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Istituto di Nematologia Agraria, C.N.R. - Bari, Italy[1]
Direcçào Regional de Agricoltura da Beira Litoral, Coimbra, Portugal[2]
Istituto di Studi per L'Olivicoltura, C.N.R. - Perugia, Italy[3]

REACTION OF AN OLIVE CULTIVAR AND AN OLIVE ROOTSTOCK TO *XIPHINEMA INDEX*

by
N. SASANELLI[1], M. I. COIRO[1], T. D'ADDABBO[1], R. J. LEMOS[2], M. RIDOLFI[3] and F. LAMBERTI[1]

Summary. A glasshouse experiment was undertaken to evaluate the reaction of the olive cultivar FS 17 and the olive rootstock DA 12 I to *Xiphinema index*. Growth of DA 12 I was significantly suppressed whereas no effect was observed on FS 17. The highest initial population densities of *X. index* also enhanced root phenols content.

Various plant-parasitic nematodes have been reported in association with olive (Lamberti and Vovlas, 1993). *Xiphinema index*, which normally occurs in the rhizosphere of grapevine and fig trees, has sometime been found in olive nurseries in Greece (Vlachopoulos, 1991) or in olive groves in Italy, although usually in the neighbourhood of vineyards.

The concentration of phenols in olive roots and leaves was recently found to be correlated to the reaction of olive plants to root-knot nematodes (Ridolfi *et al.*, 1999).

Therefore a pot experiment was carried out to evaluate the reaction of young olive plants to *X. index* and to investigate the relationship between nematode population density and plant growth and the effect of nematode attack on phenols content in roots.

Materials and methods

One year old self rooted cuttings (Fontanazza, 1993) of the CNR patent olive (*Olea europaea* L.) cultivar FS 17 and rootstock DA 12 I were planted in 500 ml clay pots filled with steam sterilized sandy soil and kept in a glasshouse at 25±2 °C. Fifteen days later when the plants were established, hand-picked non-gravid females of *Xiphinema index* Thorne *et* Allen, from a multi-generation glasshouse culture in pots planted with fig (*Ficus carica* L.), were poured, in water suspension, into two holes near the roots. Population densities were 0, 10, 20, 40 and 80 nematodes per pot, each replicated ten times. The pots were distributed at random on a glasshouse bench. During the experiment plants were fertilized and watered as needed.

Six months after inoculation, the plants were uprooted and their top and root system weighed separately. Percentage increase of main shoot length and its diameter at insertion with the stem, the stem diameter at its base and the number of nodes on the main shoot were calculated with respect to their initial values at planting.

Root systems were graded for severity of damage according to a scale from 0 to 3 (Kunde *et al.*, 1968), where 0=no symptoms; 1=few lo-

calized swollen or curved tips; 2=general swelling of root tips and 3=deformation and reduction of the root system. The soil from each pot was thoroughly mixed and from aliquots of 100 ml nematodes were extracted by means of Cobb's wet sieving technique and counted.

The content of soluble phenols was determined by extracting three different samples of roots (0.5 g) in ultraturrax for 2 minutes using 1 ml of MeOH-H_2O (80-20 v/v). The slurry was centrifuged at 8,000 rpm for 1 minute and the supernatant was collected and the extraction procedure was repeated a second time. Polyphenols were quantified by the Folin-Ciocalteau method at 650 nm using 400 µl of extract.

Data were statistically analyzed and means compared by Student's *t* test and Duncan's multiple range test.

Results and discussion

Xiphinema index caused a significant reduction in the growth of plants, particularly of root weight on the rootstock DA 12 I at all population densities (Table I). Growth was statistically suppressed at nematode densities ≥20 females/pot. Plant growth parameters of cv. FS 17 were not statistically affected by *X. index* at all population densities, but stem and shoot diameter and shoot length showed a significant percentage reduction at the highest level of inoculum (80 nematodes/pot).

Root systems of both cultivars showed no evident damage although a few localized swollen or curved tips were recorded at the lowest inoculum densities (Table II).

Nematode reproduction rate was very low both in DA 12 I and FS 17, generally less than 1. The number of juveniles was significantly higher on FS 17 and increased directly with the initial population density. The number of females was low and did not show statistical differences either among the initial population levels or between the cultivar and the rootstock, except at the 80 females/pot population density.

Phenol content of the roots of DA 12 I increased significantly only at the highest inoculum densities whereas in FS 17 the difference was also significant at 40 females/pot (Fig. 1).

TABLE I - *Effect of* Xiphinema index *on growth of an olive cv. (FS 17) and an olive rootstock (DA 12 I).*

	Initial population density (Females/pot)	Weight (g)			Increase with respect to initial values (%)			
		Top fresh	Root	Total	Stem diam	Shoot diam	Shoot lenght	Node number
DA 12 I	0	8.9 a	9.4 a	18.3 a	19.5 a	75.5 a	149.6 a	135 a
	10	8.3 a	7.5 b	15.8 b	16.8 a	68.5 a	123.0 a	109 ab
	20	7.6 ab	7.1 b	14.7 b	14.4 ab	46.5 b	108.2 ab	90 bc
	40	7.9 ab	7.3 b	15.2 b	14.6 ab	46.0 b	64.6 b	72 bc
	80	6.3 b	5.9 c	12.2 c	8.5 b	39.8 b	58.2 b	62 c
FS 17	0	6.2 a	6.1 a	12.3 a	22.0 a	41.7 a	91.9 a	88 a
	10	6.0 a	5.9 a	11.9 a	15.4 ab	35.6 ab	98.9 a	94 a
	20	5.4 a	5.1 a	10.5 a	16.0 ab	42.7 a	67.2 ab	84 a
	40	5.0 a	4.9 a	9.9 a	16.1 ab	38.9 a	77.5 ab	86 a
	80	4.7 a	4.8 a	9.5 a	9.4 b	25.8 b	46.2 b	70 a

Data flanked in any column by the same letters are not statistically different according to Duncan's multiple range test (P=0.05).

