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## RESPONSE OF SELECTED FOREST TREES TO *MELOIDOGYNE INCOGNITA* INFECTIONS

by

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**Summary.** The reaction of seedlings of *Acer negundo*, *Acer pseudoplatanus*, *Catalpa bignonioides*, *Celtis australis*, *Fraxinus excelsior*, *Juglans nigra*, *Juglans regia* and *Tilia cordata* to *Meloidogyne incognita* host race 1 was evaluated in a glasshouse experiment. All the tested species were resistant with a GI (gall index) between 0 and 1.1. Only the roots of *C. bignonioides* were heavily infested by the nematode (GI=3.25). Cross sections of *M. incognita* infested roots of the two most susceptible tree species tested (*C. bignonioides* and *C. australis*), had 4-6 multinucleate giant cells arranged around the nematode body in the vascular cylinder. Abnormal and interrupted xylem elements were also observed in many sections.

The growth of forest tree seedlings in nurseries is inhibited by various pathogens, including nematodes. The root-knot nematodes, although are distributed throughout the world and having large host ranges, are rarely reported on trees in forest habitats. Nevertheless they can cause severe economic losses in nurseries (Madamba *et al.*, 1965; Riffle, 1973; Wang *et al.*, 1975; Fernandes *et al.*, 1988).

The objectives of this study were i) to determine the reaction of young plants of eight forest tree species to *Meloidogyne incognita* (Kofoid *et* White) Chitw., the most common and widely distributed root-knot nematode species in the Mediterranean region (Lamberti, 1981) and ii) to illustrate the anatomical changes induced by the feeding of this nematode on susceptible hosts.

### Materials and methods

The forest tree species tested were: *Acer negundo* L., box-elder; *Acer pseudoplatanus* L., sycamore maple; *Catalpa bignonioides* Walt., common catalpa; *Celtis australis* L., European hackberry; *Fraxinus excelsior* L., European ash; *Juglans nigra* L., black walnut; *Juglans regia* L., English walnut and *Tilia cordata* Mill., small-leaved linden.

Two year-old plants of each species were transplanted singly into clay pots each filled with 1 l of steam sterilized sandy soil. Before transplanting, the root system of each plant was mildly pruned to encourage the production of new fleshy roots. Thirty-five days later, when new roots

had developed, each plant was inoculated with a water suspension of 10,000 eggs and juveniles of *M. incognita* host race 1 (Taylor and Sasser, 1978), poured into two 3 cm deep holes in the soil around the base of the plants.

The *M. incognita* population used was from Castellane-ta (Apulia). It was cultured on tomato (*Lycopersicon esculentum* Mill.) cv. Roma VF in a glasshouse at 25±1 °C and the inoculum was extracted from infested roots by the sodium hypochlorite method (Hussey and Barker, 1973). Pepper cv. Como di Toro Rosso was also inoculated as a control. There were ten replicates for each plant species. Pots were arranged on benches in a glasshouse at 25±3 °C.

Sixty days after inoculation the forest and control plants were uprooted. The roots were carefully washed free of soil particles and dipped for 15 minutes into a phloxine B solution (0.15 g/l) to stain the nematode egg masses (Dickson and Ben Struble, 1965). Then numbers of galls per root system were counted and the root gall index (GI) assessed according to a 0-5 scale, where 0 = no galls, 1=1-2 galls, 2=3-10, 3=11-30, 4=31-100 and 5=>100 galls (Taylor and Sasser, 1978). The plants were considered resistant when the GI was ≤2.

Data were compared by analysis of variance and Duncan's multiple range test.

Histological observations were made on the two most susceptible forest plant species, *C. bignonioides* and *C. australis*. Root segments were fixed in an aqueous solution of FAA, dehydrated in tertiary butyl alcohol series and embedded in paraffin. Root sections 10-12 µm thick were

