*Istituto di Nematologia Agraria, C.N.R. - 70126 Bari, Italy and
** International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria

PATHOGENICITY OF *PRATYLENCHUS THORNEI* ON CHICKPEA IN SYRIA

by
M. Di Vito*, N. Greco* and M. C. Saxena**

Summary. A field experiment was conducted in Syria in 1988 to relate yield of chickpea to soil population densities of the root-lesion nematode, *Pratylenchus thornei*. The field, infested with 0 to 32 nematodes/cm ^{3} soil, was divided in 100 plots of 6.75 m ^{2} each and sown to chickpea on 1 March, 1988. The nematode density in the soil of each plot was determined before sowing and after harvest. In mid April, nematodes were counted in the chickpea roots and root necrosis was assessed. There was a negative correlation between nematode densities at sowing and yield of chickpea. It is estimated that a threshold limit is 0.031 nematodes/cm ^{3} soil and a maximum yield loss of 58% occurs at 2 nematodes/cm ^{3} soil. Numbers of *P. thornei*/g roots were positively correlated with root necrosis index.

The root-lesion nematodes, *Pratylenchus* spp. and *Pratylenchoides* spp., are probably the most widespread nematodes in such legume crops as chickpea (*Cicer arietinum* L.), faba bean (*Vicia faba* L.), lentil (*Lens culinaris* Medic.), and alfalfa (*Medicago sativa* L.), in the Mediterranean basin (Greco *et al.*, 1988). *Pratylenchus thornei* Sher *et* Allen is the commonest root-lesion nematode in Syria, where it causes severe yield decline especially in chickpea (Greco *et al.*, 1984).

Walia and Seshadri (1985) reported significant growth reduction of chickpea in soil infested with 0.1 specimen of *P. thornei*/g soil under greenhouse condition. However, as there is no information on the relationship between population densities of *P. thornei* at sowing and yield of chickpea under field condition, a field experiment was undertaken in Syria in 1988.

Materials and methods

A field naturally infested with *P. thornei* at the ICARDA main station (Tel Hadya, Syria) was divided in to 100 plots of 6.75 m ^{2} (3 x 2.25 m) each. Ten plots were treated with 5 kg a.i. aldicarb/ha before sowing and 5 kg/ha at plant emergence and served as non-infested control plots. Soil samples were collected from each plot before sowing. Each sample was a composite of 40 cores of 1.5 cm diameter and 30 cm deep, from which nematodes were extracted from 500 cm ^{3} soil aliquots by the centrifuge method (Coolen, 1979).

Five rows of chickpea cv. Ghab 1 per plot were sown on 1 March 1988. Biological (straw plus grain) and grain yields of chickpea from each plot were weighed on 10 June 1988. Four chickpea plants from the central row of each plot were also collected on 6 May 1988. Root samples were washed free of adhering soil, weighed, rated and incubated for 48 hours in large jars (Young, 1954) at room temperature. The nematodes in the water suspension were then counted.

Plots with similar nematode densities at planting were grouped (Fig. 1) and the average yield of each group was expressed as the ratio of the average yield obtained in the plots treated with aldicarb, whose chickpea roots were practically free of nematodes. These ratios, considered as relative yields, were then fitted to curves according to the Seinhorst's equation (Seinhorst, 1965; 1986).

Results and discussion

The environmental conditions during the course of the experiment were suitable both for chickpea growth and nematode reproduction. Chickpea plants in non-treated plots showed varying degrees of growth reduction compared with the treated control. The reductions were negatively correlated with nematode soil population densities in the plots. A tolerance limit of chickpea to *P. thornei* of 0.031 specimens/cm ^{3} soil for grain yield was derived by fitting the data to the curves of the equation $y = m + (1 - m)\, z^{P-T}$ (Seinhorst, 1965; 1986), in which y = the relative yield, with $y = 1$ for $P \leqslant T$; m = minimum relative yield (that at the largest P); P = nematode population density at sowing, expressed as specimens/cm ^{3} soil; T = tolerance limit of P above which yield loss occurs; z = a constant with $z^{-T} = 1.05$. The tolerance limit was also estimated by fitting the equation to the data of shoot dry weights. Minimum relative yield (m) was 0.42 both for grain and shoot weight at nematode densities $\geqslant$ 2 specimens/cm ^{3} soil.

