Fundam. appl. Nematol., 1996, **19** (2), 205-206

Short note

HOST SUITABILITY OF ALTERNATIVE OILSEED AND FIBER CROPS TO *PRATYLENCHUS PENETRANS*

Cornelis J. Kok and Gertruda C. M. Coenen

Research Institute for Plant Protection (IPO-DLO), P.O. Box 9060, 6700 GW Wageningen, The Netherlands.

Accepted for publication 11 April 1995.

Key-words : *Cannabis, Crambe, Dimorphoteca, Euphorbia, Pratylenchus penetrans,* rotation effects

Dutch agriculture faces an increasing problem with soil-borne pathogens (including nematodes) due to intensive cultivation of a limited number of crops in short rotations. The government's plan to reduce the use of soil disinfectants by 50 % by the next century may well aggravate the situation. A possible solution to the problem is the introduction of new crops into the rotation scheme.

The root-lesion nematode, *Pratylenchus penetrans* Cobb is one of the plant pathogenic nematodes that is studied in our laboratory in respect to crop rotation effects. This nematode species has an extremely wide host range. It can cause severe growth reduction and yield loss in potato production (Mai *et al.* 1977; Santo, 1989). Furthermore, *P. penetrans* increases the effect of *Verticillium dahliae* in the early dying syndrome of potato (Kotcon *et al.*, 1985; Rowe *et al.*, 1985). The effect of four alternative crops on population dynamics of *P. penetrans* was determined in greenhouse studies, using three different types of inoculum. The host suitability of the alternative crops was compared to that of conventional crops of known host status.

The alternative crops investigated were the oil seed plants *Crambe abyssinica* Hochst ex Fries, *Dimorphotheca pluvialis* (L.) Mnch. and *Euphorbia lagascae* Sprengel, and the fiber crop *Cannabis sativa* L. Plants of known host status were included in the experiment for comparison. Sugar beet (*Beta vulgaris* L.) cv. Univers was used as poor host reference species. Potato (*Solanum tuberosum* L.) and fiddleneck (*Phacelia tanacetifolia* Benth.) were included as susceptible hosts.

The reproduction of *P. penetrans* on the plant species was studied in a greenhouse at 20°C. The plants were inoculated with either a nematode suspension or nematode-infested root pieces of oats, or planted in naturally infested soil.

Two sources of inoculum of *P. penetrans* were used in two separate experiments. For experiment 1, infested root pieces from oats on which a greenhouse culture of *P. penetrans* was kept, and a suspension of *P. penetrans* extracted from oats roots were used. Roots of oats were cut into 1 cm pieces and used as inoculum. *P. penetrans* was extracted from weighted portions of cut roots in a mist chamber to estimate the inoculum density and to prepare a nematode suspension as alternative inoculum type. The initial population was 340 nematodes per plant. The test plants were grown in 400 ml pots containing a potting mixture and coarse river sand (1:2 in volume).

For experiment 2, 3 week-old seedlings or rooted potato cuttings were transferred to 400 ml pots containing naturally infested soil. The initial population of *P. penetrans* in this soil was 3280 nematodes/pot.

The experiments were terminated at senescence of the *C. abyssinica* plants, two months after inoculation. The final population of the *P. penetrans* in the roots was extracted in a mist chamber, and in the soil with an Oostenbrink elutriator. Both experiments were carried out in a completely randomized design. In experiment 1, there were five replications per plant species and inoculum type, and ten replications in experiment 2. The data were transformed to $log(x + 1)$ and subjected to ANOVA and the LSD test. Means were compared by LSD-test ($P \leq 0.05$).

Species identity of *Pratylenchus* was confirmed using various characteristics (Loof, 1991). No nematodes were found at the beginning or at the end of both experiments that showed characteristics of *Pratylenchus* species other than *P. penetrans*. On average, 28.6 % of adult *Pratylenchus* were males and this percentage did not change significantly during the experiment and it was not influenced by the source of the nematode inoculum (greenhouse culture or infested soil) or host plant (tested with ANOVA, $P > 0.05$).

