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## THE EFFECT OF INITIAL POPULATION DENSITIES OF *XIPHINEMA INDEX* ON THE GROWTH OF GRAPEVINE

by

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There is much published information on the relationship between *Xiphinema index* Thorne *et* Allen and grapevine fanleaf virus, for which the nematode is the main natural vector (Martelli, 1978) but there is little information on the direct effect of nematode feeding on young vines (Radewald and Raski, 1962; Van Gundy *et al.*, 1965; Cohn and Orion, 1970; Kirkpatrick *et al.*, 1965; Boubals *et al.*, 1971).

Therefore the relationship between different population densities of *X. index* and the growth of the grape plant (*Vitis vinifera* D.C.) was studied in 1983 in the glasshouse.

### *Materials and Methods*

Plastic pots containing 160 cm<sup>3</sup> of a steam sterilized sandy soil (sand 89%; clay 7%; silt 4% and organic matter 2%) were planted with a 45 day old seedling of grapevine cv. Aglianico. The seedlings had been reared in a glasshouse at 20-23°C. One week after transplanting, a suspension of juvenile and adult *X. index* from a population reared on fig. (*Ficus carica* L.) in a glasshouse was poured into four holes around the seedling roots, to give a geometric series of inoculum levels of 0, 0.31, 0.62, 1.25, 2.5 . . . 320 and 640 nematodes/10 cm<sup>3</sup> of soil.

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The pots were arranged on a bench in a randomized block design comprising six replications per inoculum level in a glasshouse kept at  $21 \pm 2^\circ\text{C}$ .

Three months after inoculation the plants were removed from the pots and tops and roots were weighed separately. The nematodes in each pot were extracted by a centrifugation and silica gel method (Coolen and D'Herde, 1977); eggs, juveniles and adults of *X. index* were counted.

### *Results and Discussion*

The effect of *X. index* on the growth of the grapevine cv. Aglianico was noticeable at a population density of 2.5 nematodes/10 cm<sup>3</sup> of soil. A population density of 80 *X. index* resulted in very stunted plants with only one or two reddish true leaves (Fig. 1).

