. penetrans* and *P. neglectus* penetrated host roots better in sandy loam than in silt loam soils. Rich et al. (13) reported that *P. scribneri* preferred coarser textured soils and that reproduction of *P. scribneri* on sugar beets was greater in sandy loam soils than in loam soils. Loof (9) reports *P. penetrans* and *P. crenatus* occurring mainly in sandy soils and *P. neglectus* from clay or loamy soils. The predominately silty textured Ohio soils would be expected to discriminate against most root lesion nematodes.

A recent field-crops survey in Ontario showed the influence of crop on *Pratylenchus* species distribution (12). *Pratylenchus neglectus* was detected most frequently overall, but especially in the small-grain soils which constituted most of the soil surveyed (91% of the samples). *Pratylenchus penetrans* dominated the less-sampled fruit and tobacco areas. *P. crenatus* occurred sporadically, and no relation to crop was seen. In Great Britain, Corbett (5) found that *P. neglectus* (= *P. minyus*) occurred most commonly in the small-grain fields, independent of soil texture. Other *Pratylenchus* species were related to soil type, with *P. thornei* in heavy soils and *P. crenatus* and *P. fallax* in lighter soils. Loof (9) consistently reports *P. neglectus*, *P. crenatus*, and *P. thornei* as occurring in high and damaging populations on cereals. He reports cereals as a tolerant host for *P. penetrans* and potato as a poor host for *P. crenatus*.

From the literature, therefore, one might expect the predominance of wheat in the cropping rotations and silty soils in Ohio cv Superior fields to favor *P. neglectus* or *P. thornei* over *P. crenatus* or *P. penetrans*. However, *P. crenatus* and *P. penetrans* were found most often and *P. neglectus* and *P. thornei* infrequently. The economic importance of *P. crenatus* on potato is unknown and needs to be determined. The economic importance of *P. penetrans* and *P. scribneri* on potatoes in Ohio also needs to be determined.

The widespread and more frequent occurrence of *Pratylenchus* species in Ohio cv Superior potato fields, where vascular wilt

fungi (especially *Verticillium dahliae*) is present, suggests that they may be involved together in the "early dying" of potatoes here.

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