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PATHOGENICITY OF *MELOIDOGYNE INCOGNITA* ON KENAF IN MICROPLOTS[a)]

by
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Summary. The relationship between initial population densities (*Pi*) of *Meloidogyne incognita* and growth of kenaf was investigated in the field. Microplots were artificially inoculated with finely chopped nematode-infested tomato roots to give a range of initial population densities (*Pi*) of 0, 0.062, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128 or 256 eggs and juveniles of *M. incognita*/cm^3 soil. Tolerance limits (*T*) of 0.129, 0.18, 0.32 and 0.67 eggs and juveniles/cm^3 soil were calculated for top fresh weight, stem weight, height and stem basal diameter of plants, respectively. Minimum relative yields (*m*) of 0.05, 0.1, 0.3 and 0.4 were also calculated for fresh top weight, stem weight, height and basal stem diameter of plants, respectively. Maximum nematode reproduction rate (*Pf/Pi*) was 588 at low *Pi* and decreased with increasing nematode population density.

Kenaf (*Hibiscus cannabinus* L.), a member of the Malvaceae family, is an annual plant that has been grown for many years as a fibre and food source. It is cultivated in some tropical and subtropical countries for the production of bast and the long and strong fibres are of particular value for speciality use in the textile industry.

Kenaf is subject to several diseases and pests including some nematodes, especially root-knot nematodes (*Meloidogyne* spp.) which can cause severe damage (McSorley and Parrado, 1986; Veech, 1992). However, information regarding the yield loss caused by root-knot nematodes to kenaf is scarce. Therefore, an experiment was undertaken in microplots to investigate the effect of a range of initial densities of an Italian population of *M. incognita* (Kofoid *et* White) Chitw. on the growth of kenaf.

Materials and methods

One hundred and twelve bottomless plastic pipes (20 cm diameter x 70 cm deep) were plunged into the soil in a field at Rotondella (Province of Matera). The pipes were contiguous along the row and spaced at 40 cm between rows. They were filled with 20 dm^3 of sandy soil which had been treated three months earlier with 200 l/ha of 1,3-dichloropropene. An Italian population of *M. incognita* host race 1 (Taylor and Sasser, 1978) was reared on tomato (*Lycopersicon esculentum* Mill.) cv. Rutgers. Tomato roots infested by the nematode were gently washed, finely chopped, and the number of eggs and juveniles in the egg masses on the roots were estimated by processing ten root samples of 10 g each with 1% aqueous solution of sodium hypochlorite (Hussey and Barker,

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1973). The roots were then thoroughly mixed with 25 kg of fumigated soil and used as the inoculum. Appropriate amounts of inoculum and 5 g of fertilizer (12% N, 24% P and 12% K) were thoroughly mixed in a concrete mixer and incorporated into the soil of each microplot to give population densities (*Pi*) of 0, 0.062, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128 or 256 eggs and juveniles of *M. incognita*/cm^3 soil. Microplots were arranged in a randomized block design with eight replicates of each population density. Four seeds of the line G 4 of kenaf were sown into each microplot on 29 May 1996 and thinned to two plants per microplot ten days after emergence. Appropriate experimental procedures were followed for irrigation, fertilizers and disease, pest and weed control.

The plants were harvested on 30 October and stem height, top weight and basal diameter of the stem were recorded. A 1 kg soil sample, composite of ten cores, was collected with a soil sampler from each microplot soon after harvest. Subsamples of 500 cm^3 each were then processed by Coolen's modified method (Coolen, 1979; Di Vito *et al.*, 1985) to determine the final population density (*Pf*) and to ascertain the reproduction rate (*Pf/Pi*) of the nematode.

Results and discussion

Meloidogyne incognita, host race 1, adversely affected the growth of kenaf. Symptoms of nematode attack (yellowish and stunting) were evident in microplots inoculated with more than 16 eggs and juveniles/cm^3 soil. The inoculum level did not affect the time required for germination nor the number of seeds that germinated. Symp-

