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PHENOLIC COMPOUNDS IN TOMATO SUSCEPTIBLE AND RESISTANT TO *MELOIDOGYNE INCOGNITA* (KOFOID *ET* WHITE) CHITWOOD

by

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Increased levels of phenolic compounds have been correlated with the resistance of plants to various nematode diseases (Giebel, 1970; Pi and Rohde, 1967). The present investigation was made to assess the phenolic constituents in the leaves and roots of two tomato cultivars resistant and susceptible respectively to the root-knot nematode, *Meloidogyne incognita* (Kofoid *et* White) Chitwood. Earlier studies by other workers were confined to the roots only, but as the phenolic compounds are biosynthesised in the leaves and are then translocated to the roots, investigation of phenolic compounds of the leaves was also considered important.

MATERIAL AND METHODS

The local susceptible variety S-12 and the root-knot resistant variety NMR-1 were used in the experiments. Seedlings were grown in steam sterilised soil and the first samples taken four weeks later, after which the plants were transplanted in pots. Another sample was taken after nine weeks. Phenolic compounds were extracted from dried and powdered roots and leaves with 80 percent aqueous methanol by refluxing for one hour (1:50 w/v). Total and ortho-dihydroxy phenols were determined by the method of Swain and Hillis (1959) and Nair and Vaidyanathan (1964) respectively. Individual phenols were separated by chromatography on Whatman paper no. 1.

Table I - *Qualitative analysis of the polyphenolic constituents of roots and leaves ofNMR-1 and S-12 varieties of tomato.*

Tentative identification	Rf values in		4 weeks old				9 weeks old			
	B.A.W. (4:1:5)	2% AcOH	Leaves		Root		Leaves		Root	
			NMR-1	S-12	NMR-1	S-12	NMR-1	S-12	NMR-1	S-12
Unidentified flavone	0.82	0	+	+	+	+	+	+	+	+
Trans-Isochlorogenic acid	0.74	0.1	—	—	++	+	—	—	+	+
3-0-feruoyl quinic acid	0.74	0.29	+	+	+	+	++	++	+	+
Ferulic acid	0.75	0.34	+	+	+	+	++	++	+	+
Naringenin - 7-rhamnoglucoside	0.75	0.40	+	+	+	+	+	+	+	+
p-coumaric acid	0.77	0.55	+	+	+	+	+	+	+	+
Cis-caffeic acid	0.76	0.62	++	+	++	+	+++	++	++	+
Unidentified flavonol glycoside	0.78	0.73	+	+	+	+	+	+	+	+
Trans-chlorogenic acid	0.63	0.62	+++	++	++	+	+++	++	++	+
Cis-chlorogenic acid	0.66	0.78	+++	++	++	+	+++	++	++	+
Trans-neo-chlorogenic acid	0.56	0.67	++	+	—	—	+++	++	—	—
Cis-neo-chlorogenic acid	0.54	0.77	++	+	—	—	+++	++	—	—
Unidentified flavonol glycoside	0.60	0.22	+	+	—	—	+	+	—	—
-do-	0.58	0.42	+	+	—	—	+	+	—	—
Rutin	0.47	0.40	+	+		—	++	++	—	—
Cis-Isochlorogenic acid	0.70	0.16	—	—	++	+	—	—	+	+
Unidentified flavonol	0.60	0.08	—	—	+	+	—	—	+	+
Luteolin-7-glucoside	0.39	0.03	—	—	+	+	—	—	+	+
Unidentified flavonol	0.37	0.23	—	—	+	+	—	—	+	+
-do-	0.39	0.57	—	—	—	—	—	—	+	+
Unknown	0.45	0.64	—	—	—	—	—	—	+	+

Visual concentration: +++ Very high; ++ High; + Low; — Nil.

Table II - *Quantitative analysis of the polyphenols (μg/g dry wt. basis) in the roots and leaves of NMR-1 (resistant) and S-12 (susceptible) varieties of tomato (average of triplicate estimations).*

	Four weeks old growth				Nine weeks old growth			
	Leaves		Roots		Leaves		Roots	
	NMR-1	S-12	NMR-1	S-12	NMR-1	S-12	NMR-1	S-12
Total phenols	6062	3437	2275	1775	6812	6656	3906	3375
Total ortho-dihydroxy phenols	2062	787	140	110	3350	1862	375	312

The chromatograms were developed in n-butanol: acetic acid: water (4:1:5) in the first dimension and 2% acetic acid in the second. The tentative identification of phenolic compounds was made according to Harborne (1967).

RESULTS AND DISCUSSION

The qualitative composition of phenolic compound in four and nine week old plants of resistant and susceptible varieties is given in tables I and II respectively. The phenolic make up of resistant and susceptible varieties was found to be the same, though the concentration of chlorogenic and neo-chlorogenic acids (cis and trans) and caffeic acids (cis and trans) were found to be greater in roots and leaves of the resistant variety than the susceptible one. The phenolic make up of roots and leaves different significantly. In nine week old plants, similar results were observed, though there was a relative increase in the concentration of phenolic compounds. Quantitatively, both leaves and roots of NMR-1 had higher concentration of total phenols and ortho-dihydroxy phenols, though this difference in total phenols narrowed down in older plants, possibly due to translocation from leaves and their accumulation in the roots. Yet the leaves of the resistant variety had a higher level of ortho-dihydroxy phenolic compounds. In roots, the relative concentration of total phenols and ortho-dihydroxy phenols was maintained. Wilski and Giebel (1971) recorded identical observations in roots of potato resistant to the golden cyst nematode.

The concentration of total phenols and ortho-dihydroxy phenols was greater in nine week old than in four week old plants. The increased level of caffeic acids is likely to be due to hydrolysis of chlorogenic acid and 3-caffeoyl quinic acid. High level of phenolics in leaves of the resistant variety suggests that phenolic compounds after their biosynthesis in leaves are translocated to roots to confer resistance to nematode infections.

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