

## POLYPHENOL CONTENT IN THE FEEDER ROOTS OF NEMATODE-TOLERANT AND SUSCEPTIBLE TEA CLONES IN RELATION TO INFESTATION BY *PRATYLENCHUS LOOSI* LOOF

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A significant increase in the total free polyphenol content in the feeder roots of nematode-tolerant clones was observed following infestation with the root-lesion nematode *Pratylenchus loosi* Loof. On the other hand, a decrease in the total free polyphenol content was observed in nematode-susceptible clones. Polyphenols, therefore, seem to be playing an important role in the host-parasite relationship of tea and *P. loosi*.

### INTRODUCTION

A series of tea clones have been selected on the basis of natural tolerance or resistance to the root-lesion nematode, *Pratylenchus loosi* (Hutchinson 1960; Kerr 1965). Several clones are now available which range from highly resistant to extremely susceptible. No attempts have, so far, been made to study the possible biochemical or physiological basis for resistance to *P. loosi*. Biochemical investigations have been carried out on other crops and other species of nematodes (Feldman & Hanks 1964; 1968; 1971; Doney *et al.* 1970). Polyphenols have been found to play a significant role in imparting resistance to citrus plants infested with the burrowing nematode, *Radopholus similis* (Feldman & Hanks 1968). The present investigation was undertaken to study the possible role of polyphenols in the host-parasite relationship of *P. loosi* and tea clones.

### MATERIALS AND METHODS

Twelve clones, ranging from highly resistant to extremely susceptible were selected for the present investigation. The clones were TRI 62/9, 1526, 2016, 2024, 2025, 2043, 2142, N 2, K 145, DT 95, BR 1 and G 7/1. Twelve-month old plants of uniform growth, were planted into large cement pots (30 x 30 x 30 cm) filled with nursery soil (pH 4.8, organic matter 15.8 %). Each clone was replicated 10 times and the pots were arranged in a randomized block design. Six months after establishing the plants in pots, half the number of replicates of the respective clones were inoculated with a suspension of 3,500 nematodes per pot.

Fertilizer applications were made regularly with the TRI fertilizer mixture T 200, according to regular estate practices for young tea (Tolhurst 1961). The plants were removed for assessments 18 months after the commencement of the experiment. The feeder roots from each plant were cut off, washed carefully and stored

at -20°C for biochemical analysis. Total polyphenols were estimated by the Folin Ciocalteu's reagent and the flavanol content by the vanillin reagent method (Swain & Hill 1959).

In order to rule out possible changes in the polyphenol content in root tissue due to physical damage during processing, root tissues of the different clones were incubated following partial maceration and then assessed for changes in the total polyphenol content.

## RESULTS AND DISCUSSION

The results of analysis of the total free polyphenol content in the feeder roots of the test plants are presented in Table 1, along with the nematode tolerance ratings (Sivapalan 1969). It is seen that all the clones that have been rated as having good nematode tolerance or moderate tolerance showed a marked increase in the total free polyphenol content with nematode infestation. The clones rated as nematode susceptible showed a marked reduction in the total free polyphenol content with infestation. The clone DT 95, N 2 and TRI 62/9, which have been rated as having good tolerance showed the greatest increase in polyphenol content following infestation ( $P < 0.05$ ). On the other hand, the clone TRI 1526, rated as an extremely susceptible clone, has shown the least free polyphenol content with nematode infestation ( $P < 0.05$ ). It is interesting to note that in general, the clones rated as moderately tolerant, showed an increase in the total free polyphenol content with infestation but this increase was not statistically significant. Likewise, the clones rated as moderately susceptible, showed a decrease in the polyphenol content with infestation, but this decrease was again, not statistically significant.

The results of analysis of the free flavanol content in the feeder roots of the test plants are presented in Table 2.

TABLE 1 — *Mean total free polyphenol content in the feeder roots of plants infested with Pratylenchus loosi and in uninoculated control plants*

clone	mg total polyphenols /g dry weight of feeder roots			tolerance index
	control (C)	infested (I)	(I) — (C)	
TTI 62/9	24.72	37.43	12.71	++
N 2	22.53	34.78	12.25	++
DT 95	25.33	35.24	9.91	++
TRI 2016	33.41	41.44	8.03	++
TRI 2142	29.64	35.77	6.13	++
K 145	30.95	36.63	5.68	+
TRI 2025	32.45	36.45	4.00	+
G 7/1	33.04	35.60	2.56	+
BR 1	20.03	19.40	-0.63	-
TRI 2043	32.79	30.23	-2.56	-
TRI 2024	21.13	17.58	-3.55	-
TRI 1526	27.72	11.19	-16.53	--
LSD ( $P=0.05$ )			6.42	

++ Good nematode tolerance  
 + Moderate nematode tolerance  
 - Nematode susceptible  
 -- Extreme susceptibility to nematodes

TABLE 2 — *Mean total free flavanol content in feeder roots of plants infested with Pratylenchus loosi and in uninoculated control plants*

Clones	mg total flavenols /g dry weight of feeder roots			tolerance index
	control (C)	infested (I)	(I)-(C)	
TRI 62/9	10.49	17.36	6.87	++
N 2	14.50	14.90	0.40	++
DT 95	16.55	22.60	6.05	++
TRI 2016	13.57	19.36	5.79	++
TRI 2142	23.29	23.13	-0.16	+ +
K 145	15.11	27.89	12.78	+
TRI 2025	22.33	19.21	-3.12	+
G 7/1	21.23	19.21	-2.02	+
BR 1	10.92	11.64	0.72	-
TRI 2043	20.51	17.57	-2.94	-
TRI 2024	14.95	10.44	-4.51	-
TRI 1526	20.27	7.02	-13.25	--
LSD ( $P=0.05$ )			5.94	

- ++ Good nematode tolerance
- + Moderate nematode tolerance
- Nematode susceptible
- Extreme susceptibility to nematodes

In general, many of the clones but not all rated as nematode tolerant, showed an increase in the free flavanol content with nematode infestation, whereas many of those rates as susceptible showed a decrease.

Only certain polyphenols with undeactivated 1, 3 or 1, 3, 5—hydroxyl substituted rings respond to the vanillin reagent (Swain & Goldstein 1964). The response to nematode infestation does not appear to be confined to this class of compounds, but is a response by the total free polyphenols in general. The specific polyphenols are to be elucidated in future studies.

On checking the possible changes in the total free polyphenol content due to physical damage, a general reduction in the polyphenols was observed in both the tolerant and susceptible clones. This reduction in the free polyphenol content could be due to condensation and coagulation with amino acids and proteins. The reduction in polyphenol content in the nematode-infested susceptible clones could be due to such condensation reactions. The increase in the total free polyphenol content of nematode-infested tolerant clones appears therefore to be a positive physiological response to nematode infestation.

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