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CORRELATION OF RESISTANCE AND SUSCEPTIBILITY OF TOMATO CULTIVARS TO *ROTYLENCHULUS RENIFORMIS* WITH LEVELS OF PHENOLICS AND AMINO ACIDS PRESENT

by
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Summary. Phenolics and amino acids were high in tolerant cultivars of tomato followed by susceptible and highly susceptible cultivars. Percentage increase in both phenolics and amino acids were high in tolerant and lowest in highly susceptible cultivars when inoculated with *Rotylenchulus reniformis*. There was positive correlation between degree of nematode resistance and amounts of phenolics and amino acids present in tomato cultivars.

Correlation between the degree of resistance to a pathogen and the phenolics present in the plant has been observed by various workers (Giebel, 1970; Giebel, 1974; Mahmood and Saxena, 1986). On the other hand Siddiqui and Husain (1992) reported positive correlation between peroxidase activity and resistance response of chickpea plants to *Meloidogyne incognita*. Peroxidase is known to catalyze several reactions including those involved in the metabolism of phenols and indoles. Positive correlation of peroxidase and resistant response of the plant was due to increase in the phenolics of the plant.

The role of amino acids in the disease resistance has also been identified by various workers (Farkas and Kiraly, 1962; Hanks and Feldman, 1963; Howell and Krusberg, 1966; Singh *et al.*, 1978). Thymine, azathymine, histidine, isoleucine, methionine and serine have been reported to prevent the development of *Puccinia graminis tritici* and *P. recondita* (Fuchs and Bauermeister, 1958). Plant resistance can also be affected by phenylalanine and tyrosine (Farkas and Szirmai, 1969, Rahe *et al.*, 1969).

In the present study 11 tomato (*Lycopersicon esculentum* Mill.) cultivars were screened against *Rotylenchulus reniformis* Linford *et* Oliveira and their phenolics content and amino acids correlated with the resistance-susceptibility response of the cultivars.

Materials and methods

Two weeks old seedlings of 11 cultivars of tomato, raised in autoclaved soil, were transplanted into 15 cm earthen pots with 1 kg autoclaved soil, sand and compost mixture (70:20:10) and a week later each pot was inoculated with 1000 immature females of *R. reniformis*. There were six replicates of each treatment. The pots were randomised on glasshouse bench. Uninoculated plants served as control.

After 60 days plant growth in terms of the dry shoot weight of the plants was determined and the nematodes in the soil and in the roots were counted. The soil nematode population was estimated by Cobb's sieving and decanting technique followed by Baermann funnel. Females in the roots were counted by staining the roots in cotton blue-lactophenol. Numbers of egg-masses from the roots were hand picked with the help of forceps and were placed for 5 minutes in sodium hypochlorite. The sodium hypochlorite was stirred with a glass rod and the egg suspension poured onto a 350 mesh sieve. The eggs washed from the sieve with distilled water were than counted.

Rating of resistance/susceptibility were done using the scale of Husain (1986) with slight modification where *0* = no reduction in dry shoot weight, no nematode reproduction (*Immune*); *1* = reduction in dry shoot weight up to 5%, reproduction factor (RF) 0.1-1.0 (*Resistant*); *2* = reduction in dry shoot weight 5.1-10.0%, RF = 1.1-3.0 (*Moderately resistant*); 3 = reduction in dry shoot weight 10.1-15.0%, RF = 3.1-5.0 (*Tolerant*); *4* = reduction in dry shoot weight 15.1-25%, RF = 5.1-7.0 (*Susceptible*); *5* = reduction in dry shoot weight > 25%, RF = > 7 (*Hightly susceptible*).

