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EFFECTS OF THE NEMATODE *PRATYLENCHUS FALLAX* ON ROOTS OF OILSEED RAPE *(BRASSICA NAPUS* VAR. *OLEIFERA)*

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Pratylenchus fallax Seinhorst, 1968 is widespread in sandy arable soils throughout Europe. It was found associated with barley (Corbett, 1970) and was present in large numbers in stunted maize from Berkshire, England, it also damaged the roots of wheat, barley and sugar beet in *in vitro* tests (Corbett, 1972). Oilseed rape is often used as a break crop between cereal crops and these experiments were performed to determine whether *P. fallax* from a cereal crop could damage a following crop of oilseed rape. Therefore this study investigates the effect of infestation of *P. fallax* at two different inoculation densities on oilseed rape cv. Bienvenu in *in vitro* monoxenic culture.

Materials and methods

Seeds of oilseed rape, *Brassica napus* var. *oleifera* cv. Bienvenu, were surface sterilised using 0.1 % mercuric chloride solution and then placed on White's medium (Mountain, 1955) in sterile Petri dishes and incubated at 22 °C. When tap root growth measured 4 cm the seed was excised and discarded. Cultures of *P. fallax*, derived from a single female nematode, were grown on excised maize roots and pieces of this infested root were used as inoculum (Olowe & Corbett, 1976). Three treatments with fifteen replicates of each were started : control plants without nematodes, plants inoculated with 670 nematodes (light inoculum), or 1 340 nematodes (heavy inoculum). All plates were incubated at 22 °C in dark conditions. Each plate was examined each day for 30 days and individual lesions were marked and developments noted. A record of root growth was obtained by marking the position of the tip of each infested root on the Petri dishes each day. After 30 days each plate was photocopied against a white ground and an image obtained of the root system. The length and number of tap and lateral roots were measured from these photo-

Table 1

Behaviour of *Pratylenchus fallax* on excised roots of oilseed rape : number of days from inoculation to specific observation.

Observation	Inoculation Level I	II
	No. of days	
Nematodes aggregating just behind lateral root tips	2	1
Nematodes feeding along tap root surface	3	2
Penetration of cortex at tap and lateral junctions	5	1
Nematodes leaving surface feeding sites and attacking fresh sites	6	3
Root necrosis observed (*50)	6	2
Growth of infested roots stopped	7	4
Nematodes aggregated just behind tap root tip	+	5
Lateral roots swollen behind tip	9	7
Root necrosis visible to unaided eye	16	4

I and II : initial inoculum of 670 and 1 340 *P. fallax* per plant, respectively.
+ : did not cocur.

copies. Nematodes were then extracted from roots and agar (Stemerding, 1963) and counted.

Results and discussion

Symptoms on roots at both initial nematode densities were similar but the heavy inoculum accelerated the onset, and increased the severity of effects (Tab. 1). Nematodes moved directly towards lateral roots and aggregated just behind root tips as they did in wheat, barley and sugar beet (Corbett, 1972), but no penetration of the root cap was seen in rape. Many nematodes along the tap root surface were observed feeding on epidermal cells. In rape, many of the nematodes remained ectoparasitic and did not penetrate into the root cortex. They moved along the root surface, feeding at several different sites. These feeding sites later showed as small patches of necrosis involving the epidermis and never extending more than a few cells deep into the cortex. This patch necrosis was occasionally visible as speckling to the unaided eye.

Many nematodes were seen to penetrate the cortex at the junctions of lateral and tap roots. They moved through, and produced breakdown of cortical cells, and extensive necrosis throughout the whole depth of the cortex but did not enter the stele. After sixteen days the cortex of one attacked root was seen to have disintegrated, exposing the stele. Many lateral root initials were killed, before they erupted, by nematodes which had migrated through the cortex. Such symptoms were also found in maize attacked by *P. zeae* (Olowe & Corbett, 1976). Nematodes began collecting just behind some tap root tips after five days and many tap roots were seen to be necrotic and killed after twenty days. Eggs were seen inside the cortex and on the agar surface outside the root, the largest numbers of eggs were found outside the root further indicating the predominance of ectoparasitism in this host.

