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INVESTIGATION ON THE ROOT LESION NEMATODE *PRATYLENCHUS THORNEI*, IN SYRIA

by
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Summary. Experiments were undertaken under field conditions in Syria, in 1983-1987, to investigate host range and chemical control of *Pratylenchus thornei*, and the reaction of chickpea lines to this nematode. The reproduction of the nematode on 24 plant species and on 97 chickpea lines was tested in an infested field in 1983-1984. Trials to control *P. thornei* by seed and soil treatments with aldicarb were established in 1983-1987. *P. thornei* reproduced well on leguminous plant species, except on grasspea, lettuce, potato, cauliflower and cereals. Very low root infestations were observed on carrot, radish, coriander, spinach and sugarbeet, while turnip, rashad, parsley and kumboz were free of nematodes. All chickpea lines were susceptible to the nematode. Soil treatments with 5-10 kg a.i. of aldicarb/ha greatly suppressed nematode root invasion and increased chickpea yield, but seed treatments were ineffective.

The root lesion nematode, *Pratylenchus thornei* Sher *et* Allen, appears to be very common in Syria where 74% of chickpea (*Cicer arietinum* L.) crops were found infested with this nematode (Greco *el al.*, 1984). It also can infest faba bean (*Vicia faba* L.), lentil (*Lens culinaris* Medic.) and alfalfa (*Medicago sativa* L.) (Greco *et al.*, 1984). In the Mediterranean region it can also infest wheat (Lamberti, 1981), where the damage is very severe especially in Israel (Orion *et al.*, 1982). However, there is little information on the host range of the nematode and on its control on food legumes. Therefore, investigations were undertaken in 1983-1987 to ascertain: i) host status for plant species of agricultural importance in the Mediterranean area; ii) reaction of some lines of chickpea; iii) chemical control.

Materials and Methods

i) *Host range*. Twenty four plant species belonging to eight botanical families (Table I), were tested in a field infested with *P. thornei* (about 300 nematodes/500 cm³ soil) at Tel Hadya (Syria). Each host plant was sown as a single row in two plots (2×0.4) m on 1 December 1983. Plots were arranged in two randomized block designs. On 15 May 1984, four roots of each plant species per plot were collected, washed free of the adhering soil and incubated for 48 hours in large jars (Young, 1954). The specimens of *P. thornei* in the water suspension were then counted.

ii) *Screening of chickpea lines*. Ninety seven lines of kabuli and desi chickpea germplasm were evaluated in a field infested with the nematode, at Tel Hadya (Table II). The population densities of the nematode, before sowing, ranged from 101 to 969/500 cm³ soil. Each chickpea line was sown as a single row in 4 plots (2×0.4) m according to a randomized block design on 1 December 1983. At the end of April 1984 four chickpea roots from each plot were incubated for 48 hours, as described before, and nematodes in the water suspension were counted.

iii) *Chemical control on chickpea*. Experiments were undertaken in 1983-1987. Two experiments were conducted in 1983-1984, one to evaluate the effect of rate and time of application of aldicarb on chickpea (Table III) and the second to assess the effect of chickpea seed treatment with aldicarb (Table IV). The population densities of *P. thornei* at sowing ranged from 150 to 760 nematodes/500 cm³ soil. The experiments undertaken in the 1984-1985 season were to evaluate the effect of aldicarb as a soil treatment at different rates and times of application, or as a seed treatment (Table V). The studies were planned on winter and spring chickpea but

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TABLE I - *Plant species tested as hosts for* Pratylenchus thornei.

