Nematol. medit. (1981), 9: 99-103.

Istituto di Nematologia Agraria del C.N.R.
70126 Bari - Italy

RELATIONSHIP BETWEEN POPULATION DENSITIES OF *MELOIDOGYNE INCOGNITA* AND YIELD OF SUGARBEET AND TOMATO

by

M. Di Vito, N. Greco and A. Carella [1]

A decline of sugarbeet (*Beta vulgaris* L.) and tomato (*Lycopersicon esculentum* Mill.) in Southern Italy is often associated with heavy infestations of *Meloidogyne incognita* (Kofoid *et* White) Chitw. (Di Vito, 1980). However, although this root-knot nematode is widely distributed, there is a lack of information on the relationship between population densities and yield in Italy. Two experiments were therefore carried out at Ginosa Marina, in the Province of Taranto, to determine the effect of *M. incognita* on the yield of sugarbeet and tomato.

Materials and methods

Two series of bottomless concrete tubes (30 x 30 cm cross section x 50 cm deep) were plunged in the field. Tubes were contiguous along the row and spaced 90 cm between rows for tomato and 20 cm for sugarbeet. They were filled with a sandy soil (7% clay, 3.9% silt, 89.1% sand and 2.3% organic matter) which had been fumigated six months earlier with 200 l/ha of ethylene dibromide. Before filling, at the end of March 1980, the soil was thoroughly mixed with eggs and juveniles of a population of *M. incognita* race 1 to provide popu-

(1) We acknowledge the technical assistance of Mr. G. Zaccheo.

lation densities in a geometric series of 0, 0.125, 0.25 ... 256/ml. Eggs and juveniles had been collected by the sodium hypochlorite method (Hussey and Barker, 1973) from pepper (*Capsicum annuum* L.) roots. Two sets of inoculum levels, one for tomato and the other for sugarbeet, were distributed at random in eight replicates, in the two series of tubes, each of which had received 10 g of fertilizer (12, 24, 12 NPK). On 25 March 15 seeds of sugarbeet cv 'Kawemono' or 20 seeds of tomato cv 'Chico III' were sown in the two series of tubes. Seedlings

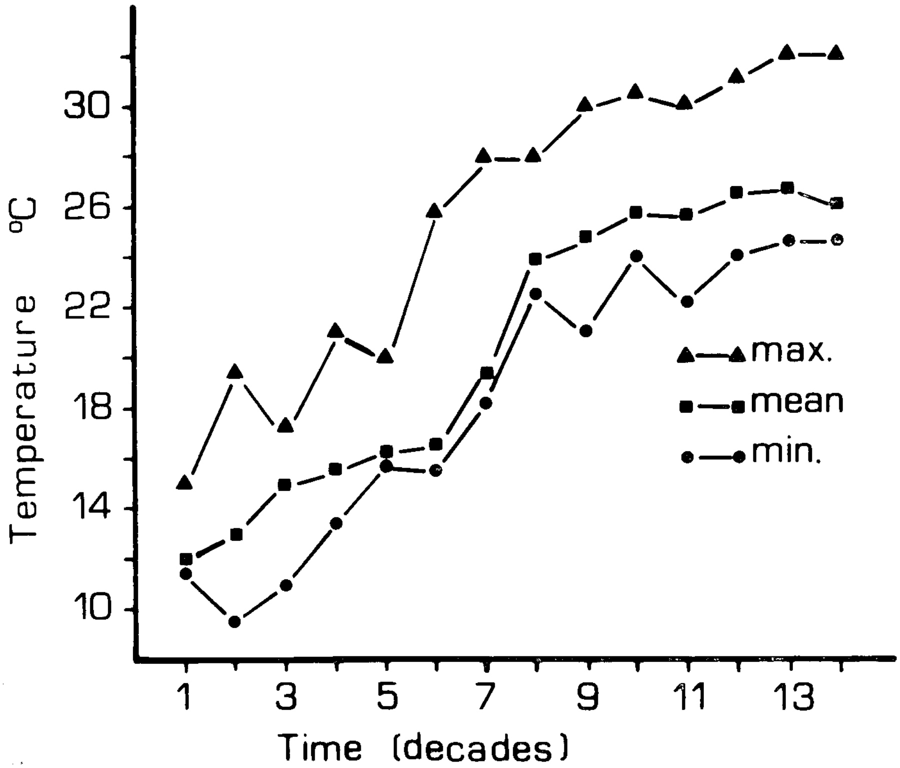

Fig. 1 - Soil temperature at 20 cm deep during the experiments.

were then thinned to a single plant in each tube 30 and 45 days later for sugarbeet and tomato respectively.

