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RESPONSE OF LINES AND VARIETIES OF TOMATO TO ROOT-KNOT NEMATODE INFECTION

by

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The use of resistant varieties is the most economically and environmentally acceptable way to control root-knot nematodes (*Meloidogyne* spp.). They do not cause pollution and avoid the use of expensive chemicals and associated machinery (Fassuliotis, 1979). They can also be included in crop rotation schemes to enhance the decline of nematode populations in the soil (Lamberti, 1979).

Lycopersicon peruvianum (L.) Mill. was the wild source of resistance to root-knot nematodes (Bailey, 1941) from which all resistant varieties are currently derived (Thomason and Smith, 1957). Embryo cultures were used to overcome incompatibility of the wild species with varieties (*L. esculentum* Mill.) and thus obtain hybrids (Smith, 1944) with resistance to *M. incognita* (Kofoid *et* White) Chitw., *M. javanica* (Treub) Chitw. and *M. arenaria* (Neal) Chitw. (Good, 1972). Over 65 tomato varieties resistant to the above *Meloidogyne* spp. have been developed so far.

Varieties resistant to *Meloidogyne* spp. should be introduced into a crop rotation only after an investigation has been made of the races occurring in the area. Moreover, variation may occur between populations of the same species in aggressiveness and pathogenicity to the same host (Di Vito and Lamberti, 1976). Therefore, a study was undertaken to evaluate the resistance of four Italian

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inbred lines and six varieties of tomato to five Italian populations of root-knot nematodes by comparing their reactions with that of the susceptible tomato « Roma VF ».

Materials and Methods

The following Italian populations of root-knot nematodes were tested: *M. incognita* race 1 and *M. hapla* Chitw. collected from sugar beet fields at Castellaneta (Taranto) and Lesina (Foggia) respectively, *M. javanica* from tomato at Trepuzzi (Lecce), *M. incognita* race 2 from tobacco at Scafati (Napoli) and *M. arenaria* from peach at Bovolone (Verona). All were reared as pure cultures on tomato « Rutgers » in a glasshouse. Seeds of the four resistant tomato inbred lines (81305/1, 81305/2, 81305/3 and 81305/4) of the Istituto di Nematologia Agraria of Bari, and the seven varieties (Brech, Rossol, Piersol, VFN8, Nematex, Atkinson and Roma VF) were germinated in plastic trays containing steam sterilized loam soil. Single 34 day old seedlings were transplanted into 500 ml clay pots containing the same soil mixture and four days later seven plants of each line or variety were each inoculated with 3500 eggs and juveniles of one of the populations of *Meloidogyne*. The inoculum was obtained by the NaOCl method (Hussey and Barker, 1973) and introduced into five holes around the tomato root. Inoculated plants were then arranged in a randomized block design on benches in the glasshouse with 23-25 °C days and 15-18 °C night temperatures, watered daily and fertilized as required.

After 45 days, each root system was removed from the pots, washed free of soil and the extent of galling was estimated (Taylor and Sasser, 1978). Eggs and juveniles from the egg masses and different developmental stages of the nematode were then extracted from the roots by the NaOCl method or by maceration and centrifugal floatation (Coolen, 1979), respectively. All the data were compared by analysis of variance.

Results and Discussion

The galling index (GI) (Table I) shows that galls were produced on Roma VF by all four species of *Meloidogyne*. Little or no galling

occurred on the other lines and varieties in response to *M. incognita*, *M. javanica* or *M. arenaria*, but each was susceptible to *M. hapla*. There were no significant differences among GI values of Roma VF, VFN 8, Atkinson and Brech inoculated with *M. hapla*; GI of Roma VF was significantly higher ($P = 0.05$) than that of the four lines and varieties Rossol, Piersol, and Nematex. No significant differences were observed among GI values of the four lines and the varieties Rossol, Piersol and Nematex infested with *M. hapla*. Finally GI of Roma VF infested with *M. incognita* race 1, *M. javanica* and *M. arenaria* was significantly higher ($P = 0.01$) than that of those plants inoculated with *M. incognita* race 2 and *M. hapla*.

Many eggs and juveniles of all *Meloidogyne* spp. were observed on Roma VF. None was formed on any of the other lines or varieties except for a very few *M. hapla* on the variety Atkinson. A final population (Pf) of 2479 *M. arenaria* on Roma VF was significantly higher ($P = 0.01$) than that of the other populations tested. The Pf of *M. javanica* (1642) was significantly higher ($P = 0.01$) than that of *M.*

Table I - Gallings index and reaction of lines and varieties of tomato inoculated with five Italian populations of *Meloidogyne* species.

