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RELATIONSHIP BETWEEN POPULATION DENSITIES OF *MELOIDOGYNE INCOGNITA* AND GROWTH OF RESISTANT AND SUSCEPTIBLE TOMATO

by
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Yields of tomato (*Lycopersicon esculentum* Mill.) are greatly reduced by infestations of *Meloidogyne incognita* (Kofoid *et* White) Chitw., in southern Italy, especially in sandy soils (Di Vito, 1979). Investigations done under field condition in Apulia, established a tolerance limit to *M. incognita* of 4 eggs/ml soil for a susceptible tomato cultivar (Chico III) and a minimum relative yield of *0* (Di Vito *et al.*, 1981). Similar results were obtained by Barker *et al.* (1980) in U.S.A. Nevertheless, there is little information on the relationship between population densities of *Meloidogyne* spp. at sowing or transplanting and yield of resistant tomato cultivars. Therefore, a glasshouse experiment was undertaken to study the effect of population densities of *M. incognita* on the growth of a susceptible and a resistant tomato cultivar.

Materials and Methods

Two groups of 12 cm diam clay pots were filled with 650 ml of a steam sterilized sandy soil (sand 89.1%; clay 7%; silt 3.9% and organic matter 2.3%), and inoculated with a local population of *M. incognita* race 1 at increasing population densities according to

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a geometric series (0, 0.125, 0.25, 0.5, 1, 2, ... 512 eggs and juveniles/ml soil). The nematode population had been reared on tomato cv « Rutgers » and the inoculum, obtained with the sodium hypochlorite method (Hussey and Barker, 1973) was thoroughly mixed into the soil. A single 30 day old seedling of either the susceptible cv « Roma VF » or the resistant line « IAS-1 » of the Istituto di Agronomia of Sassari University, was transplanted in each pot on April 4, 1982. To provide information on the natural decline of the nematode population 10 pots were inoculated with 96 eggs and juveniles/ml soil and left without plants. All pots were then arranged in a randomized block design on benches in a glass-house, maintained at 24-27°C, providing ten replicates per inoculum level of each cultivar. The pots were watered daily. At the end of the experiment, June 15, 1982, the top of each plant was weighed and the eggs and juveniles of the nematode in the soil and in the egg masses on the tomato roots determined by the method of Coolen (1979) or that of sodium hypochlorite, respectively.

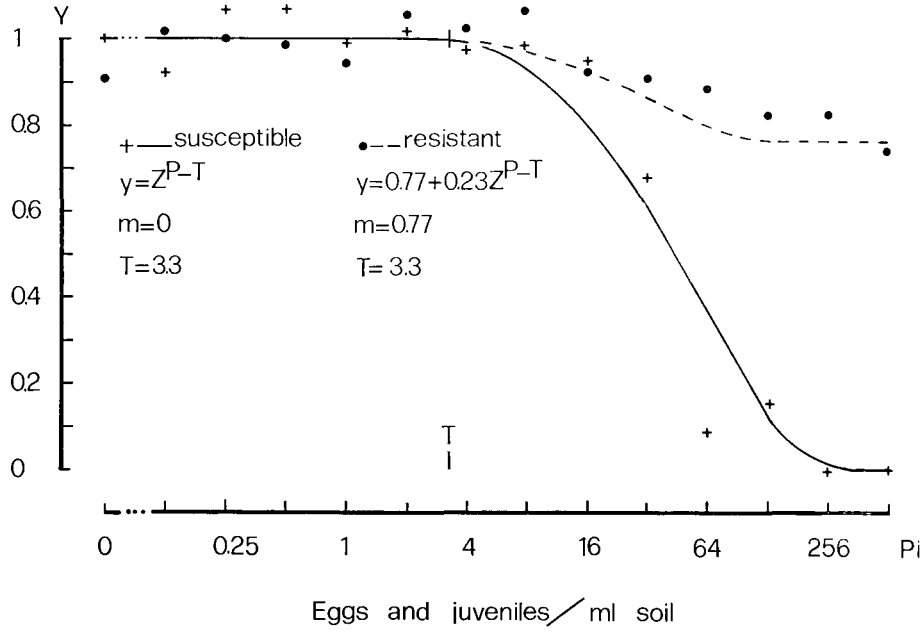

Fig. 1 - Relationship between initial population densities (*Pi*) of *Meloidogyne incognita* at transplanting and relative weight of the top (*y*) of susceptible cv « Roma VF » (+ ——) and resistant line « IAS-1 » (· ——) of tomato.