Common name	Botanical name	Cultivar hybrid or line	Nematodes/5 g roots
Leguminosae:			
Chickpea	*Cicer arietinum* L.	L.C 482	156
Faba bean	*Vicia faba* L.	Local Syrian	554.5
Grasspea	*Lathyrus sativus* L.	Acc 347	0
Lentil	*Lens culinaris* Medic.	ILL 4400	366.5
Annual Medics	*Medicago rigidula* Desr.	Sel 716 Acc 811	350
Pea	*Pisum sativum* L.		1108
Vetch	*Vicia sativa* L.	Acc. 2541	440.5
Graminaceae:			
Barley	*Hordeum vulgare* L.		54
Bread wheat	*Triticum vulgare* Vill.		54
Durum wheat	*Triticum durum* Desf.		40.5
Triticale	*Triticasecale* Withmack	Driva outcross 7 Syria	21.5
Chenopodiaceae:			
Sugarbeet	*Beta vulgaris* L.		16.5
Spinach	*Spinacia oleracea* L.		11
Cruciferae:			
Cabbage	*Brassica oleracea* L.		15.5
Cauliflower	*B. oleracea* L. var. *botrytis* L.		42.5
Radish	*Raphanus sativus* L.		6.5
Rashad	*Nasturtium fontanum* Asch.	Local Syrian	0
Turnip	*Brassica rapa* L.		0
Umbelliferae:			
Carrot	*Daucus carota* L.		8
Coriander	*Coriandrum sativum* L.	Local Syrian	13
Parsley	*Petroselinum hortense* L.		0
Compositae:			
Lettuce	*Lactuca sativa* L.		103.5
Solanaceae:			
Potato	*Solanum tuberosum* L.		128
Urticaceae:			
Kumboz	*Cannabis sativa* L.		0
L.S.D. P=0.05			392.5
P=0.01			531.5

TABLE II. - *Number of* Pratylenchus thornei *found in roots of chickpea lines at Tel Hadya*

Line	Nematodes/ 5g roots	Line	Nematodes/ 5g roots	Line	Nematodes/ 5g roots	Line	Nematodes/ 5g roots
ILC 72	116	ILC 3866	208	FLIP 82-178C	157	ICC 7028	329
ILC 182	93	ILC 3868	62	FLIP 82-191C	255	ICC 8486	78
ILC 183	163	ILC 3870	162	FLIP 82-239C	166	ICC 9189	110
ILC 187	351	ILC 4421	227	FLIP 82-246C	385	ICC 9501	121
ILC 191	87	FLIP 81-41	41	FLIP 82-236	257	ICC 1881	68
ILC 195	320	FLIP 81-59	222	FLIP 82-269	191	ICC 1963	493
ILC 196	251	FLIP 81-70	163	ICC 641	32	ICC 3127	257
ILC 200	218	FLIP 81-71	362	ICC 2160	100	ICC 4835	196
ILC 201	293	FLIP 81-75	651	ICC 3932	58	ICC 8930	210
ILC 202	213	FLIP 81-293	85	ICC 4181	321	ICC 11871	82
ILC 215	348	FLIP 82-1C	325	ICC 4256	126	ICC 12023	44
ILC 484	190	FLIP 82-2C	135	ICC 4475	194	NEC 138-2	123
ILC 620	284	FLIP 82-3C	113	ICC 5035	163	CAM 66	77
ILC 629	171	FLIP 82-26C	86	ICC 5124	117	CAM 67	95
ILC 1929	105	FLIP 82-40C	267	ICC 5127	385	CAM 68	151
ILC 2380	301	FLIP 82-59C	224	ICC 5566	187	CAM 72	239
ILC 2506	214	FLIP 82-64C	367	ICC 6304	77	CAM 94	117
ILC 2956	182	FLIP 82-65C	273	ICC 6306	100	CAM 96	362
ILC 3246	110	FLIP 82-68C	420	ICC 6336	61	G 543	116
ILC 3274	193	FLIP 82-74C	113	ICC 6373	91	G 688	133
ILC 3279	140	FLIP 82-91C	155	ICC 6945	105	Sel 80 Tr50004	44
ILC 3803	106	FLIP 82-99C	183	ICC 6981	321	Pch 15	44
ILC 3856	184	FLIP 82-100C	291	ICC 6988	152	Pch 70	131
ILC 3864	232	FLIP 82-129C	117	ICC 6989	66	Pch 124	68
						ILC 482	446
L.S.D. P=0.05	271.3 N.S.						