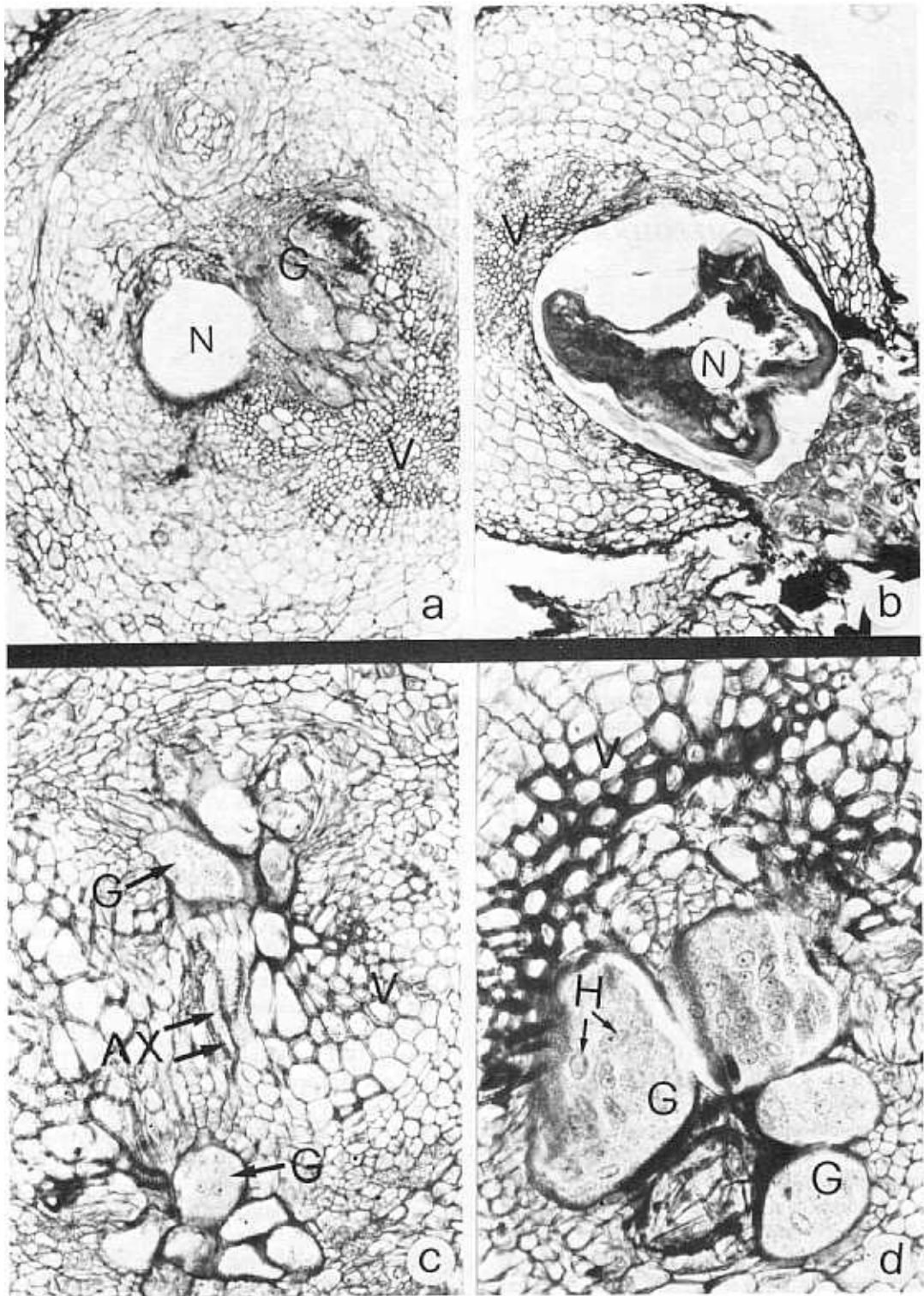


Fig. 1 - Anatomical changes induced by *M. incognita* feeding on *Catalpa bignonioides* (a, b) and *Celtis australis* (c, d) roots. Abbreviations used: N = nematode; G = giant cell; V = vascular cylinder; AX = abnormal xylem; and H = hypertrophied nuclei.

stained with safranin and fast-green, mounted in Dammar balsam (Johansen, 1940) and examined with the aid of a compound microscope.

## Results and discussion

The response of the tested plants to *M. incognita* is reported in Table I. *A. pseudoplatanus* and *J. nigra* were completely free of *M. incognita* while a very few egg masses and galls were found on the roots of *A. negundo*, *C. australis*, *F. excelsior*, *J. regia* and *T. cordata* and all these species are considered resistant to the nematode. The resistance of *A. pseudoplatanus* and *F. excelsior* is not in accordance with findings by Scognamiglio (1964). This was probably due to the different age of the plants. Infact, Wang *et al.* (1975) demonstrated that black locust, jellow cypress, scotch pine and even the highly susceptible China-fir became resistant with the increase of age.

TABLE I - *Galling caused by Meloidogyne incognita on the roots of forest tree species.*

Tree species	No. galls/root system		Gall index	
<i>Acer negundo</i>	4.7	A		B
<i>Acer pseudoplatanus</i>	0	A	0	A
<i>Catalpa bignonioides</i>	23.1	B	3.3	C
<i>Celtis australis</i>	2.9	A	1.1	B
<i>Fraxinus excelsior</i>	0.3	A	0.1	A
<i>Juglans nigra</i>	0	A	0	A
<i>Juglans regia</i>	2.1	A	0.8	AB
<i>Tilia cordata</i>	3.3	A	0.9	AB
Control (pepper)	88.1	C	4.1	D

Data flanked in any column by the same letters are not statistically different according to Duncan's test (P=0.01).

Generally the egg masses formed were small, with the exception of those on the roots of *C. bignonioides*. Galls induced on *C. bignonioides* and *C. australis* varied in size according to root region (tips and/or along the root axis).

Transverse sections of root galls (Fig. 1) showed that nematode feeding stimulated the formation of several (4-6) large giant cells around its body. Giant cells were always in the vascular cylinder of the root. The granulated cytoplasm of the giant cells appeared dense and homogenous containing numerous hypertrophied nuclei. Abnormal and interrupted xylem elements as well as direct injury of xylem and parenchyma were observed in many sections.

Our results indicate that *M. incognita* can suppress the growth of *C. bignonioides*.

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