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EFFECT OF *PRATYLENCHUS NEGLECTUS* AND *P. THORNEI* ON THE GROWTH OF FABA BEAN

by

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Summary. An experiment was undertaken to investigate the effect of a range of inoculum densities of Italian populations of *Pratylenchus neglectus* and *P. thornei* on the growth of faba bean (*Vicia faba*) in pots. Clay pots of 1 l capacity were filled with steam sterilized sandy soil and sown with a single pregerminated seed of faba bean cv. Aguadulce. At plant emergence a suspension of either nematode species, juveniles and adults, was poured into six holes around the seedling roots to give initial population densities of 0, 0.03, 0.06, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128 or 256 nematodes/cm^3 soil. Data of fresh top weight of plants fitted the Seinhorst model $y = m + (1-m)z^{P-T}$. According to this model, tolerance limits (T) of faba bean to *P. neglectus* and *P. thornei* were 2 and 2.2 nematodes/cm^3 soil, respectively. Minimum relative yields (m) of faba bean were 0.4 and 0.6 for fresh top plant weight for *P. neglectus* and *P. thornei*, respectively, and occurred at $Pi \geq 128$ specimens/cm^3 soil. Maximum reproduction rates (Pf/Pi) were 18.3 and 3.3-fold, at lowest Pi, for *P. neglectus* and *P. thornei*, respectively.

Faba bean (*Vicia faba*), a subtropical or temperate crop grown in the Mediterranean during the cool season, has been found associated with various plant parasitic nematodes of which the economic importance is known of only a few. The root-lesion nematodes, *Pratylenchus neglectus* and *P. thornei*, are the most common nematodes on faba bean and on other legumes in Italy, North Africa and Middle East (Greco *et al.*, 1992; Greco and Di Vito, 1994; Di Vito *et al.*, 1994a; 1994b) and cause extensive necrosis on the roots with consequent crop losses. However, the economic impact of these two nematodes species on faba bean has never been determined. Therefore, an experiment was undertaken in a glasshouse to assess the effect of Italian populations of *P. neglectus* and *P. thornei* on the growth of faba bean and on the dynamics of nematode populations on this plant species.

Materials and methods

The experiment was conducted in pots using a population of *P. neglectus* (Rensch) Filipjev *et* Schuurmans Stekhoven collected from a durum wheat field at Cerignola (Italy) and a population of *P. thornei* Sher *et* Allen from a field of faba bean at San Ferdinando di Puglia (Italy). Large populations of the two nematode species were separately reared on carrot disks maintained in a growth chamber at 22±2 °C for three months. The nematodes were extracted from the carrot disks by incubation for 48 hours (Young, 1954); they were collected twice a day.

Two groups of ninety clay pots of 1 l capacity, filled with steam sterilized sandy soil (sand 89.1%, silt 3.9%, clay 7% and organic matter 2%), were sown with a single pregerminated seed of faba bean (*Vicia faba* L.) cv. Aguadulce.

At plant emergence juveniles and adults of either *P. neglectus* or *P. thornei* were poured into six holes around the seedling roots, to give a geometric series of inocula of 0, 0.03, 0.06, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128 or 256 nematodes/cm^3 soil. The pots were arranged in a randomized block design comprising six replications per inoculum level and nematode species on benches in a glasshouse kept at 22±2 °C.

Eighty days later the plants were removed from the pots and top and roots were weighed separately. Data on fresh top weight were fitted according to the Seinhorst's model $y = m + (1 - m)z^{P-T}$ (Seinhorst, 1965; 1979), where y = the ratio between the yield (fresh top weight of plants) at Pi and that at $P \geq T$, m = minimum relative yield (y at very large Pi), z = a constant <1 with $z^{-T} = 1.05$, T = the tolerance limit (Pi up to which no yield is lost), Pi = population density of the nematodes at sowing.

Nematodes were extracted from each root system and from each pot soil by Coolen's (1979) method.

Results and discussion

The environmental conditions during the course of the experiment were suitable both for faba bean growth and nematode reproduction. Plant growth was greatly affected by the nematodes and stunting and yellowing were evident twenty days after sowing at $Pi \geq 128$ individuals/cm^3 soil for both nematode species; with lower population densities growth suppression was delayed.

Data of fresh top weight of the plants were consistent with Seinhorst's model and tolerance limits (T) to *P. neglectus* and *P. thornei* of 2 and 2.2 juveniles and adults/cm^3 soil, respectively, were derived by fitting the data to this model (Fig. 1). Minimum relative yields (m) were 0.4 and 0.6 at inoculum level $Pi \geq 128$ juveniles and adults/cm^3 soil with *P. neglectus* and *P. thornei*, respectively.