Normal cultural practices were applied during the course of the experiment. Soil temperature was continuously recorded at 20 cm deep (Fig. 1).

Marketable tomato fruits were harvested and weighed on 11 August and sugarbeet roots on 21 August.

Results and discussion

The graphs, representing the relationship between initial population densities of *M. incognita* and yield of sugarbeet roots (Fig. 2)

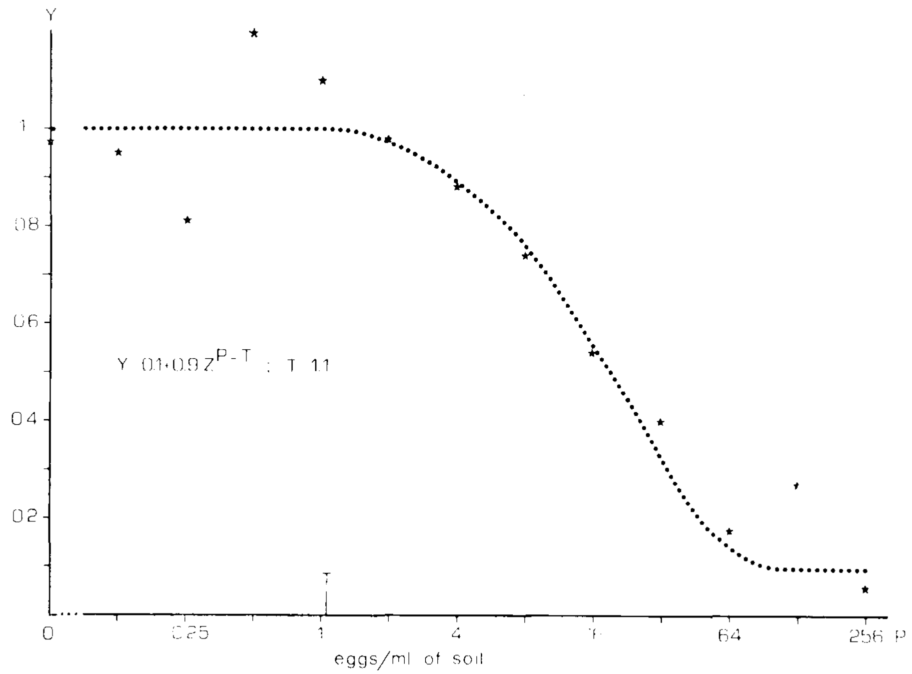

Fig. 2 - Relationship between initial population density (Pi) of *Meloidogyne incognita* and yield (y) of sugarbeet.

and marketable tomato fruits (Fig. 3), agree with the equation $y = m + (1 - m) z^{P-T}$ proposed by Seinhorst (1965), where y = the ratio between the yield at P density and the yield at P $\leq$ T; m = the relative minimum yield; P = the initial population density and T = the tolerance limit. Curves for $P \geq T$, $y = 1$ for P $\leq$ T and $z^{-T} = 1.05$, suggest tolerance limits of 1.1 eggs and juveniles/ml soil for sugarbeet and 4 eggs and juveniles/ml soil for tomato, with minimum yields of 0.1 (10% of the yield at $P \leq T$) for sugarbeet and 0 for tomato.

The tolerance limit of tomato found in our experiments is larger thant that reported by Barker and Olthof in 1976 (0.04, 0.4 juveniles/ml soil). This discrepancy may be due to different methods of analyzing the data rather than to different environmental conditions. Nevertheless, the minimum yield at larger initial populations is very close to that found by Barker *et al.* (1976).