TABLE III. - *Effect of aldicarb on population of* Pratylenchus thornei *and yield of winter chickpea at Tel Hadya in 1983-1984*

Rates (kg a.i./ha) and time of application	Nematodes/5g roots	Grain yield (kg/6.3 m²)
Control (untreated)	761.2	0.784
5 kg at sowing	16.1	0.798
5 kg at sowing + 2.5 kg at plant emergence	23.3	0.912
5 kg at sowing + 2.5 kg at plant emergence + 2.5 kg at preflowering stage	2.1	0.850
10 kg at sowing	11.2	0.852
10 kg at sowing + 5 kg at plant emergence	6.1	0.843
10 kg at sowing + 5 kg at plant emergence + 5 kg at preflowering stage	3.0	0.849
10 kg at sowing + 10 kg at plant emergence + 10 kg at preflowering stage	4.6	0.723
L.S.D. P=0.05	161.0	0.176 N.S.
P=0.01	216.8	

TABLE IV. - *Effect of seed treatments with aldicarb on* Pratylenchus thornei *and yield of winter chickpea at Tel Hadya in 1983-1984*

Treatment (g aldicarb/kg seeds)	Nematodes/5g roots	Grain yield (kg/6.3 m²)
6 g	674	0.926
3 g	477.5	0.944
Control (untreated)	536.9	0.807
LSD P=0.05	378.9 N.S.	0.160 N.S.

TABLE V. - *Effect of aldicarb on population of* Pratylenchus thornei *and yield of spring chickpea at Tel Hadya in 1984-1985*

Rates (kg a.i./ha) and time of application	Nematodes/5g roots	Grain yield (kg/6.3 m²)
5 kg at sowing + 2.5 kg at plant emergence + 2.5 kg at preflowering stage	1.7	1.058
5 kg at sowing + 5 kg at plant emergence	0	1.039
10 kg at sowing	0	1.047
Seed treatment (3g/kg seeds) + 2.5 kg at plant emergence + 2.5 kg at preflowering stage	16.7	0.827
Seed treatment (3g/kg seeds)	37.5	0.734
Control (untreated)	50	0.769
L.S.D. P=0.05	12.2	0.292 N.S.
P=0.01	16.6	

TABLE VI. - *Effect of aldicarb on population of* Pratylenchus thornei *and yield of winter and spring chickpea at Tel Hadya in 1985-1986*

Rates (kg a.i./ha) and time of application	Nematodes/5g roots		Plant weight (kg/6.3 m²)		Grain yield (kg/6.3 m²)	
	Winter	Spring	Winter	Spring	Winter	Spring
5 kg at sowing + 2.5 kg at plant emergence + 2.5 kg at preflowering stage	43.5	6.3	3.370	2.488	2.346	1.518
5 kg at sowing + 5 kg at plant emergence	7.5	20.7	3.580	2.867	2.415	1.617
10 kg at sowing	7.5	12.6	3.780	2.380	2.440	1.333
Control (untreated)	56.5	499.0	3.370	1.895	2.305	0.977
L.S.D. P=0.05	48.6 N.S.	176.2	0.460 N.S.	0.438	0.305 N.S.	0.245
P=0.01		244.0		0.607		0.339

TABLE VII. - *Effect of aldicarb on population of* Pratylenchus thornei *and yield of winter and spring chickpea at Tel Hadya in 1986-1987*

