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THE EFFECT OF *MELOIDOGYNE INCOGNITA* ON THE GROWTH OF *CATALPA BIGNONIOIDES*

by
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Summary. A glasshouse experiment was undertaken to ascertain the relationship between population densities of *Meloidogyne incognita* host race 1 and growth of common catalpa. A range of population densities of 0, 0.0625, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128 and 256 eggs and juveniles/cm^3 soil was considered. Tolerance limit of 0.78 for fresh and dry top weight and leaf area and 1.8 eggs and juveniles/cm^3 soil for plant height were derived. Minimum relative yields of 0.4 and 0.65 for the same parameters and an equilibrium density of the nematode of 47.5 eggs and juveniles/cm^3 soil were estimated. The maximum reproduction rate of the nematode was 123-fold and occurred at the lowest *Pi*.

Root-knot nematodes (*Meloidogyne* spp.) can severely damage forest and ornamental tree seedlings in nurseries (Wang *et al.*, 1975; Fernandes *et al.*, 1988). The genus *Catalpa* includes ornamental and forest tree species, widespread in Europe, Asia and Northern America, that can be infected by these nematodes (Shen *et al.*, 1990). Common catalpa (*C. bignonioides* Walt.) is an ornamental tree largely used in urban forestry (Agostoni and Marinoni, 1978). In a previous experiment seedlings of catalpa resulted very susceptible to the attack of *M. incognita* (Kofoid *et* White) Chitw. host race 1 (Sasanelli and Pierangeli, 1994).

No information is available on the effect of different *M. incognita* population densities on the growth of this tree species. Therefore, a glasshouse experiment was undertaken to ascertain the relationship between different infestation levels of an Italian population of *M. incognita* and growth parameters of common catalpa.

Materials and methods

Meloidogyne incognita, host race 1 (Taylor and Sasser, 1978), from sugarbeet (*Beta vulgaris* L.) (Castellaneta, Apulia), was reared on tomato (*Lycopersicon esculentum* L.) cv. Rutgers for two months in a glasshouse at 25±3 °C. Infested tomato roots were washed free of adhering soil, finely chopped and the number of eggs and juveniles in the egg masses were estimated by processing ten root samples of 5 g each with 1% aqueous solution of sodium hypochlorite (Hussey and Barker, 1973). The roots were then thoroughly mixed with 3 Kg of steam sterilized sandy soil and used as inoculum (Di Vito *et al.*, 1986).

Appropriate amounts of this inoculum were then added to sterilized sandy soil in 750 cm^3 clay pots to give a range of initial population densities of 0, 0.0625, 0.125, ...128 and 256 eggs and juveniles/cm^3 soil (*Pi*). A one-month old seedling of common catalpa was transplanted into each pot. There were six replicates for each inoculum density and the pots were arranged, according to a randomized block design, on benches in a glasshouse at 25±3 °C.

The catalpa plants were uprooted 70 days after transplanting and the height, fresh and dry top weight and total leaf area were recorded. Final nematode population densities (*Pf*) in each pot were determined by processing 500 cm^3 soil by Coolen's (1979) method and in the roots by shaking them in a 1% aqueous solution of sodium hypochlorite (Hussey and Barker, 1973).

Results and discussion

The growth of catalpa plants was negatively affected by the attack of *M. incognita* host race 1. Symptoms (stunting and yellowing) were evident 30 days after transplanting in pots infested with ≥64 eggs and juveniles/cm^3 soil.

Fresh and dry top weights, height and leaf surface were affected by *M. incognita*. Data were consistent with the equation $y = m + (1-m)\, z^{(P-T)}$ (Seinhorst, 1979), where y is the ratio between the yield (fresh and dry top weight, height and leaf surface) at a given P and that at $P \leq T$, m = the minimum relative yield (y at very large P), z = a constant < 1 with $z^{-T} = 1.05$, P = initial population density and T = the tolerance limit (P at which no yield is lost).