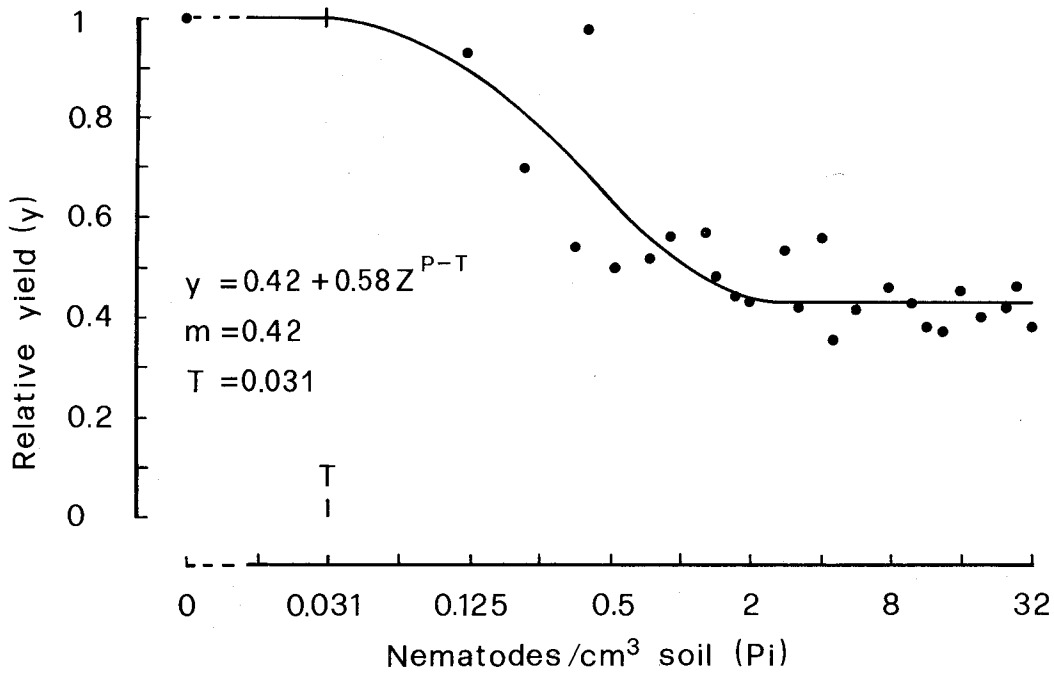

Fig. 1 - Relationship between soil population densities of *Pratylenchus thornei* before sowing (*Pi*) and relative yield (*y*) of spring sown cv. Ghab 1 chickpea, in Syria, in 1988..

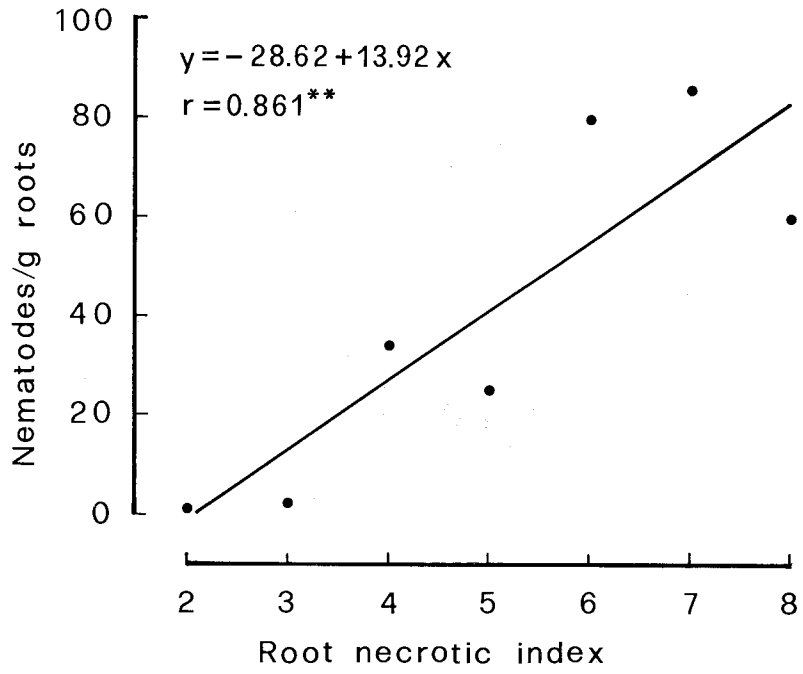

Fig. 2 - Relationship between necrotic index of chickpea roots and numbers of *Pratylenchus thornei* specimens within roots.

Roots of chickpea in non-treated plots showed different degrees of necrosis, which were significantly ($P \leq 0.01$) and positively correlated with numbers of *P. thornei*/g chickpea roots observed on 6 May (Fig. 2).

Attempts to relate nematode soil population densities at sowing with numbers of nematodes within chickpea roots on May 6, failed probably because the growth of chickpea was equally suppressed at nematode densities ≥ 2 specimens/cm^3 soil.

Our investigation confirmed that *P. thornei* is highly damaging to chickpea. However, the tolerance limit of chickpea to the nematode (0.031 specimen/cm^3 soil) in our experiment is much smaller than that observed in a greenhouse (about 0.1 specimen/g soil) in India (Walia and Seshadri, 1982). This difference could be due to different environmental conditions. Several pathogens of chickpea, other than nematodes, usually occur in the field and then pathogenicity is enhanced by the nematodes feeding on the roots. Moreover, under the dry wheather conditions of Syria, chickpea infested with *P. thornei* may have also suffered water stress which probably would not occur in the greenhouse.

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TABLE I - *Effect of infestation severity of* Pratylenchus thornei *on number of nematodes in the roots and yield of cv. Ghab 1 chickpea, in Syria, in 1988*

Root infestation (scale 0-9*)	Number of nematodes/g roots	Yield (g/6.75 m^2)	
		Whole shoot	Grain
2	1.0	2,431	1,348
3	1.7	2,514	1,433
4	34.2	1,039	508
5	24.8	1,292	654
6	79.8	1,179	592
7	85.7	1,151	552
8	59.7	1,426	712

* 0 = no necrosis; and 9 = 100% necrosis.

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