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THE EFFECT OF *RHIZOCTONIA SOLANI*, *SCLEROTIUM ROLFSII*, AND *VERTICILLIUM DAHLIAE* ON THE RESISTANCE OF TOMATO TO *MELOIDOGYNE INCOGNITA*

by
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During the course of screening tomatoes (*Lycopersicon esculentum* Mill) for sources of resistance to root-knot nematode, *Meloidogyne incognita* (Kofoid *et* White) Chitw., Hasan (1983) found that cultivars and breeding lines, which were variously immune to moderately resistant, performed less well under microplot conditions. Examination of soil and root samples (Riker and Riker, 1936) from the microplots revealed the presence of *Rhizoctonia solani* Kuehn, *Sclerotium rolfsii* Saccardo and *Verticillium dahliae* Kleb. There are several reports implicating root-knot/lesion nematodes in the breakdown of resistance of tomato, egg-plant, cotton and peppermint plants to *Fusarium/Verticillium* wilt disease (Bergeson, 1975; Faulkner and Skotland, 1965; Faulkner *et al.*, 1970; Good and McGuire, 1967; Harrison and Young, 1941; Jenkins and Coursen, 1957; McKeen and Mountain, 1960; Mountain and McKeen, 1960; Southards and Chambers, 1970; Young, 1939). However, there is little information on the role of soil-borne fungal pathogens in reducing the resistance of crop cultivars to root-knot nematode infection. Therefore, we investigated the effect of *R. solani*, *S. rolfsii* and *V. dahliae* on resistance of tomato to *M. incognita*.

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Materials and Methods

Tomato cultivars used were immune (F-24-C8), resistant (Heinz-1409) or moderately resistant (T-4) under pot conditions. Stock cultures of *R. solani, S. rolfsii* and *V. dahliae* isolated from diseased plants and soil samples were maintained aseptically at room temperature in 500 ml conical flasks containing 150 ml of Richard's liquid medium (Riker and Riker, 1936). Seedlings of the three tomato cultivars were raised in autoclaved soil and then transplanted singly at the 3-leaf stage in 10 cm clay pots filled with a soil — sand — compost mixture (3:1:1). A week after transplanting, one gram inoculum (mycelial mat macerated and strained through cheese cloth) of each fungus was pipetted separately into the soil around each seedling. A suspension of 500 freshly hatched 2nd stage *M. incognita* larvae was added to each pot either immediately, or one or two weeks after

Table I - *Effect of* Rhizoctonia solani, Sclerotium rolfsii *and* Verticillium dahliae *on reducing the resistance of three cultivars of tomato to infection of root-knot nematode under greenhouse conditions.*

Treatment	Host reaction *		
	Cultivars		
	F-24-C8	Heinz-1409	T-4
Nematode alone	I	R (0)	MR (830 a)
Rhizoctonia + Nematode (Simultaneously)	—	—	S (1015 ab)
Rhizoctonia + Nematode (1 week prior to nematode)	—	—	S (1105 b)
Rhizoctonia + Nematode (2 week prior to nematode)	—	—	S (1580 c)
Sclerotium + Nematode (Simultaneously)	—	MR (410 a)	—
Sclerotium + Nematode (1 week prior to nematode)	—	MR (950 b)	—
Sclerotium + Nematode (2 week prior to nematode)	—	S (1375 d)	—
Verticillium + Nematode (Simultaneously)	R (0)	MR (615 a)	S (1610 c)
Verticillium + Nematode (1 week prior to nematode)	R (0)	S (1280 b)	S (1575 c)
Verticillium + Nematode (2 week prior to nematode)	MR (1080)	S (2044 c)	S (3530 d)

— = Resistance unaffected; *I = Immune; R = Resistant; MR = Moderately resistant; S = Susceptible; Values in parentheses indicate eggs/g root; values in the same columm followed by same letter do not differ significantly (P=0.05) by Duncan's multiple range test.

inoculation with the fungi. Each treatment was replicated five times and the pots were arranged in a randomized design on the greenhouse bench. Forty days after inoculation with the nematodes, plants were uprooted, the roots washed in running water and the number of galls and egg masses counted. The development of larvae within the roots and production of eggs were determined by treating the roots with 4% sodium hypochlorite solution or staining in lactophenol cottonblue and comminuting in a Waring blender (Southey, 1970). Galling and host reactions were recorded: no galls, no nematode development in the roots = Immune; few galls (1-25) without egg masses = Resistant; few galls (1-25) with eggmasses = Moderately resistant; moderate galling (26-50) with eggmasses = Susceptible; severe galling (more than 50) with numerous eggmasses = Highly susceptible.

Results and Discussion

The resistance to root-knot nematode of each of the three cultivars was reduced in all *V. dahliae* treatments. *S. rolfsii*, but not *R. solani*, reduced the resistance of Heinz-1409 and *R. solani*, but not *S. rolfsii*, reduced the resistance of T-4. Most of the treatments were found to give similar reaction to *M. incognita*. Egg production was highest where seedlings were inoculated with the fungi two weeks prior to nematode inoculation, irrespective of the fungus or the cultivar. In some cases, when seedlings were inoculated with *S. rolfsii* or *V. dahliae* one week prior to inoculation with nematode, egg production was also increased. The breakdown of resistance to root-knot nematode in tomato cultivars at high soil temperature have been reported by Dropkin (1969) and Holtzmann (1965). To the best of our knowledge this is the first report of pathogenic fungi reducing immunity or resistance of tomato cultivars to root-knot nematodes. It is evident from the present study that the possible role of soil-borne pathogenic fungi should be considered when identifying and selecting prospective sources of resistance to root-knot nematodes.

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SUMMARY

The effect of *Rhizoctonia solani, Sclerotium rolfsii* and *Verticillium dahliae* on expression of resistance to root-knot nematode, *Meloidogyne incognita* in tomato cultivars F-24-C8 (immune), Heinz-1409 (resistant) and T-4 (moderately resistant) was studied under greenhouse conditions. *V. dahliae* reduced the resistance of all theree cultivars, *R. solani* reduced the resistance only of T-4 and *S. rolfsii* only of Heinz-1409. Egg production was highest in each treatment when nematodes were added two weeks before fungal inoculation, compared with one week before or simultaneously.

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