The largest final population densities (Pf) of *P. neglectus* and *P. thornei* were 28.3 and 17.9 specimens/cm^3, respectively, and occurred at $Pi = 128$ juveniles and adults/cm^3 soil (Fig. 2). The maximum reproduction rates (Pf/Pi) of *P. neglectus* and *P. thornei* were 18.3 and 3.3-fold at the lowest initial population density (Pi) and decreased with increasing initial population densities (Fig. 2).

The experiment demonstrates the destructive effect of the two species of root-lesion nematodes on faba bean. The tolerance limits of this crop plant to both nematode species are rather low, although, the tolerance limits of chickpea to a Syrian population of *P. thornei* (Di Vito *et al.*, 1992) has been shown to be much lower (0.031 specimen/cm^3 soil). Such a difference could be attributed to a higher susceptibility of chickpea to the nematode, to different environmental conditions (a glasshouse for this experiment and the field in Syria) and/or to different geographical origins, and aggressiveness of the nematode populations.

The maximum reproduction rate of *p. neglectus* (18.3) was greater than that of *P. thornei* (3.3), and the same trend was observed in final population densities of the two nematodes. Moreover, although the difference of the minimum yield was remarkable, 0.4 for *P. neglectus* and 0.6 for *P. thornei*, this would suggest that the faba bean cultivar used in our experiment is more susceptible to *P. neglectus* than to *P. thornei*. This finding should be considered when suggesting crop sequences to control these nematodes.

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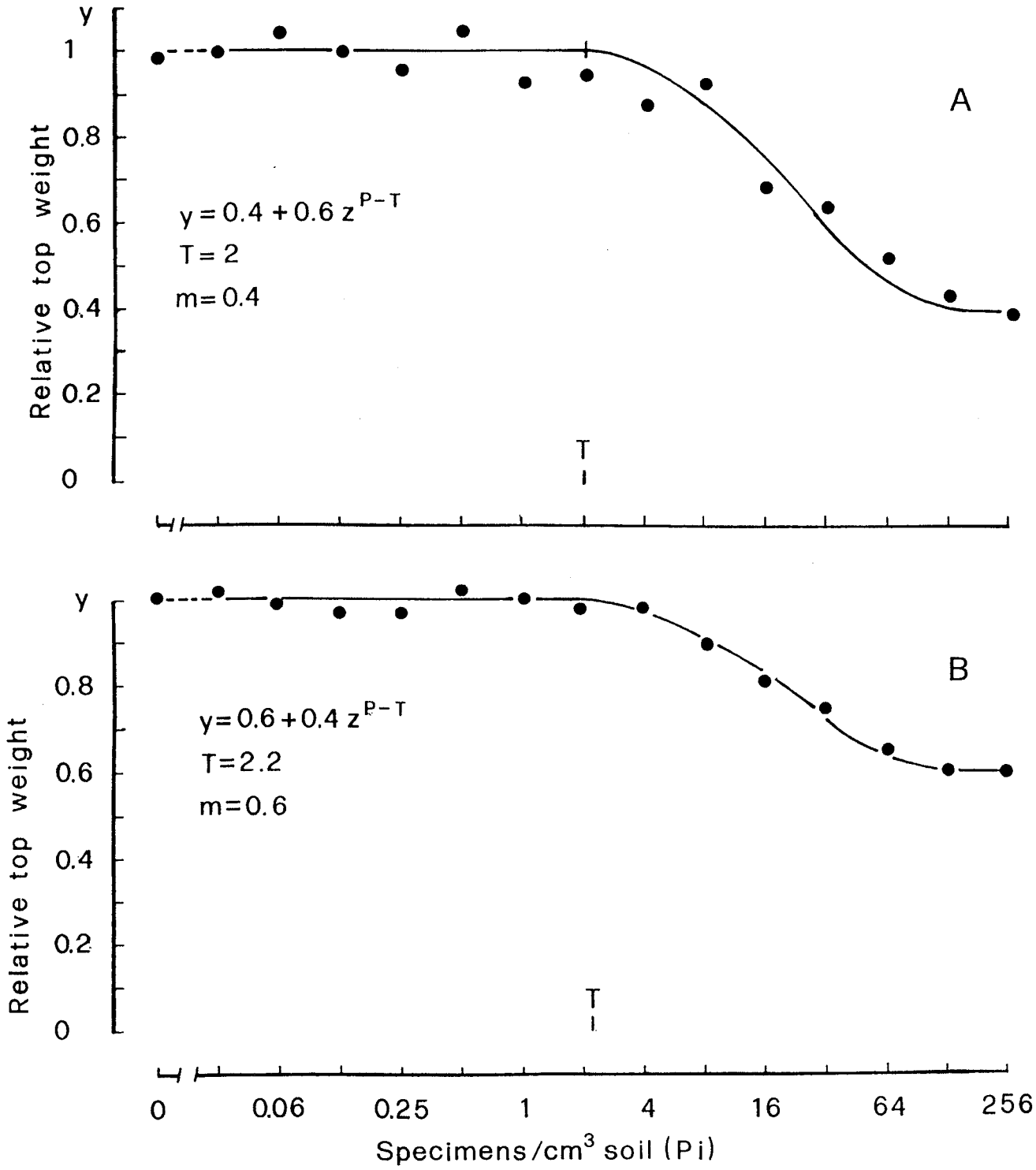

Fig. 1 - Relationship between initial population densities (*Pi*) of *Pratylenchus neglectus* (A) and *P. thornei* (B) and relative fresh top weight (*y*) of faba bean grown in a glasshouse.