Fitting the data from the experiment to Seinhorst's equation gave tolerance limits of 0.78 eggs and juveniles/cm^3 soil for fresh and dry top weight and leaf area (Fig. 1) and 1.81 eggs and juveniles/cm^3 soil for plant height (Fig. 2). The minimum relative yields were 0.40

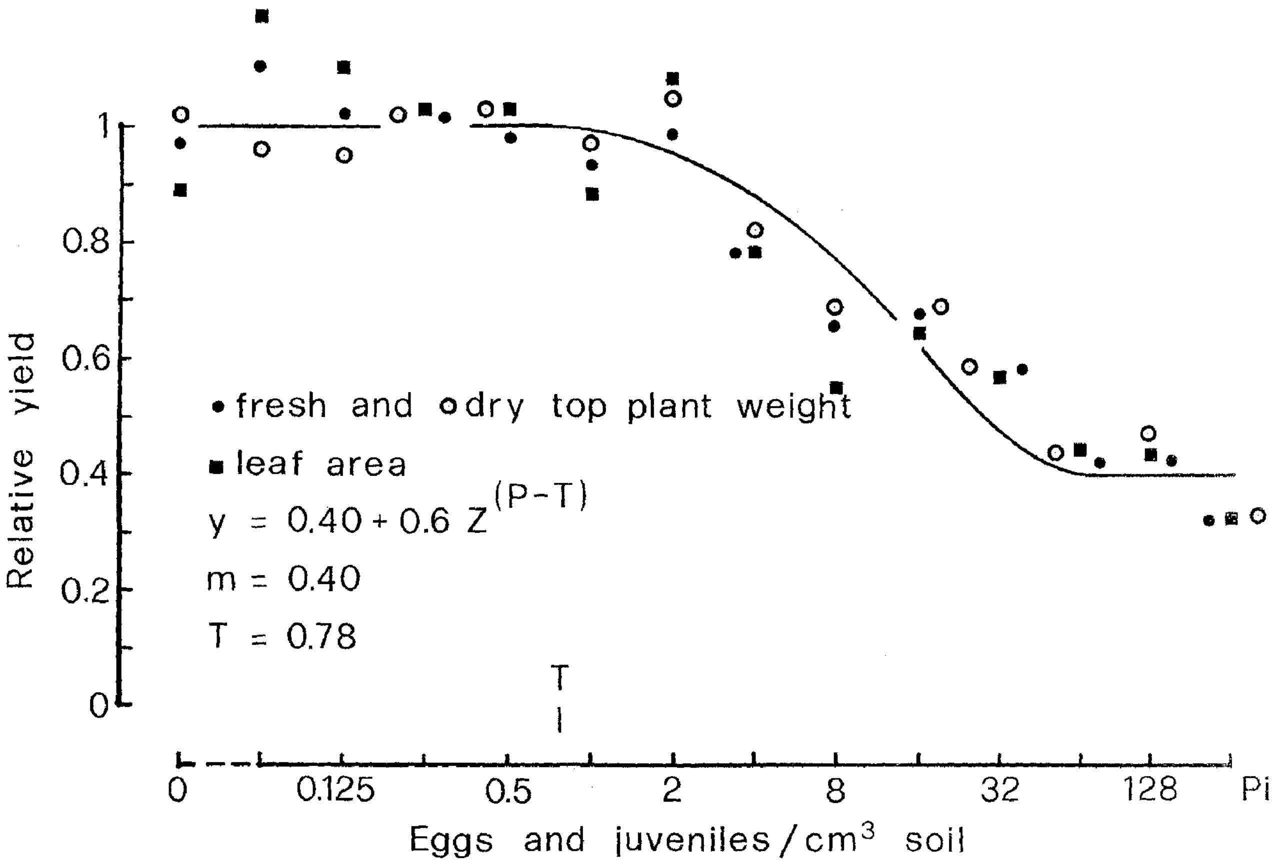

Fig. 1 - Relationship between initial population density (*Pi*) of *Meloidogyne incognita* host race 1 and relative fresh and dry top weight and leaf area of *Catalpa bignonioides* grown for 70 days in pots in a glasshouse.