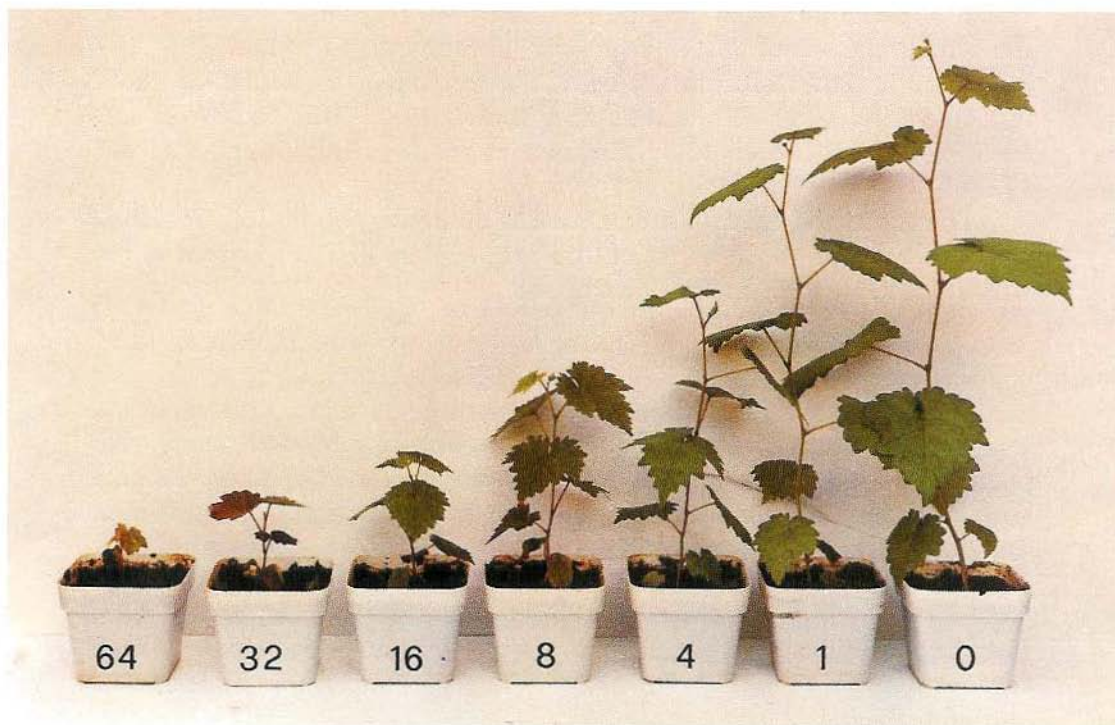


Fig. 1 - Effect of increasing densities (from right to left) of *Xiphinema index* (nematode/cm<sup>3</sup> soil) on the growth of grapevine cv. Aglianico, three months after transplanting.

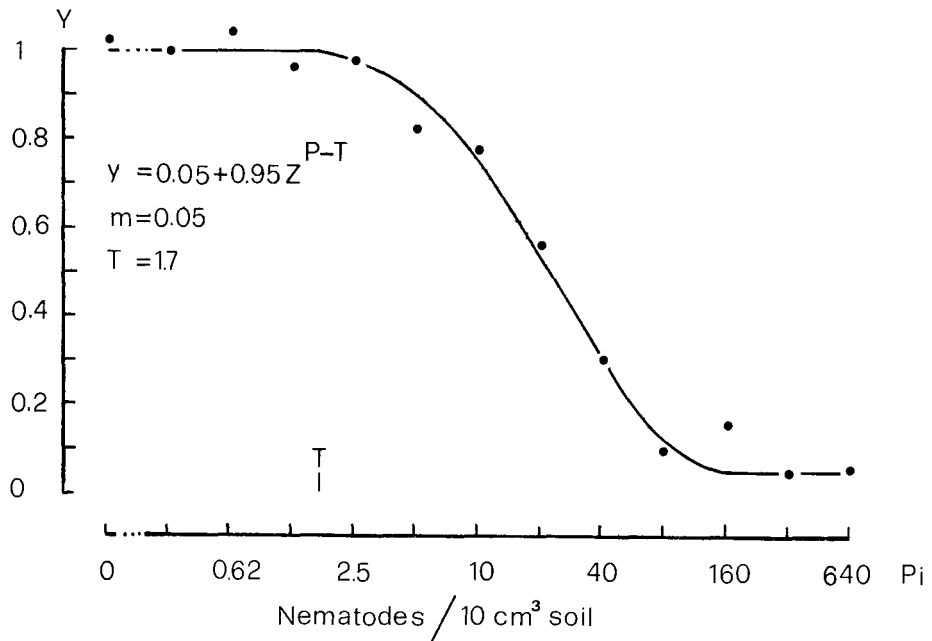


Fig. 2 - Relation between initial population densities ( $P_i$ ) of *Xiphinema index* and relative top weight ( $y$ ) of grapevine plants.