Results and Discussion

Meloidogyne incognita severely affected the growth of « Roma VF ». Six and seven plants of the above cultivar died after four weeks in pots inoculated with 64 and 128 eggs and juveniles/ml soil, respectively, and all the plants died after 3 weeks with inoculum densities of $\geq$ 256 eggs and juveniles/ml soil. The pots planted with the resistant line « IAS-1 » showed negligible reduction of growth even at large inoculum levels. Figure 1 reports the relation between initial population densities (*Pi*) of *M. incognita* and weights of above-ground parts of « Roma VF » and « IAS-1 ». Data fit the equation $y = m + (1 - m)\ z^{P-T}$ (Seinhorst, 1965), (where y = the ratio between the weight of the plants at P and 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 $z^{-T} = 1.05$) and suggest a tolerance limit (T) of 3.3 eggs and juveniles/ml soil and a minimum relative yield (m) of *0* and 0.77 (77% of the yield at $P \leq T$), respectively, for « Roma VF » and « IAS-1 ».

Nematode numbers increased in pots inoculated with $\leq$ 128 or $\leq$ 2 eggs and juveniles/ml soil and planted with « Roma VF » and « IAS-1 », respectively, and declined in pots with larger initial population densities (Table I).

Table I - *Population changes of* Meloidogyne incognita *on susceptible « Roma VF » and resistant « IAS-1 » of tomato.*

Eggs and juveniles/ml soil			Multiplication rate (*Pf*/*Pi*)	
At transplanting (*Pi*)	After harvest (*Pf*)			
	« Roma VF »	« IAS-1 »	« Roma VF »	« IAS-1 »
0.125	24.1	0.3	192.8	2.4
0.25	36.3	0.5	145.2	2
0.5	54.1	0.5	108.2	1
1	472.8	2.5	472.8	2.5
2	601.1	2.7	300.5	1.3
4	1381	1.1	345.2	0.27
8	2791.8	0.7	348.9	0.08
16	2452.4	1.8	153.2	0.11
32	3091.6	2	96.6	0.06
64	1149.5	9.1	17.9	0.14
128	973.4	7.8	7.6	0.06
256	35.4	24	0.1	0.09
512	27.7	29	0.05	0.05
96 (without plants)	0.85	0.85		

The tolerance limit to *M. incognita* and the minimum relative yield of « Roma VF » were very close to those obtained in microplots (Di Vito *et al.*, 1981). The root-knot nematode resistant line « IAS-1 » showed promise where the initial population density was in the range 8-32 eggs and juveniles/ml soil, which are the most frequent infestation levels found in the field, and confirmed results obtained under field conditions (Di Vito and Carella, 1979).

The decline of nematode populations in pots with a large inoculum, and with « Roma VF », may have been due to a lack of food because of poor growth of the plants following the nematode attack. In the pots with « IAS-1 », most of the juveniles which had penetrated the roots were unable to complete their development because of the plant reaction and, therefore, nematode numbers declined.

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SUMMARY

To investigate the relationship between population densities of *Meloidogyne incognita* (Kofoid *et* White) Chitw. race 1 and growth of tomato (*Lycopersicon esculentum* Mill.) a glasshouse experiment was undertaken at 24-27 °C using susceptible (Roma VF) and resistant (line IAS-1) tomato plants. Seedlings were planted in clay pots, containing 650 ml of steam sterilized sandy soil, inoculated with 0, 0.125, 0.25, 0.5, 1, 2, ... 256 and 512 eggs and juveniles/ml soil. Results agree with the equation $y = m + (1 - m)\, z^{P-T}$ and suggest tolerance limit of 3.3 eggs and juveniles/ml soil for « Roma VF » and « IAS-1 ». Minimum relative yield was *0* for « Roma VF » and 0.77 for « IAS-1 ». Final nematode population densities were low with a large initial population density with « Roma VF », and at all initial densities with « IAS-1 ». Nematode reproduction occurred at low initial densities only on « Roma VF ».

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