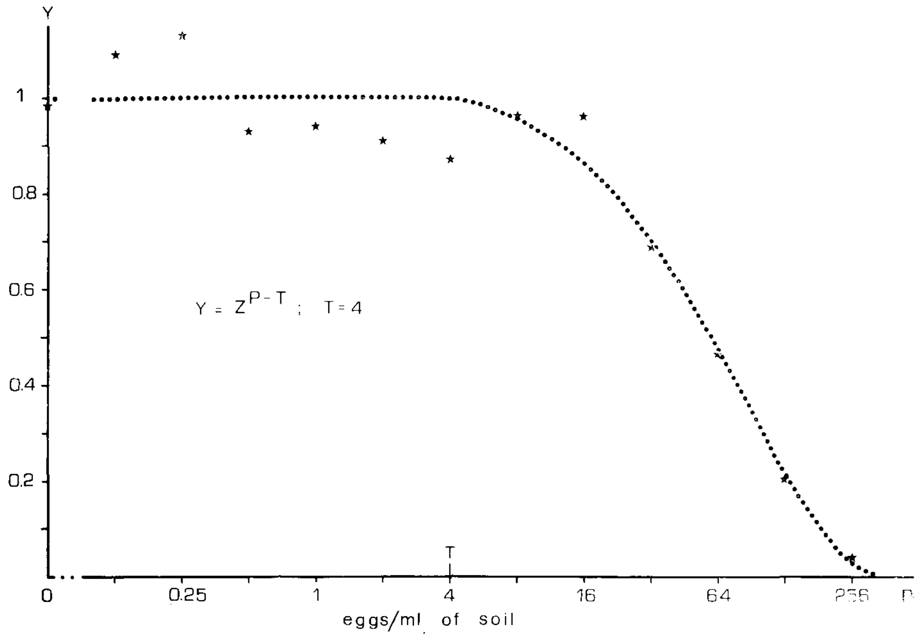

Fig. 3 - Relationship between initial population density (Pi) of *M. incognita* and yield (y) of tomato.

The tolerance limit of tomato to *M. incognita* is larger than that of sugarbeet and this is very close to that found by Oostenbrink (1966) for *M. hapla* (1 larvae/ml soil).

It is interesting to note that the tomato fruits harvested from the tubes with large population densities of *M. incognita* were of poor quality and unsuitable for canning.

SUMMARY

Two experiments were carried out at Ginosa Marina, Taranto, using concrete tubes (30 x 30 cm cross section x 50 cm deep) to study the relationship between population densities of *Meloidogyne incognita* (Kofoid *et* White) Chitw. and the yield of sugarbeet and tomato. The tubes were filled with 40 l of fumigated sandy soil inoculated with 0, 0.125, 0.25 ... 256 eggs and juveniles of the nematode/ml and sown with 'Kawemono' sugarbeet or 'Chico III' tomato. Data on yield are in agreement with the equation $y = m + (1 - m) z^{P-T}$ and suggest tolerance limits of 1.1 eggs and juveniles/ml soil for sugarbeet and 4 eggs and juveniles/ml soil for tomato, with minimum yield of 0.1 for sugarbeet and 0 for tomato.

RIASSUNTO

Relazione fra densità di inoculo di Meloidogyne incognita *e produzioni di barbabietola da zucchero e pomodoro.*

Nel 1980, in agro di Ginosa Marina (Taranto), sono stati condotti due esperimenti in tubi di eternit (30 x 30 x 50 cm), riempiti con terreno sabbioso, per studiare la relazione tra diverse densità d'inoculo di *Meloidogyne incognita* (Kofoid *et* White) Chitw. (0, 0,125, 0,25, ... 256 uova/ml di terreno) e produzioni di barbabietola da zucchero e di pomodoro. I risultati sono in accordo con l'equazione $y = m + (1 - m) z^{P-T}$ e suggeriscono un limite di tolleranza di 1,1 e 4 uova/ml di terreno rispettivamente per barbabietola e per pomodoro. Inoltre, alle massime densità d'inoculo le produzioni minime sono state del 10% per barbabietola e 0 per pomodoro.

LITERATURE CITED

BARKER K. R. and OLTHOF T. H. A., 1976 - Relationship between nematode population densities and crop responses. *A. Rev. Phytopath.*, *4*: 327-353.

BARKER K. R., SHOEMAKER P. B. and NELSON L. A., 1976 - Relationship of initial population densities of *Meloidogyne incognita* and *M. hapla* to yield of tomato. *J. Nematol.*, *8*: 232-239.

DI VITO M., 1980 - Status of research on the biology and control of the root-knot nematodes in Italy. Proc. II Planning Conference on Root-knot Nematode, *Meloidogyne* spp., Athens (Greece), Nov. 26-30, 1979, pp. 135-137.

HUSSEY R. S. and BARKER K. R., 1973 - A comparison of methods of collecting inocula of *Meloidogyne* spp., including a new technique. *Pl. Dis. Reptr.*, *57*: 1025-1028.

OOSTENBRINK M., 1966 - Major characteristics of the relation between nematodes and plants. *Meded. Landbouwhogesch. Wageningen*, *66 (4)*: 1-46.

SEINHORST J. W., 1965 - The relation between nematode density and damage to plants. *Nematologica*, *11*: 137-154.

Accepted for publication on 8 October 1980.