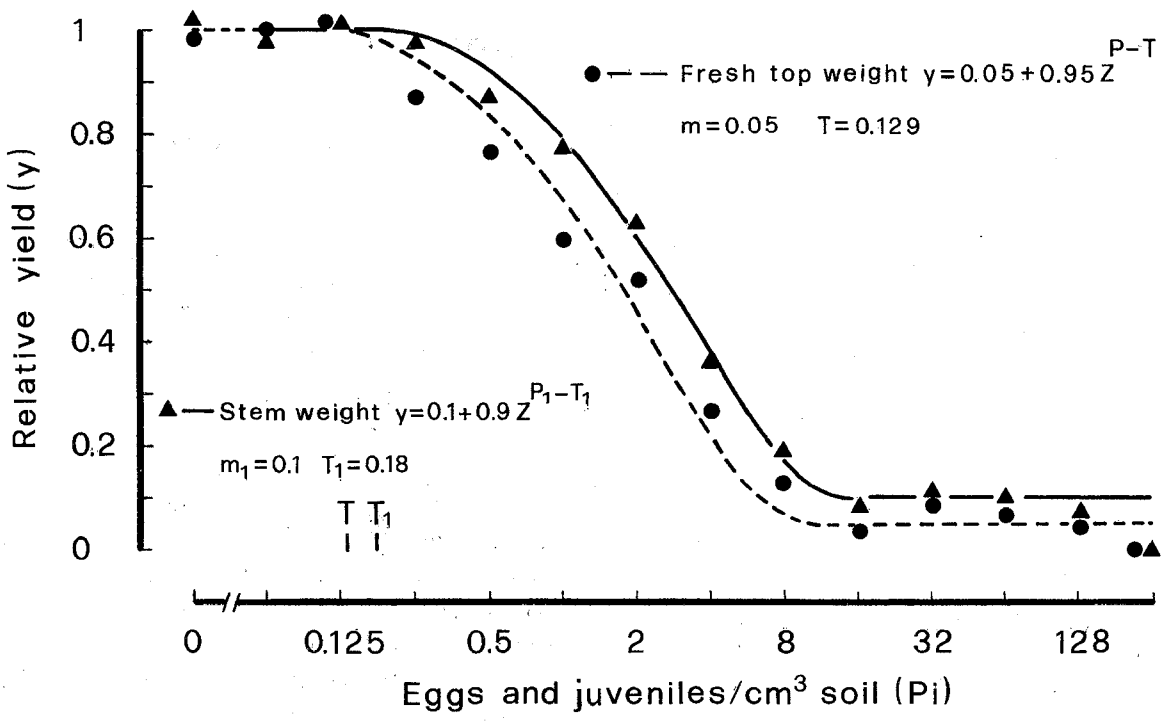

Fig. 1 - Relationship between initial population densities (*Pi*) of *Meloidogyne incognita* host race 1 and relative total fresh top weight and stem weight of the line G 4 of kenaf grown in microplots.