In conclusion, the presence of *X. index* did not affect the growth of FS 17, whereas the rootstock DA 12 I seemed to be more consistently damaged. Both cultivars can not be considered to be good hosts for *X. index*, although the nematode is able to reproduce on them as demonstrated by the presence of juveniles in the soil at the end of the experiment.

Ridolfi *et al.* (1998) showed that root phenols are involved in the the mechanisms of

TABLE II - *Reproduction of* X. index *in the rhizosphere of an olive cv. (FS 17) and an olive rootstock (DA 12 I).*

Initial population density (Females/pot)	Root gall index			Females (No/500 ml soil)			Juveniles (No/500 ml soil)			Reproduction rate ($r=Pf/Pi$)		
	DA 12 I	FS 17	$t^{(1)}$	DA 12 I	FS 17	t	DA 12 I	FS 17	t	DA 12 I	FS 17	t
0	0 a[2]	0 a	–	0 a	0 a	–	0 a	0 a	–	0 a	0 a	–
10	0.7 b	0.6 b	–	2.5 ab	3.5 ab	–	1.8 ab	7.5 ab	*	0.4 d	1.2 b	–
20	0.6 b	1.0 bc	–	3.7 b	5.4 b	–	2.4 ab	16.3 bc	**	0.3 cd	1.1 b	*
40	0.8 b	0.6 b	–	5.6 b	4.0 ab	–	3.1 b	16.5 bc	**	0.2 bc	0.5 a	–
80	0.8 b	1.4 c	**	3.7 b	12.5 c	*	2.4 ab	19.5 c	**	0.1 ab	0.4 a	**

(1) Statistically different according to Student's t test. * for P=0.05; ** for P=0.01.
(2) Data flanked in any column by the same letters are not statistically different according to Duncan's multiple range test (P=0.05).

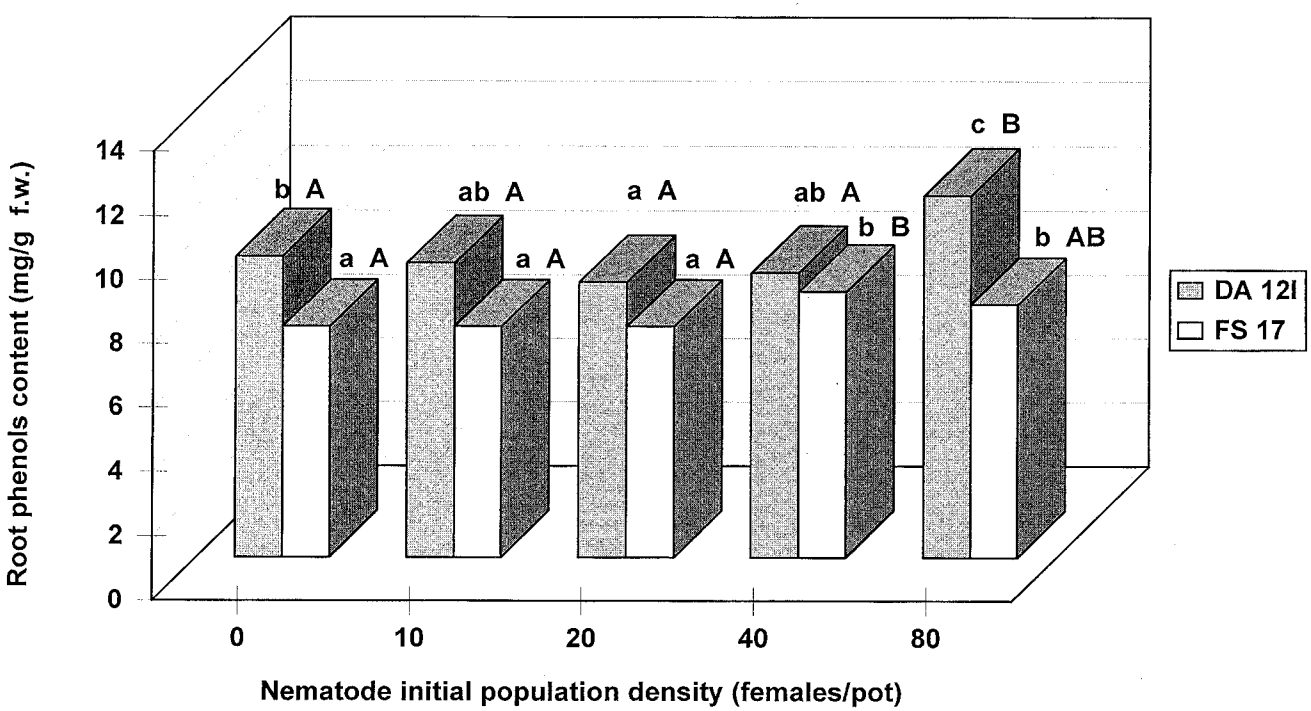

Fig. 1 - Root phenols content of an olive cv. (FS 17) and an olive rootstock (DA 12 I) in soil infested with different initial population levels of *Xiphinema index*. Within cv. or rootstock same letters indicate no statistical difference among the treatments. Small letters for P=0.05; capital letters for P=0.01.

plant reaction in the relationship between olive and root-knot nematodes. The same mechanism seems to apply in the relationship between olive and *X. index*, since in this experiment a high level of phenols was associated with lower gall numbers and lower nematode reproduction rate.

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