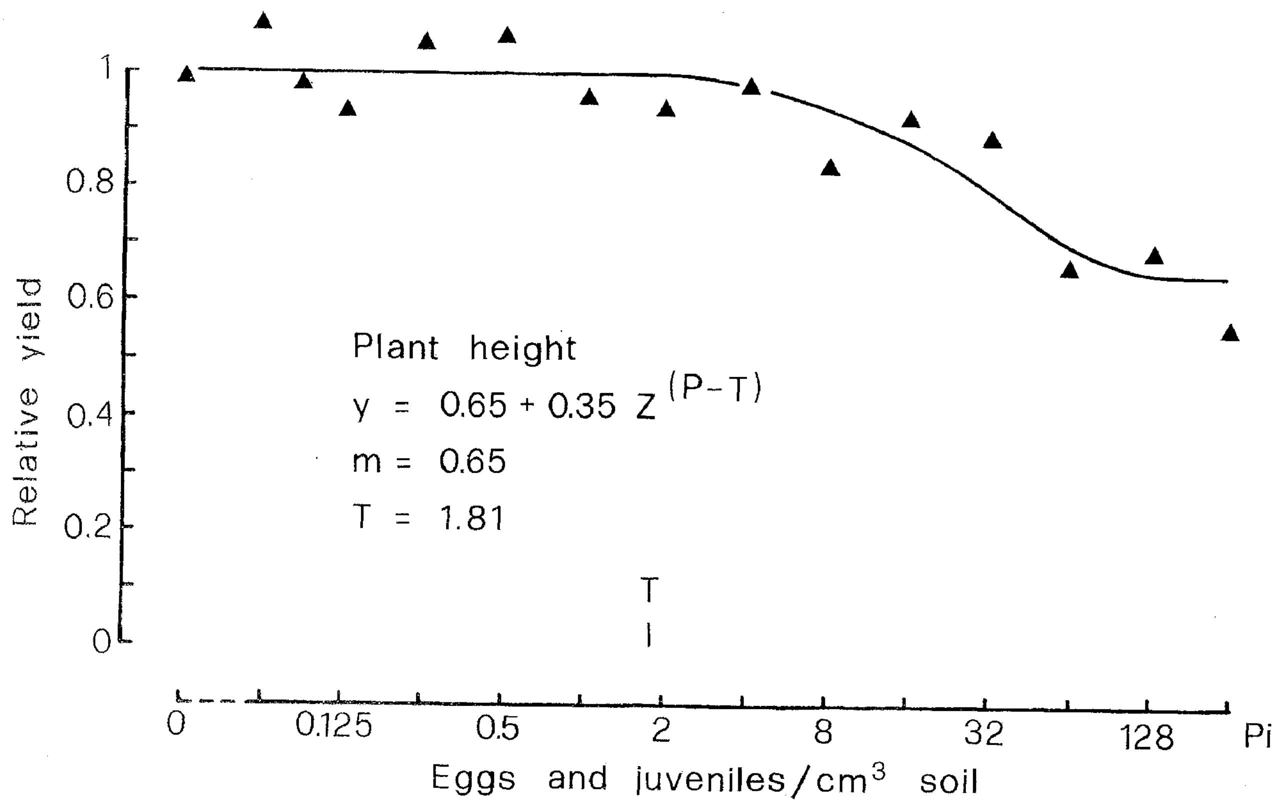

Fig. 2 - Relationship between initial population density (*Pi*) of *M. incognita* host race 1 and relative height of *C. bignonioides* grown for 70 days in pots in a glasshouse.

for fresh and dry top weight and leaf area and 0.65 for plant height.

The relationship between initial (*Pi*) and final (*Pf*) population density is shown in Fig. 3. The data agree with the Seinhorst (1970) model: $Pf = ay\,(^{e}\log q^{-1})\,(1\text{-}q^{Pi}) + s\,(1\text{-}x)\,Pi$ in which *Pf* and *Pi* are as above; a = maximum multiplication rate (for *Pi* tending to 0); q = a constant < 1; y = the relation between root weight at a given *Pi* and that in the absence of the nematode; s = the proportion of the eggs unhatched in the absence of host roots and x = the proportion of eggs hatched in the presence of host roots. Data of final populations of *M. incognita* fit the above model if it is assumed that $s = 0.1$ and $x = 1$.

