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POPULATION DENSITIES OF *MELOIDOGYNE INCOGNITA* AND GROWTH OF SUSCEPTIBLE AND RESISTANT PEPPER PLANTS

by
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The root-knot nematode *Meloidogyne incognita* (Kofoid *et* White) Chitw. occurs in almost all vegetable-growing areas of Italy where it causes severe damage to sweet pepper (*Capsicum annuum* L.) (Lamberti, 1975; Di Vito and Lamberti, 1980).

Microplot experiments have shown that nematode densities larger than 0.165 eggs and juveniles/cm^3 soil greatly reduce the growth of sweet pepper in Italy (Di Vito *et al.*, 1985). Remarkable yield losses were also observed in the United States when population densities were above 0.1-1 egg/cm^3 soil (Lindsey and Clayshulte, 1982; Thomas and Ryder-White, 1982). However the use of resistant pepper cultivars could provide effective, safe and cheap control of root-knot nematodes (Di Vito and Saccardo, 1982). Therefore, a glasshouse experiment was undertaken to investigate the effect of population densities of *M. incognita* on the growth of susceptible and resistant pepper cultivars, and on population changes of the nematode.

Materials and Methods

Two series of 104 clay pots were filled with 600 cm^3 of steam sterilized sandy soil (sand 89.1%, clay 7%, silt 3.9% and organic matter 2.3%), and inoculated in a geometric progression with a local population of *M. incognita* race 1 (Taylor and Sasser, 1978). A pure culture of the nematode was reared on pepper cv. Yolo Wonder in a glasshouse at 24-28°C. When large egg masses were produced, infested roots were finely chopped,

mixed, and 10 subsamples of 10g each were processed by the sodium hypochlorite method (Hussey and Barker, 1973) to estimate the number of available eggs and juveniles of the nematode. The roots were then thoroughly mixed in a known quantity of steam sterilized soil, and aliquots of this were added to sterilized soil in the pots to give a range of increasing population densities of 0, 0.125, 0.25, 0.5, 1, 2, ... 128 and 256 eggs and juveniles/cm^3 soil. Each pot was planted on 22 January 1986 with a 45 day old seedling of either the susceptible cv. Yolo Wonder or the resistant inbred line 85558 of the Istituto di Nematologia agraria. There were eight replicates of each inoculum level and each pepper genotype. Pots were arranged in a randomized block design on benches in a glasshouse maintained at 24-28°C, and watered daily. Fifty days after transplanting, the harvested top of each plant was weighed, and the numbers of eggs and juveniles of the nematode both in the soil and on the roots were estimated by Coolen's (1979) modified method (Di Vito *et al.*, 1985) or the sodium hypochlorite method (Hussey and Barker, 1973).

Fig. 1 - Effect of increasing population densities (from left to right) of *Meloidogyne incognita* on the growth of the susceptible «Yolo Wonder» pepper (above) and of the resistant «line 85558» (below), fifty days after transplanting.

Results and Discussion

The effect of *M. incognita* on the growth of the susceptible pepper cv. Yolo Wonder was very evident at population densities ≥ 4 eggs and juveniles/cm³ soil. Population densities ≥ 32 resulted in very stunted growth with only few true leaves (Fig. 1). However, the resistant pepper line 85558 showed negligible growth reduction even at large population densities (Fig. 1).

The relation between initial population densities (*Pi*) of *M. incognita* and relative weight of above ground parts of Yolo Wonder and line 85558 plants (Fig. 2) agreed with the equation $y=m+(1-m)\ z^{P-T}$ (Seinhorst, 1965), where y=the ratio between the weight of the plants at P and that at $P \leq T$; m=the minimum relative yield; P=the initial population density; T=the tolerance limit, for $P \geq T$ and $y=1$ for $P \leq T$; and z=constant with $z^{-T}=1.05$. The tolerance limit (T) of 0.74 eggs and juveniles/cm³ soil for both the susceptible cultivar and resistant line and minimum relative yields (m) of 0.1 for the susceptible cv. Yolo Wonder and of 0.4 for the resistant line 85558, were derived by fitting the data to the above equation. Nematode populations in the pots planted with Yolo Wonder pepper