Total phenols were estimated from 100 mg of dry powdered sample of the whole plant by Method of Biehn

TABLE I - *Correlation between resistance and susceptibility of tomato cultivars* to Rotylenchulus reniformis *with levels of phenolics and amino acids present.*

Cultivars	Treatments	Dry shoot Weight (g)	% red. in dry. shoot wt.	Nematode population	Nematode multiplication (RF)	Reaction	Total phenols	% increase in phenols	Total amino acid	% incr. in amino acid
Prit chard	C	7.3	–	–	–	–	0.590	–	0.460	–
	R	6.4	12.3	3120	3.1	T	0.804	36.3	0.576	25.2
C.D. 5%		0.2					0.062		0.036	
Flower seeds	C	7.1	–	–	–		0.576	–	0.446	–
	R	6.1	14.1	3688	3.7	T	0.769	33.5	0.545	22.2
C.D. 5%		0.3					0.041		0.020	
Best of all	C	8.6	–	–	–		0.520	–	0.437	–
	R	6.9	19.8	5215	5.2	S	0.680	30.8	0.530	21.3
C.D. 5%		0.2					0.048		0.042	
Fire ball	C	8.8	–	–	–		0.495	–	0.425	–
	R	6.9	21.6	5792	5.8	S	0.635	28.3	0.508	19.5
C.D. 5%		0.4					0.035		0.046	
Bonny best	C	9.5	–	–	–		0.474	–	0.412	–
	R	7.3	23.2	6784	6.8	S	0.605	27.6	0.489	18.7
C.D. 5%		0.3					0.024		0.038	
Perfection	C	8.5	–	–	–		0.465	–	0.396	–
	R	6.3	25.9	7102	7.1	HS	0.590	26.9	0.465	17.5
C.D. 5%		0.5					0.036		0.028	
Meerut local	C	8.9	–	–	–		0.450	–	0.388	–
	R	6.3	29.2	7690	7.7	HS	0.570	26.7	0.456	17.5
C.D. 5%		0.4					0.024		0.018	
Kanpur local	C	8.8	–	–	–		0.435	–	0.375	–
	R	6.0	31.8	8330	8.3	HS	0.545	25.3	0.438	16.8
C.D. 5%		0.3					0.044		0.040	
Early special	C	8.7	–	–	–		0.402	–	0.352	–
	R	5.8	33.3	8872	8.9	HS	0.500	24.4	0.415	17.9
C.D. 5%		0.4					0.035		0.046	
Ghazipur local	C	8.7	–	–	–		0.381	–	0.345	–
	R	5.6	35.6	9576	9.6	HS	0.465	22.0	0.402	16.5
C.D. 5%		0.4					0.048		0.032	
Lucknow local	C	9.3	–	–	–		0.370	–	0.332	–
	R	5.8	37.6	10215	10.2	HS	0.440	18.9	0.380	14.5
C.D. 5%		0.5					0.048		0.026	

C = Control; R = *Rotylenchulus reniformis.*

et al. (1968) using Folin ciocalteau reagent (Bray and Thorpe, 1954) in a Bausch and Lomb spectronic-20 colorimeter at 660 nm. Total free amino acids were estimated using modified ninhydrin reagent (Moore and Stein, 1954) at 570 nm. The amounts of phenols and amino acids were determined from the standard curves plotted for paracresol and DL-leucine respectively. The data were analysed statistically and critical differences were calculated at 5% level.

Results and conclusions

None of the cultivars was found resistant or moderately resistant to *R. reniformis* as determined on the basis of reduction in dry shoot weight and nematode reproduction. Only two cultivars (Pritchard and Flower seeds) were tolerant while three cultivars (Best of all, Fireball and Bonny best) were susceptible. The remaining ones were highly susceptible (Table I).

There were higher amount of phenolics and amino acids in tolerant cultivars than in susceptible and highly susceptible cultivars. There was an increase in phenolic contents and amino acids after inoculation with *R. reniformis* which was also more in tolerant cultivars than in susceptible and highly susceptible cultivars (Table I). Positive correlation was noted with increase in phenolics and amino acids and the degree of resistance present in the cultivars. Nematode multiplication was inversely proportional to the amount of phenolic and amino acid content present in the cultivars. Nematode multiplication was maximum in tomato cultivar Lucknow local and minimum in Pritchard. Cultivars having high phenolics and amino acid showed less reduction in plant growth due to *R. reniformis.*

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