The maximum reproduction rate (*Pf/Pi*) was 123 at the lowest *Pi* and declined as *Pi* increased. An equilibrium density of the nematode of 47.55 eggs and juveniles/cm^3 soil was also estimated (Fig. 3).

The results of the experiment confirm the pathogenic effect of *M. incognita* on common catalpa, as observed previously (Sasanelli and Pierangeli, 1994), and indicate that severe damage may occur in nurseries heavily infested by the nematode. Therefore soil disinfestation is recommended before sowing infested nursery beds.

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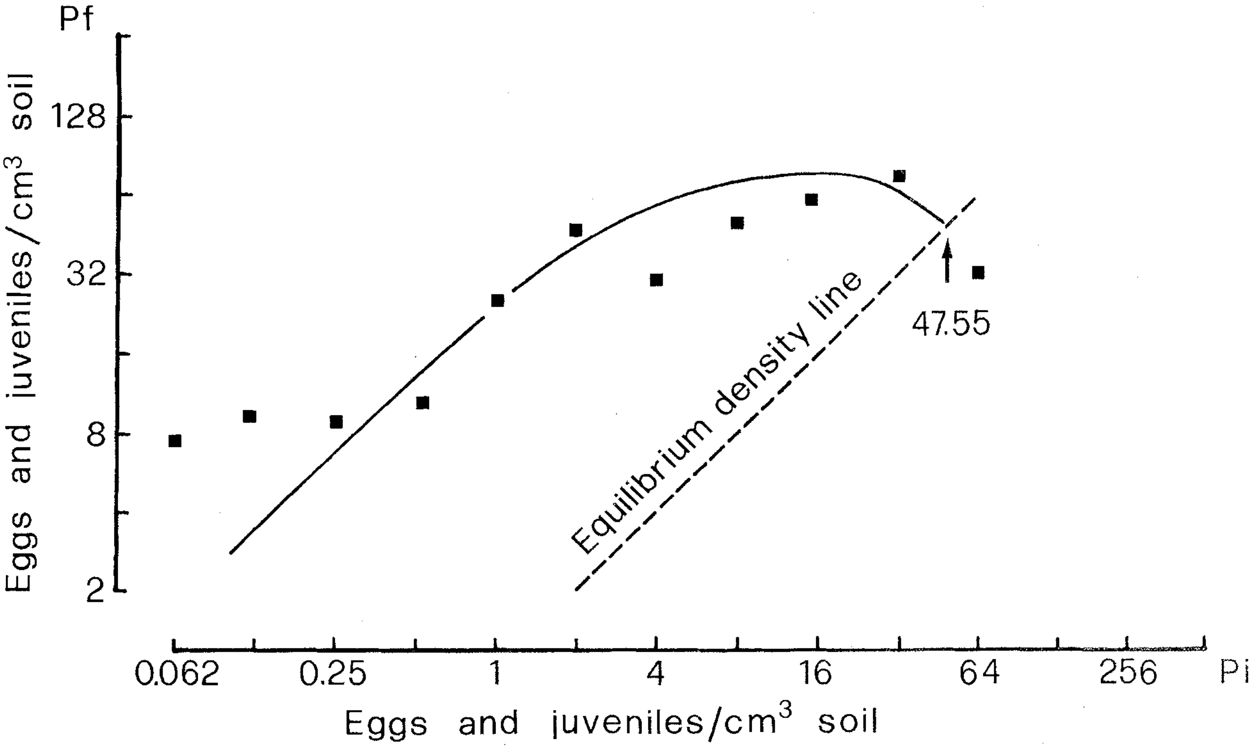

Fig. 3 - Relationship between initial (*Pi*) and final (*Pf*) population density of *M. incognita* host race 1 on *C. bignonioides* grown for 70 days in pots in a glasshouse.

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