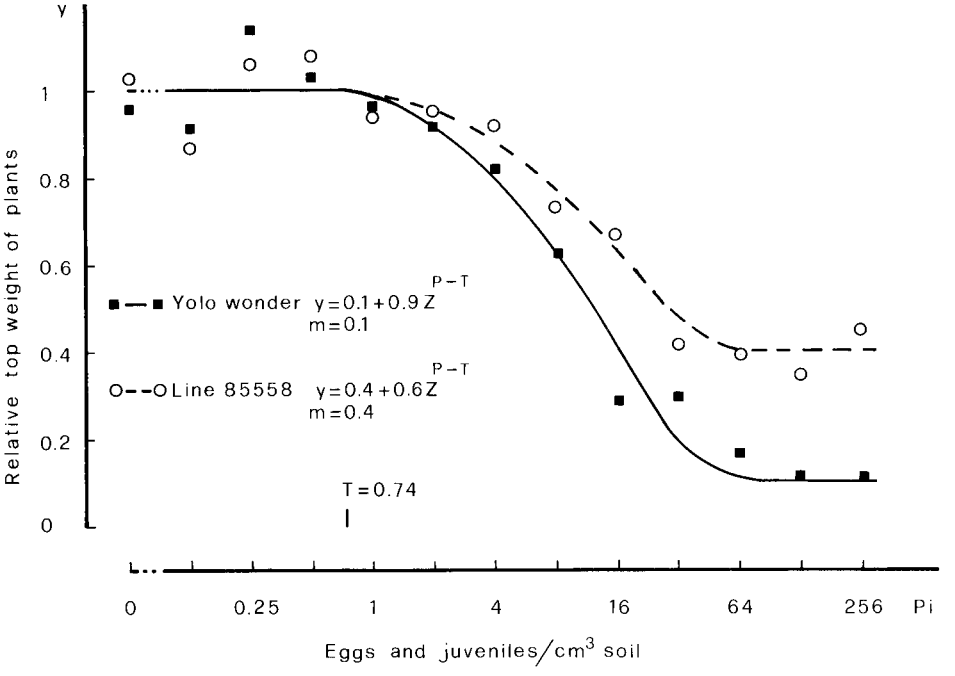

Fig. 2 - Relation between initial population densities (*Pi*) of *Meloidogyne incognita* race 1 at transplanting and relative top weight (y) of susceptible (Yolo Wonder) and resistant (Line 85558) pepper.

Table I - *Population changes of* Meloidogyne incognita *race 1 in pots planted with the susceptible «Yolo Wonder» and the resistant «Line 85558» pepper.*

Eggs and juveniles/cm³ soil			Multiplication rate (Pf/Pi)	
Pi	Pf		Yolo Wonder	Line 85558
	Yolo Wonder	Line 85558		
0.125	8.4	0	67.2	0
0.25	4.9	0	19.6	0
0.5	1.1	0.1	2.2	0.2
1	28	0.1	28	0.1
2	27.1	1	13.5	0.5
4	32.9	0.9	8.2	0.2
8	55.7	1.3	7	0.2
16	56.5	5.2	3.5	0.3
32	71.6	6.2	2.2	0.2
64	101	1.7	1.6	0.02
128	75.6	9.1	0.6	0.1
256	49.6	8.7	0.2	0.03

increased in soil infested with ≤ 64 eggs and juveniles/cm³, but declined in the pots with higher initial population densities and in all those transplanted with line 85558 (Table I).

The tolerance limit obtained in this experiment was the same for both susceptible and resistant peppers and was close to that of 0.165 found in microplots (Di Vito *et al.*, 1985). The minimum relative yield (*m*) of the resistant pepper line was larger than that of the susceptible Yolo Wonder pepper.

The decline of nematode populations in pots infested with high inoculum density and planted with cv. Yolo Wonder, may have been due to a shortage of food supply for the nematode because of the poor growth of pepper following the nematode attack. In the pots planted with the line 85558, most of the juveniles which had penetrated the pepper roots were unable to complete their development because of the plant reaction and therefore the nematode population declined drastically.

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SUMMARY

The relationship between initial population densities of *Meloidogyne incognita* (Kofoid *et* White) Chitw. race 1 and growth of susceptible (Yolo Wonder) and resistant (Line 85558) pepper (*Capsicum annuum* L.) was studied in a glasshouse at 24-28°C. Fortyfive day-old seedlings were transplanted in clay pots containing 600 cm^3 of steam sterilized sandy soil artificially infested with 0, 0.125, 0.25, 0.5, 1, 2, ... 128 and 256 eggs and juveniles of the nematodes/cm^3. Results agree with the equation $y = m + (1-m)\, z^{P-T}$ and suggest a tolerance limit of 0.74 eggs and juveniles/cm^3 soil for both pepper genotypes. Minimum relative yields were 0.1 and 0.4 for «Yolo Wonder» and «Line 85558», respectively. Final population densities of *M. incognita* increased in pots with low initial densities and planted with the susceptible cultivar, but declined in those with high inoculum levels planted with «Yolo Wonder», and at all initial population densities with «Line 85558».

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