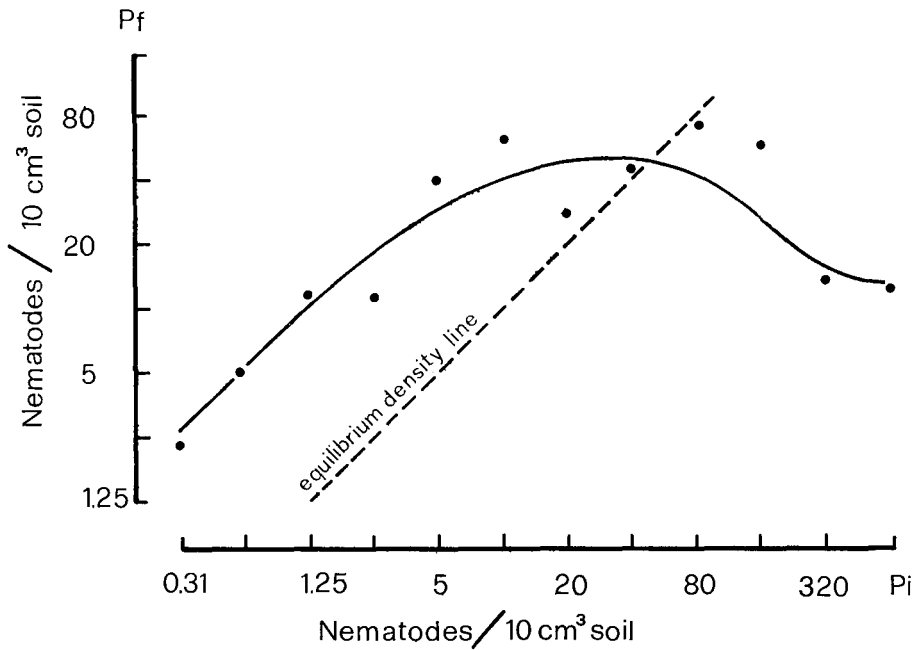


Fig. 3 - Relation between initial ( $P_i$ ) and final ( $P_f$ ) population densities of *Xiphinema index*.

The data (Fig. 2) fit the curve according to the equation  $y = m + (1 - m) z^{P-T}$  (Seinhorst, 1965), for  $P \geq T$  and  $y = 1$  for  $P \leq T$ , where  $y$  = relative yield;  $m$  = minimum relative yield;  $P$  = initial density of the nematode;  $T$  = tolerance limit;  $z$  = a constant  $< 1$  and  $z^{-T} = 1.05$ . A tolerance limit  $T$  of grapevine to *X. index* of 1.7 nematode/10 cm<sup>3</sup> of soil and a relative minimum yield ( $m$ ) of 0.05 were derived in this way (Fig. 2).

The relationship between initial ( $P_i$ ) and final ( $P_f$ ) population of the nematode (Fig. 3) shows a fairly high rate of multiplication.

A maximum multiplication rate ( $P_f/P_i$ ) of eight was observed at smaller initial populations, then it decreased as the initial population increased and an equilibrium density of 46.7 was estimated. There was considerable damage of the roots caused by *X. index*, with relatively large galls formed especially at the larger initial population densities (Fig. 4). It seems that damage to grapevine caused by *X.*