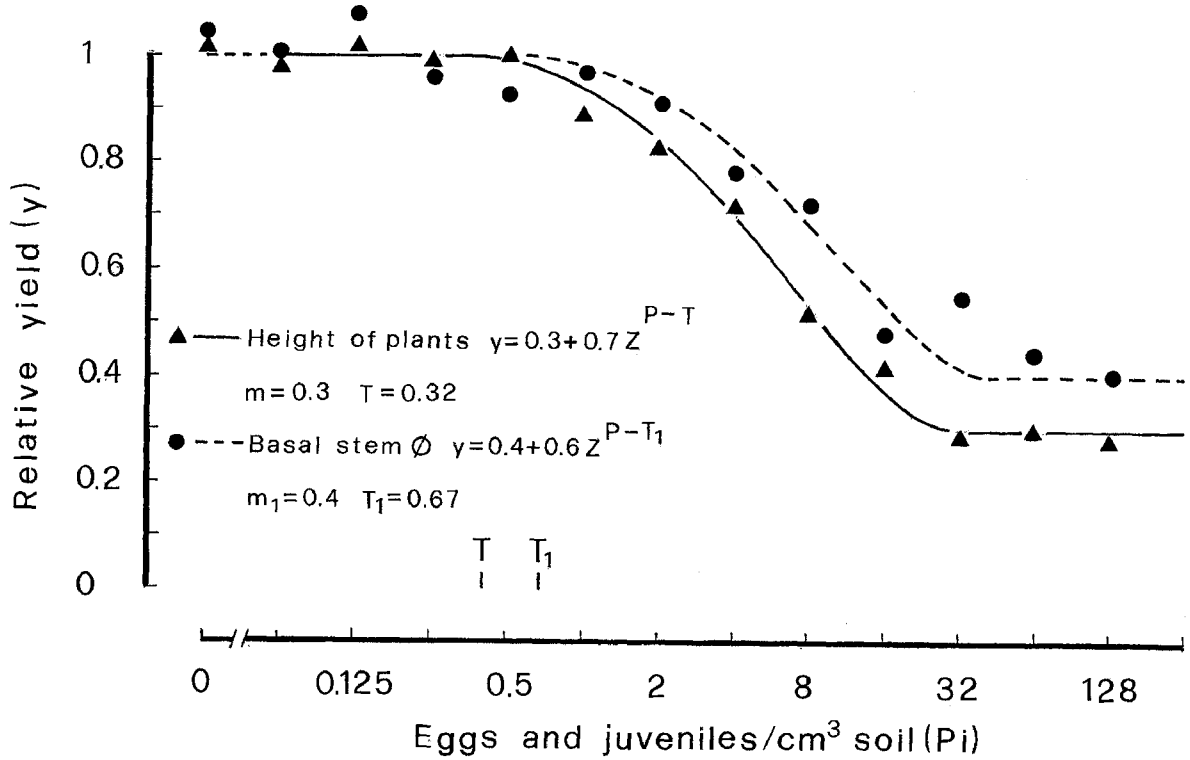

Fig. 2 - Relationship between initial population densities (*Pi*) of *M. incognita* host race 1 and relative height of stem and basal stem diameter of the line G 4 of kenaf grown in microplots.

toms of the nematode attack were evident one week after plant emergence in microplots infested with $Pi \geq 128$ eggs and juveniles/cm^3 soil. Several seedlings died two weeks after plant emergence and all of them died in microplots infested with $Pi = 256$ eggs and juveniles/cm^3 soil after four weeks of sowing.

Total fresh top and stem weight, height and basal stem diameter of the kenaf plants were greatly affected by *M. incognita*. Data were consistent with Seinhorst's model $y = m+(1-m)z^{P-T}$ (Seinhorst, 1965; 1979), where y is the relative yield, the ratio between the yield at Pi and that at $P \leq T$, m the minimum relative yield (y at very large Pi), z a constant < 1 with $z^T = 0.95$, T the tolerance limit (Pi above which yield is lost), and P initial population density of the nematode. Fitting the data to this model gave tolerance limits (T) of 0.129, 0.18, 0.32, and 0.67 eggs and juveniles/cm^3 soil for total top fresh weight, stem fresh weight, stem height and stem basal diameter of kenaf plants, respectively (Figs. 1 and 2). The minimum relative yields (m) were: 0.05, for total top fresh weight at $Pi \geq 8$ eggs and juveniles/cm^3 soil; 0.1 for stem fresh weight of plants at $Pi \geq 16$; 0.3 for height of plants at $Pi \geq 32$; and 0.5 for stem basal diameter at $Pi \geq 32$ (Figs. 1 and 2).

Final population densities (*Pf*) of *M. incognita* increased in microplots with initial population densities between 0.062 and 32 eggs and juveniles/cm^3 soil (Table I) and decreased in microplots infested with $Pi \geq 64$ eggs and juveniles/cm^3 soil. The highest reproduction rate (*Pf/Pi*) of *M. incognita* was recorded in microplots inoculated with 0.125 eggs and juveniles/cm^3 soil (Table I) and was lowest in microplots with initial population densities $Pi \geq 64$.

TABLE I - *Relationship between initial (Pi) and final (Pf) population densities and reproduction rate (Pf/Pi) of* Meloidogyne incognita *host race 1 on the line G4 of kenaf grown in microplots.*

Eggs and juveniles/cm^3 soil		Reproduction rate
Pi	*Pf*	*Pf/Pi*
0.062	29.9	482.2
0.125	73.5	588.0
0.25	113.4	453.6
0.5	117.6	235.2
1	246.6	246.6
2	185.5	92.7
4	203.0	50;7
8	114.4	14.3
16	84.8	5.3
32	110.9	3.5
64	55.2	0.9
128	47.0	0.4
256	7.0	0.03

This experiment confirmed the high pathogenicity of *M. incognita* to kenaf. Kenaf growth (height, top fresh weight of plants, etc.) was suppressed with the increase of nematode population.

These results are in contrast with those obtained by Barillas *et al.* (1993) who reported that shoot dry weight was reduced to 46% of the uninoculated control at 10 eggs and juvenile/cm^3 soil while in our experiment at that initial population densities the reduction of the shoot fresh weight was 95%. Most probably this discrepancy can be attributed to the type of inoculum used [eggs and juveniles extracted by NaOCl in Barillas *et al.* (1993) versus infested roots in our experiment], the different nematode population used [*M. incognita* race 3 in Barillas *et al.* (1993) versus race 1 in our investigation], and the experiment conditions [greenhouse in Barillas *et al.* (1993) and open field in our study].

Although additional studies are required to ascertain effect of the nematode on the fibber quality, nevertheless, root-knot nematodes (*Meloidogyne* spp.) must be considered important pests of kenaf and these results must be taken in consideration when planting in infested fields.

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