The final population of *P. penetrans* (adults + juveniles; soil + root population) is given in Table 1. Since the effect of the different types of inoculum (infested root pieces or nematode suspension) was not significant (ANOVA, $P > 0.05$), the data of these two treatments were pooled.

Of all plant species tested, *C. sativa* supported the largest population of *P. penetrans* with a multiplication rate of 6.1 (Exp. 1) and 4.1 (Exp. 2). The alternative crops *D. pluvialis* and *E. lagascae* had a poor host re-

ISSN 1164-5571/96/02 $ 4.00 / © Gauthier-Villars - ORSTOM

Table 1. *Final population (roots and soil) and multiplication rate* (Pf/Pi) *of* Pratylenchus penetrans *in seven plant species 60 days after inoculation.*

	Experiment 1*		Experiment 2**	
Plant species	Pf	Pf/Pi	Pf	Pf/Pi
Dimorphotheca pluvialis	310 *b*	0.91	2300 *a*	0.70
Euphorbia lagascae	250 *b*	0.74	3400 *b*	1.04
Crambe abyssinica	510 *b, c*	1.50	4050 *b*	1.23
Cannabis sativa	2080 *d*	6.11	13600 *d*	4.15
Beta vulgaris	40 *a*	0.12	4780 *b*	1.46
Phacelia tanacetifolia	1050 *c, d*	3.09	7710 *c*	2.35
Solanum tuberosum	-	-	6490 *c*	1.98

* Data pooled from two experiments of five replications inoculated with a nematode suspension and infested oat roots, respectively; Pi = 340 nematodes per plant. ** Data are means of ten replications. Inoculum from naturally infested soil; Pi = 3280 nematodes per plant. For each experiment, means followed by a different letter are significantly different ($P \leq 0.05$; LSD test on $log(x + 1)$ transformed data).

sponse comparable to sugar beet in the experiment with infested soil. In the inoculation experiment sugar beet showed a significantly lower host suitability. *C. abyssinica* showed intermediate host quality.

Of the alternative crops tested, only *C.sativa* is susceptible for *P. penetrans* and therefore not recommended as an alternative crop in *P. penetrans* infested soils. The other alternative crops tested are unlikely to cause or aggravate the problems caused by *P. penetrans*.

Modern European fiber cultivars of *C. sativa* are thought to be genetically closely related. However, land races, ornamental cultivars and drug varieties seem to be more distantly related (De Meijer & van Soest, 1992). Therefore, generalization of the results to the latter types of *C. sativa* is precarious.

Acknowledgements

The greenhouse culture of *P. penetrans* was provided by J. van Bezooijen, Agricultural University Wageningen. The soil infested with *P. penetrans* was obtained from M. Schepman, Applied Research for Nursery Stock, Boskoop.

References

De Meijer, E. P. M. & Van Soest, L. J. M. (1992). The CPRO *Cannabis* germplasm collection. *Euphytica,* 62 : 201-211.

Kotcon, J. B., Rouse, D. I. & Mitchel, J. E. (1985). Interactions of *Verticillium dahliae, Colletotrichum coccodes, Rhizoctonia solani* and *Pratylenchus penetrans* in the early dying syndrome of Russet Burbank potatoes. *Phytopathology,* 75 : 68-73.

Loof, P. A. A. (1991). The family Pratylenchidae Thorne, 1949. *In :* W. R. Nickle (Ed.). *Manual of agricultural nematology.* New York, USA, Marcel Dekker : 363-421.

Mai, W. F., Bloom, J. R. & Chen, T. A. (1977). Biology and ecology of the plant-parasitic nematode *Pratylenchus penetrans. Pennsylvania State Univ. Coll. Agric. Bull.,* 815 : 1-64.

Rowe, R. C., Rieder, R. M. & Martin, M. J. (1985). Synergistic interaction between *Verticillium dahliae* and *Pratylenchus penetrans* in potato early dying disease. *Phytopathology,* 75 : 412-418.

Santo, G. S. (1989). The role of crop rotation systems on non-cyst nematodes affecting potatoes in the temperate zones. *In :* Vos, J., van Loon, C. D. & Bollen, G. J. (Eds). *Effect of crop rotation on potato production in the temperate zone.* Dordrecht, The Netherlands, Kluwer : 121-131.