Influence of *Meloidogyne incognita* on Growth of Corn in Pots

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ABSTRACT

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The influence of *Meloidogyne incognita* on growth of a corn (*Zea mays*) hybrid was studied in pots that contained different nematode densities and were maintained at 24–26 C for 75 days. The relation between fresh weight of tops and initial nematode density suggested a tolerance limit of 10 eggs per gram of soil under the experimental conditions.

Corn (*Zea mays* L.) is commonly used in several countries in crop rotation for control of *Meloidogyne* spp. In southern Italy this plant has been introduced into the biological control program of root-knot nematodes on tobacco (*Nicotiana tabacum* L.) (3). Failure to decrease *Meloidogyne* population densities with corn hybrids has been reported in the United States (1) and also in southern Italy, where a heavy infestation of race 1 of *Meloidogyne incognita* (Kofoid & White) Chitwood on corn hybrid Dekalb-XL-41 has been observed in Apulia. Nematode-infested plants had poor growth and root systems with blunt lateral roots (Fig. 1) that resembled stubby-root of corn infested by *Paratrichodorus minor*. According to Barker and Olthof (2), the threshold density of *M. incognita* above which corn growth is retarded is more than four eggs per cubic centimeter of soil. The objective of our investigation was to ascertain the relation between corn top growth and initial density of an Italian population of *M. incognita* and to confirm experimentally the tolerance limit suggested by Barker and Olthof.

MATERIALS AND METHODS

Clay pots containing 500 g of steam-pasteurized sandy loam were inoculated with a geometric series of eggs of *M. incognita* race 1 (0 and 0.5, 1, 2, 4, ... 1,024 eggs per gram of soil). The eggs were obtained from nematode-infested tomato (*Lycopersicon esculentum* Mill. 'Roma') roots, by shaking them in jars in a 1% aqueous solution of sodium hypochlorite (4). The inoculum, in water suspension, was poured evenly onto the soil of each pot, and a seed of corn hybrid

Table 1. Population changes of *Meloidogyne incognita* on corn hybrid Dekalb-XL-41

Eggs per gram of soil		Rate of reproduction (P_f/P_i)
At sowing (P_i)	After harvest (P_f)	
0.5	229	458
1	264	264
2	184	92
4	442	111
8	592	74
16	939	59
32	1,162	36
64	1,016	16
128	1,303	10
256	1,138	4
512	875	2
1,024	1,075	1
8 (without plants)	7	

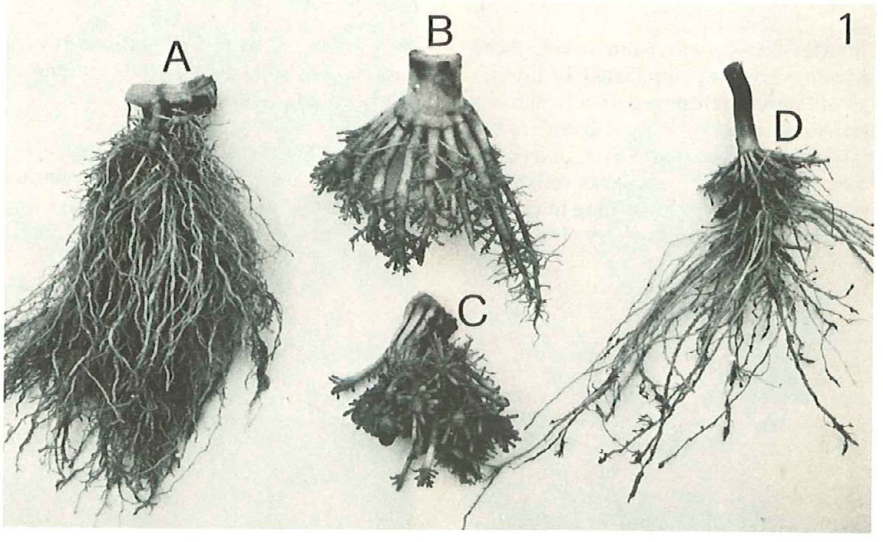

Fig. 1. Effects of *Meloidogyne incognita* race 1 infestations on root systems of corn hybrid Dekalb-XL-41. Root system **(B and C)** with deformed and blunt lateral roots, **(D)** with swollen root tips, and **(A)** uninfested.

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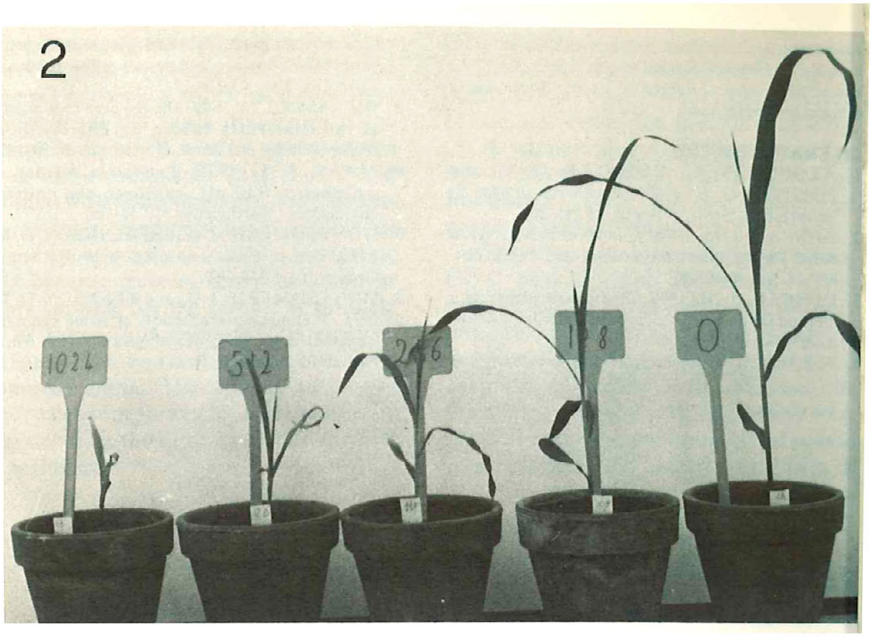