Table 2

Effect of *Pratylenchus fallax* on growth of excised roots of oilseed rape

Treatment		trl	ltr	lcr	mll
	0	18.6 (12)	7.4 (12)	0.40 (12)	0.66 (7)
	I	17.2 (13)	7.9 (13)	0.46 (13)	0.44 (8)
	II	14.8 (10)	5.3 (10)	0.35 (10)	0.39 (6)
S.E.D.	0 v. I	1.24	0.96	0.040	0.085
	0 v. II	1.32	1.21	0.043	0.092
	I v. II	1.30	1.01	0.042	0.089

0, I and II : initial inoculum of nil, 670 and 1 340 *P. fallax* per plant respectively.
trl : total length of root system cm.
ltr : number of lateral roots per tap root.
lcr : number of lateral roots per cm. of tap root.
mll : mean length of each lateral root cm.
( ) : number of replicates.
S.E.D. : standard error of difference.

Light initial inoculation produced an increase in numbers of lateral roots but a decrease in their length (Tab. 2). Heavy initial inoculation decreased both numbers and lengths of roots produced.

Oilseed rape occupies an uncertain position as a host for the genus *Pratylenchus* (Talatschian, 1974; Webb, 1977; Scotto la Massèse *et al.*, 1981; Scotto la Massèse, Minot & Voisin, 1981). In these experiments *P. fallax* did not reproduce well on rape roots, the population in the light inoculum test declined and in the heavy inoculum increased only slightly (mean numbers of nematodes extracted after 30 days = 457 and 1 507/dish respectively). However, the nematode severely damaged the roots of this cultivar in these *in vitro* tests, hence field crops of this rape cultivar, used in rotation, could be damaged by *P. fallax* from a preceeding cereal crop.

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REPRODUCTION OF THE NEMATODE *APHELENCHOIDES COMPOSTICOLA* ON CULTIVATED MUSHROOMS AND COMMON WEED MOULDS

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Mycophagous nematode *Aphelenchoides composticola* Franklin is an economic pest on the cultivated mushroom, *Agaricus bisporus* (Arnold & Blake, 1968). Particularly in India, *A. composticola* causes heavy losses in the commercial cultivation of *A. bisporus* (Grewal, 1989). Choleva (1973) observed that *A. composticola* also multiplies on other fungi including the species of *Fusarium* and *Sepedonium.*

This paper reports the results of an investigation conducted to study the multiplication of *A. composticola* on various cultivated mushrooms and on their common pathogenic/competitor moulds, present in the compost.

Materials and methods

NEMATODE CULTURE

Aphelenchoides composticola Franklin was cultured in glass bottles on grain spawn of the mushroom, *A. bisporus* Strain S11. The nematodes were extracted from the infested spawn using Baermann funnel technique (Hooper, 1986) in sterilized distilled water under aseptic conditions.

FUNGAL CULTURES

Cultures of all the fungi were taken from culture collection maintained in the Mycology Section at the Centre and were sub-cultured on malt-extract glucose agar (MEA) medium.

NEMATODE MULTIPLICATION ON FUNGI

Edible fungi including *Agaricus bisporus, Auricularia auricula, A. mesentrica, A. polytricha, Pleurotus citrinopileatus, P. dryinus, P. eryngii, P. flabellatus, P. florida, P. fossulatus, P. membranaceus, P. ostreatus, P. sajor-caju, P. sapidus, Pleurotus* sp. and *Stropharia rugoso-annulata,* and pathogenic/competitor moulds viz., *Aspergillus flavus, A. fumigatus, Chaetomium globosum, Fusarium solani, Gliocladium deliquescens, G. roseum, Helminthosporium tetramera, Memnoniella* sp. *Mucor pusilus, Paecilomyces* sp., *Penicillium* sp., *Rhizopus stolonifer, Sclerotium rolfsii, Trichoderma viride, Trichothecium roseum* and *Verticillium fungicola* were cultured on MEA medium in Petri plates (three plates per test fungus). Petri plates were incubated at 25 °C until the plates were fully covered by the mycelium. Nematodes

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