Rates (kg a.i./ha) and time of application	Nematodes/5g roots		Plant weight (kg/6.3 m²)		Grain yield (kg/6.3 m²)	
	Winter	Spring	Winter	Spring	Winter	Spring
5 kg at sowing + 5 kg at plant emergence	10.8	1.7	3.137	2.083	1.577	1.125
5 kg at sowing + 2.5 kg at plant emergence	57.0	10.3	2.833	1.823	1.422	0.967
2.5 kg at sowing + 5 kg at plant emergence	33.4	4.3	3.097	1.878	1.575	1.010
Control (untreated)	267.7	1178.8	2.600	1.215	1.307	0.640
L.S.D. P=0.05	76.1	353.7	0.251	0.258	0.123	0.143
P=0.01	105.3	489.8	0.347	0.357	0.170	0.198

unfortunately very low temperatures during the winter killed the plants. In the 1985-1986 and 1986-1987 seasons the experiments were undertaken to confirm the effect of aldicarb applied at different rates and times of application on winter and spring chickpeas (Table VI, VII). All experiments were arranged in a randomized block design with six replications. In all experiments the root samples of chickpea were collected in April and May for winter and spring chickpea, respectively, and incubated as described before. At harvest time, plant weights (seeds plus straw) and grain yields were recorded. All data were analysed by analysis of variance and the means compared by LSD's.

Results

i) *Host range. Pratylenchus thornei* reproduced well on all leguminous plants tested, except on grasspea (Table I). Very high nematode infestations were found on pea, faba bean, vetch, lentil, and annual medics. Infestations were moderate on lettuce, potato, cauliflower, and cereals, and low on carrot, radish, coriander, spinach and sugarbeet. No infestation was found on turnip, rashad, parsley and kumboz.

ii) *Reaction of chickpea lines.* All chickpea lines tested in the field were susceptible to *P. thornei* (Table II). Low infestations of the nematode, ranging from 32-58 specimens/5g roots, were observed on lines ICC 641, FLIP 81-41, Pch-15, ICC 12023, Sel 80 Tr 50004 and ICC 3932. On the remaining lines the attacks were high and in some of them up to 650 nematode/5g roots were counted.

iii) *Chemical control on chickpea.* Good control of the root lesion nematode was obtained with aldicarb in 1983-1984 (Table III). In the treated plots the nematode density in the roots was very low (2 to 23/5g roots) compared with the control plots (761/5g roots). There was no effect of seed treatment with aldicarb on the control of the nematode and on the yield of chickpea (Table IV).

Aldicarb applied at 10 kg a.i./ha on spring chickpea in 1984-1985 gave total control of nematodes and increased yields, but they were not statistically significant. In the plots with seed treatment nematode numbers were high (Table V).

Good control of *P. thornei* in 1985-1986 was obtained in plots treated with 10 kg aldicarb a.i./ha, especially on spring chickpea (Table VI). Numbers of nematodes in the roots were much reduced by treatments; infestation in the roots of control plots averaged 499/5 g roots. Higher grain yield and plant weights were obtained in the plots treated with aldicarb than in the controls (Table VI). Treatments were less effective on winter chickpea, where no yield differences were observed.

In 1986-1987 split applications of aldicarb were very effective in controlling *P. thornei* both on winter and spring chickpea: nematode populations within the roots were greatly suppressed compared to untreated plots (267.7 and 1178.8 nematode/5g roots, respectively) (Table VII).

Plant weight and seed yields significantly increased in treated plots, especially in the spring trial in which the grain yield was nearly doubled (Table VII).

Discussion and conclusion

Pratylenchus thornei can infest several mediterranean plant species especially legumes and cereals. Some crucifers (such as rashad and turnip) and parsley (*Umbelliferae*), kumboz and grasspea were not infested by the nematode. In the Mediterranean Basin the traditional rotation of legumes with cereals is not recommended in fields infested with this nematode.

Unfortunately no chickpea line is resistant to *P. thornei* and the only way to control the nematode is with nematicides. Aldicarb can be effective against *P. thornei*, but it is expensive and also can cause environmental pollution. In our experiments treating chickpea seeds with aldicarb did not control the nematode although satisfactory control in the glasshouse was reported in India (Walia, 1985).

We thank Mr. S. Hajjar for technical assistance.

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Accepted for publication on 26 March 1988.