Fig. 2. Effect of increasing densities (right to left) of *M. incognita* on the growth of corn hybrid Dekalb-XL-41.

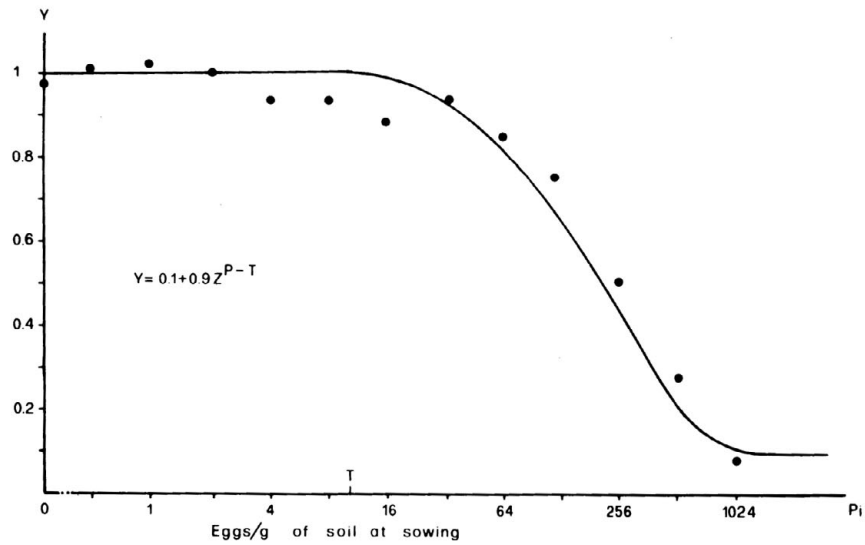

Fig. 3. Relation between initial density of *M. incognita* and weight of the tops of corn plants.

Dekalb-XL-41 was then sown. Each inoculum level was replicated 10 times.

Pots were randomized on a bench in a glasshouse, at 24–26 C, and given normal maintenance. The plants were harvested 75 days after sowing and fresh weights of tops recorded. Eggs remaining in the soil of each pot after partial decay of the roots were extracted by centrifugation (6) with sodium hypochlorite (4), and the number per pot was calculated.

RESULTS AND DISCUSSION

Figures 2 and 3 indicate the relation between the yield of corn seedlings and intitial nematode densities. The curve (Fig. 3) expresses the relation between weights of tops of corn seedlings and numbers of eggs per gram of soil at sowing and fits the equation $y = m + (1 - m)Z^{P-T}$ (where y = yield, m = relative minimum yield, P = initial nematode density, and T = tolerance limit [5]). The curve for $P \geq T$ and $y = 1$ for $P \leq T$ and $Z^{-T} = 1.05$ suggests a tolerance limit of corn to *M. incognita* of about 10 eggs per gram of soil (Fig. 3). The value of m was very low, with a growth reduction of 90% compared with uninoculated plants.

The number of eggs per gram of soil for each inoculum level at the end of the experiment is given in Table 1. The greatest increase in number of eggs (× 459) was obtained in pots inoculated with the lowest nematode density. In pots containing infested soil, without plants, there was little mortality of eggs, suggesting that the tolerance limit of 10 eggs per gram found in experimental conditions is close to or a little less than that in field situations. This value is close to that of four or more eggs per cubic centimeter of soil suggested previously (2).

The results of this experiment indicate that the corn hybrid Dekalb-XL-41 is very susceptible to *M. incognita* race 1 and should be excluded in crop-rotation programs to control this nematode. Other nematode-resistant corn hybrids such as McNair 340 and 440 might be used more advantageously (1).

ACKNOWLEDGMENT

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LITERATURE CITED

1. BALDWIN, J. G., and K. R. BARKER. 1970. Host suitability of selected hybrids, varieties and inbreds of corn to populations of *Meloidogyne* spp. J. Nematol. 4:345-350.
2. BARKER, K. R., and T. H. A. OLTHOF. 1976. Relationships between nematode population densities and crop responses. Annu. Rev. Phytopathol. 14:327-353.
3. DiMURO, A. 1975. Effetto di varie piante sui nematodi galligeni del tabacco in rotazioni biennali. Inf. tore Fitopatol. 25(8):7-14.
4. HUSSEY, R. S., and K. R. BARKER. 1973. A comparison of methods of collecting inocula of *Meloidogyne* spp., including a new technique. Plant Dis. Rep. 57:1025-1028.
5. SEINHORST, J. W. 1965. The relation between nematode density and damage to plants. Nematologica 11:137-145.
6. ZACHEO, G., and F. LAMBERTI. 1974. Un metodo rapido per l'estrazione dei nematodi dal suolo e dai tessuti vegetali. Nematol. Mediterr. 2:55-59.