Varieties and lines	MELOIDOGYNE POPULATIONS					LSD	
	<i>M. incognita</i>		<i>M. javanica</i>	<i>M. arenaria</i>	<i>M. hapla</i>	0.05	0.01
	Race 1	Race 2					
81305/1	0.3a R	0 R ^b	0 R	0 R	2.8 S	0.4	0.55
81305/2	0 R	0 R	0.4 R	0.4 R	2.4 S	0.49	0.66
81305/3	0 R	0 R	0 R	0.3 R	2.8 S	0.34	0.46
81305/4	0.6 R	0 R	0 R	0.1 R	2.5 S	0.4	0.55
Brech	0 R	0 R	0.3 R	0.1 R	3.2 S	0.42	0.57
Rossol	0 R	0 R	0 R	0 R	2.3 S	0.22	0.29
Piersol	0.1 R	0 R	0 R	0.1 R	2.7 S	0.52	0.7
VFN 8	0 R	0 R	0 R	0 R	3.7 S	0.24	0.33
Nematex	0.3 R	0 R	0 R	0.1 R	3.0 S	0.5	0.67
Atkinson	0.1 R	0 R	0 R	0 R	3.2 S	0.33	0.44
Roma VF	5.0 S	2.8 S	5.0 S	5.0 S	3.8 S	0.38	0.51
LSD 0.05	0.33	0.11	0.11	0.36	0.69		
0.01	0.44	0.15	0.15	0.48	0.93		

^a 0 = no galls; 1 = 1-2 galls; 2 = 3-10; 3 = 11-30; 4 = 31-100; and 5 = more than 100 galls per root system.

^b R = resistant, gallings index < 2; S = Susceptible, gallings index ≥ 2.

incognita race 1 (633) and race 2 (290) and of *M. hapla* (233). Because of the short duration of the experiment the egg mass production was very poor.

The number of nematodes in the root systems (Table II) indicated that significantly more ($P = 0.01$) developmental stages were detected in Roma VF than in all the other lines and varieties. Numbers of *M. arenaria* on Roma VF were significantly ($P = 0.05$) higher than that of *M. javanica*, *M. hapla* and *M. incognita* race 2. Specimens of *M. hapla* were also observed in all lines and varieties.

The results of this experiment indicate that lines (81305/1, 81305/2, 81305/3 and 81305/4) and varieties (Brech, Rossol, Piersol, VFN 8, Nematex and Atkinson) are resistant to the Italian populations of *M. incognita* race 1 and race 2, *M. arenaria* and *M. javanica* tested, but not to *M. hapla* (Table I). Triantaphyllou and Sasser (1960) and Netscher (1970, 1977) reported resistance breaking biotypes of *M. incognita*, *M. javanica* and *M. arenaria*. The four inbred lines and six varieties of tomato which were tested in this study indicate that they are resistant to the Italian populations of *M. incognita*, *M. javanica* and *M. arenaria*. The population of *M. arenaria* was the most aggressive on Roma VF, followed by those of *M. javanica*, *M. incognita* race 1, *M. hapla* and *M. incognita* race 2.

Table II - Number of nematodes per root system in lines and varieties of tomato inoculated with five Italian populations of *Meloidogyne* species.

Varieties and lines	MELOIDOGYNE POPULATIONS					LSD	
	<i>M. incognita</i>		<i>M. javanica</i>	<i>M. arenaria</i>	<i>M. hapla</i>	0.05	0.01
	Race 1	Race 2					
81305/1	0.1	0	0	0	8.5	2.9	4
81305/2	0	0	0	0	11.6	3.2	4.3
81305/3	0	0	0	0	13.8	1.7	2.4
81305/4	0	0	0	0	8.5	2.9	3.9
Brech	0.1	0	0	0	24	6.9	9.3
Rossol	0	0	0	0	7.5	3	4
Piersol	0.3	0	0	0	15	6.2	8.3
VFN 8	0.1	0	0	0	32.9	11.8	15.9
Nematex	0	0	0	0	26.7	12	16.2
Atkinson	0	0	0	0	20.2	6.2	8.4
Roma VF	119.4	20.5	104.5	153.1	51.8	19.4	26.1
LSD 0.05	5.6	1.6	4.7	7.1	18.8		
0.01	7.5	2.2	6.3	9.5	21		

Similar results were obtained by Di Vito and Lamberti (1976) on tomato varieties Brech, Rossol, VNF 8 and Roma VF infested with twelve Italian populations of *M. incognita*. Hadisoeganda and Sasser (1982) also observed very high degree of resistance in tomato varieties Atkinson, Rossol and VFN 8 to four races of *M. incognita*, two races of *M. arenaria* and *M. javanica* and susceptible reaction of Roma VF to all these *Meloidogyne* populations.

S U M M A R Y

Responses of four Italian inbred lines (81305/1, 81305/2, 81305/3 and 81305/4) and seven varieties (Brech, Rossol, Piersol, VFN 8, Atkinson, Nematex and Roma VF) of tomato, to five Italian *Meloidogyne* populations of *M. incognita* race 1 and race 2, *M. javanica*, *M. arenaria* and *M. hapla* were investigated under glasshouse condition at 23-25°C day and 15-18°C night temperatures. Except Roma VF, all the lines and varieties of tomato were resistant to *M. incognita*, *M. javanica* and *M. arenaria* and susceptible to *M. hapla*. Roma VF was susceptible to *M. hapla* population too.

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