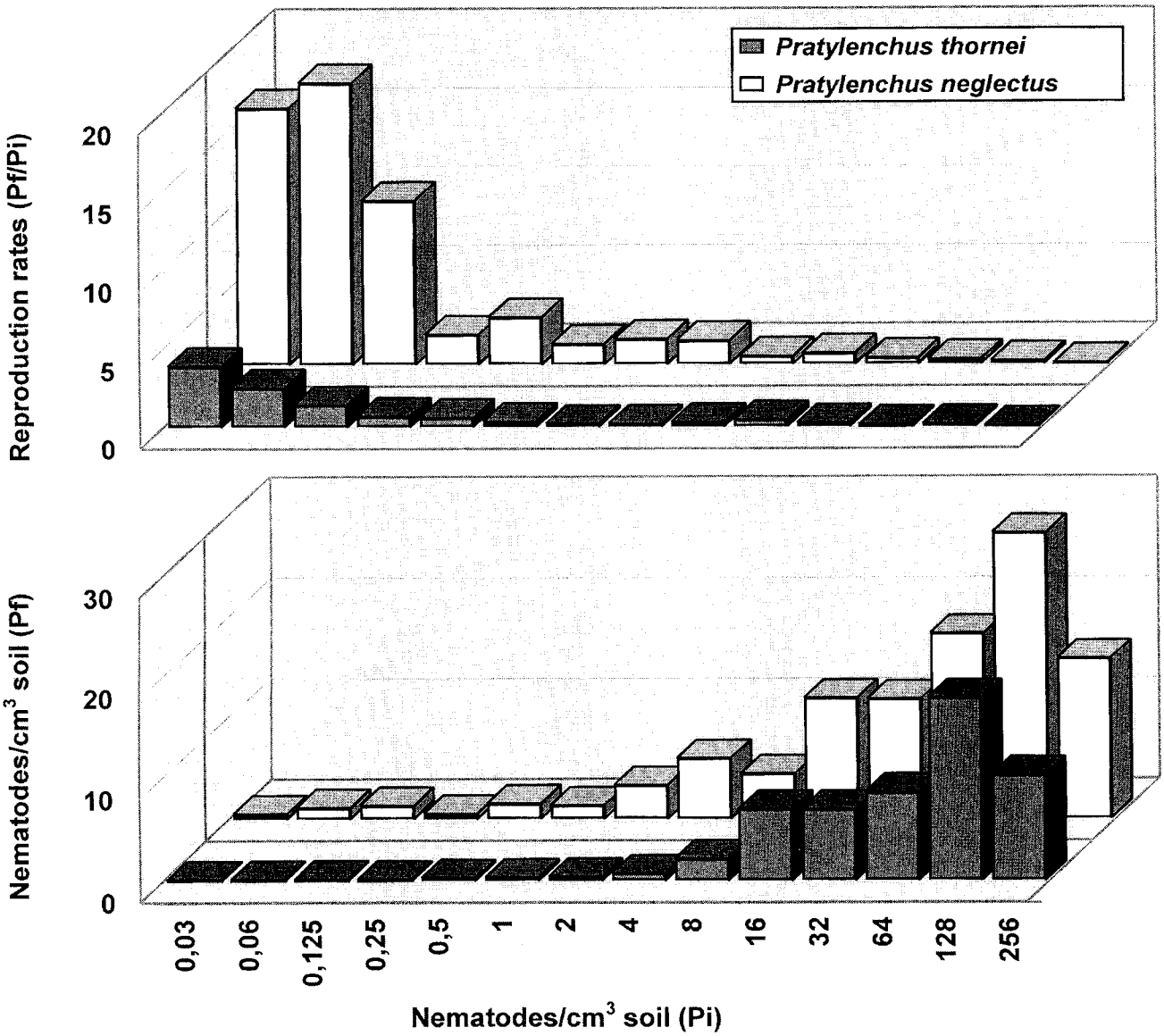

Fig. 2 - Effect of different population densities of *P. neglectus* and *P. thornei* at sowing (*Pi*) of faba bean on final population densities (*Pf*) and reproduction rates (*Pf/Pi*).

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