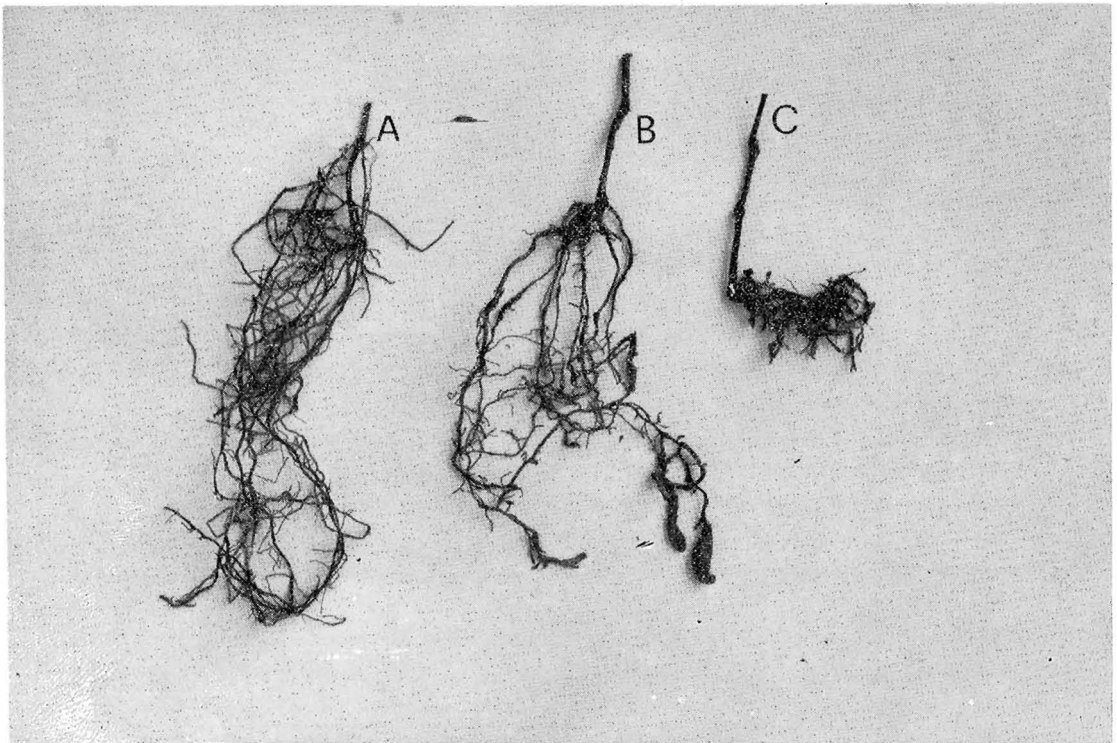


Fig. 4 - Effect of *Xiphinema index* on grapevine roots; (A) control, (B) lightly infested and (C) heavily infested.

*index* is more severe than that caused by root-knot nematodes, *Meloidogyne* spp., probably because the former feeds more extensively on the root tips, as shown by previous investigations (Vovlas *et al.*, 1978; Di Vito *et al.*, 1983).

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#### S U M M A R Y

The effect of initial population densities of *Xiphinema index* on the growth of grapevine (*Vitis vinifera* D.C.) cv. Aglianico was studied in a glasshouse at  $21 \pm 2^\circ\text{C}$ . Grape seedlings were transplanted in plastic pots containing 160 cm<sup>3</sup> of soil and inoculated with 0, 0.31, 0.62, 1.25... 640 *X. index*/10 cm<sup>3</sup> of soil. Fitting the data to the equation  $y = m + (1 - m) z^{P-T}$  indicates a tolerance limit of grapevine to the nematode of 1.7 individuals/10 cm<sup>3</sup> of soil and a relative minimum yield of 0.05. Final populations of the nematode were larger at lower initial densities, the rate of multiplication decreased with the increase of the initial population and an equilibrium density of 46.7 was estimated.

#### L I T E R A T U R E C I T E D

- BOUBALS D., PISTRE R., DALMASSO A. and BONGIOVANNI M., 1971 - Aspect des atteintes sur racines de vigne du nematode *Xiphinema index* vecteur du court-noué de la vigne. *Progrès Agricole et Viticole*, 171: 4.
- COHN E. and ORION D., 1970 - The pathological effect of representative *Xiphinema* and *Longidorus* species on selected host plants. *Nematologica*, 16: 423-428.
- COOLEN W. A. and D'HERDE C. J., 1977 - Extraction de *Longidorus* et *Xiphinema* spp. du sol par centrifugation en utilisant du silice colloidal. *Nematol. medit.*, 5: 195-206.
- DI VITO M., VOVLAS N., CARELLA A. and SOTTILE I., 1983 - Reazione di semenzali di vite nei confronti delle infestazioni di *Xiphinema index*, *Meloidogyne incognita* e *M. javanica*. *Inf.tore fitopatol.*, 33(5): 47-50.
- KIRKPATRICK J. D., VAN GUNDY S. D. and MARTIN J. P., 1965 - Effects of *Xiphinema index* on growth and abscission in Carignane grape, *Vitis vinifera*. (Abstr.). *Nematologica*, 11: 41.
- MARTELLI G. P., 1978 - Nematode-borne viruses of grapevine, their epidemiology and control. *Nematol. medit.*, 6: 1-27.
- RADEWALD J. D. and RASKI D. J., 1962 - Studies on the host range and pathogenicity of *Xiphinema index*. (Abstr.). *Phytopathology*, 52: 748-749.
- SEINHORST J. W., 1965 - The relation between nematode density and damage to plants. *Nematologica*, 11: 137-154.
- VAN GUNDY S. D., KIRKPATRICK J. D. and MARTIN J. P., 1965 - Nutritional response of *Vitis vinifera* Carignane infested with *Xiphinema index*. (Abstr.). Rep. VIII Inter. Symp. Nematol. 8-14 Sept., Antibes (France), E. J. Brill, Leiden, pp. 89.
- VOVLAS N., INSERRA R. N. and MARTELLI G. P., 1978 - Modificazioni anatomiche indotte da *Xiphinema index* e *Meloidogyne incognita* in radici di un ibrido di *Vitis vinifera* x *V. rotundifolia*. *Nematol. medit.*, 6: 67-75.

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