Sampling and Damage Assessment of *Pratylenchus* Nematodes Associated with Wheat-Carrot Seed Crop Rotations in Central Oregon

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Introduction

Pratylenchus nematodes can injure many crops, including grasses, cereal grain crops, and vegetables. There is anecdotal observation and concern that such nematodes sometimes injure seedlings of highly valued seed carrot crops in central Oregon, but the importance of population sizes, species composition, and timing of nematode sampling are not clear. Based on population levels considered damaging to crops in other regions, *Pratylenchus* root and soil assays from irrigated wheat, grass seed, and seed carrots in central Oregon sometimes appear very high. Research at Oregon State University-Pendleton on dryland wheat and on carrots in Australia suggested *P. thornei* may be of particular concern, but other species of *Pratylenchus* could be injurious as well. Seed-to-seed carrots common follow irrigated wheat and grass seed crops in central Oregon. *Pratylenchus* spp. is known to increase on cereals and grasses. Thus, increase of *Pratylenchus* on cereals and grasses may contribute to suspected carrot injury. This trial allowed us to investigate the benefit of commercially registered nematicide applied to soil where carrots were seeded into fields identified as having high *Pratylenchus* populations both in the previous wheat crop and current carrot planting.

Materials and Methods

In the first week of July 2006, around the last irrigation period, soil samples were collected from 26 irrigated wheat fields that growers and fieldmen thought might later be seeded to carrots in August or September 2006. Species of *Pratylenchus* found included *P. thornei*, *P. neglectus*, *P. crenatus*, and *P. penetrans* in various proportions per field, some with only one or two species, others with three or all four. *Pratylenchus* species may be found both within and outside of roots, when roots are present. Net populations of all species associated with irrigated wheat roots in July ranged from 0 to 208 total *Pratylenchus*/100 cc soil and 1 to 528 total *Pratylenchus*/g fresh root weight. Preliminarily, populations in excess of 100/100 cc soil or 240/g roots were considered potentially injurious. The soil threshold was exceeded in six (23 percent) of the fields; the root threshold was exceeded in eight (31 percent) of the fields; and both root and soil thresholds were exceeded in five (19 percent) of the fields. No evaluations were made of nematode versus wheat performance, although this could be a topic for future investigation.

At the time of August-September carrot planting, we intended to resample soils from many of the original 26 surveyed fields (especially those with "high" nematode counts) in order to correlate these data with those from early July wheat soil and root samples. We expected that cultivation of wheat stubble in preparation for carrot seeding, together with the absence of roots at the time of carrot seeding, would result in a decline of *Pratylenchus* populations prior to planting of carrot seed in August and September. Unfortunately, only four of the surveyed fields were actually planted to carrots in 2006, so abundant correlative data were unavailable, but three of these were fields that earlier tested high for *Pratylenchus*. August soil samples from these three fields suggested that total *Pratylenchus* in soil (no roots were present) had

declined perhaps 60-70 percent since July, but that populations remained at a level considered very high. Data are shown in Table 1.

Table 1. Number total *Pratylenchus* (all species) from selected carrot fields in central Oregon.

	early July		mid-August
Field	Soil (per 100 cc)	Roots (per g fresh root)	Soil (per 100 cc)
A	49	528	327
B	116	428	392
C	208	251	302

With the cooperation of carrot growers and Wilbur-Ellis Co., post-planting nematicide trials were established in the three fields discussed above. Using commercial application rigs, Vydate® L (oxamyl) at 1 gal/acre in 20 gal/acre water plus 1 qt/acre Superspread 7000 was applied immediately prior to overhead irrigation and within 1 week following carrot seedling emergence. Sprayed and unsprayed treatments were replicated three times in randomized block trials in each field. Vydate does not immediately kill nematodes but it does quickly disrupt nematode feeding, thus populations eventually decline (months). We assessed the efficacy of Vydate by observing carrots in the fall, then measuring carrot fresh and dry weight in March of 2007. Soil samples also were collected in early March 2007. No visual differences were noted in fall carrot seedling growth or in early spring carrot growth in March 2007. Extensive winter frost heaving of carrots was observed in many fields, but was not much noted in our trial fields. Mean fresh weight of 100 carrot taproots and foliage sampled in early March (and mean dry weight of 50 of these plants) was not significantly different ($P \leq 5$ percent), nor were there trends in favor of Vydate treatment or nontreatment. March soil and carrot root samples suggested a substantial but nevertheless non-statistically significant decline in *Pratylenchus* populations in Vydate-treated plots in one of three fields (data not shown) but no trend in the other two fields. Most likely, data from the one field would have been statistically significant if more replications had been included in the trial. It is unknown why Vydate didn't appear to lower *Pratylenchus* populations in the other two fields.

Results and Discussion

At final wheat irrigation and/or just prior to carrot planting appear to be reasonable times for collecting information on *Pratylenchus* populations with respect to fall carrot seeding. Because of the time required to process soil/root assays, only July sampling allows sufficient time for making nematicide application decisions close to carrot planting time. Four *Pratylenchus* species were common in carrot fields, but insufficient information was collected to determine which of them are singly or together injurious to seed carrots in central Oregon. Vydate treatment appeared to lower *Pratylenchus* populations from high to low levels in soil around seedling carrots in treated plots in one but not all trials, and beneficial plant response was measured. While it is possible that our Vydate treatments were applied too late if injury was restricted to a period during and immediately post-emergence, it seems likely that a period of injury would extend throughout seedling development. We might reconsider whether our measures of plant injury were sufficient; the adverse winter of 2006-2007 may have confounded our early spring measurements. The demonstrated frequency of presumed high *Pratylenchus* populations in wheat-carrot rotations begs further investigation.