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CHANGES IN TOTAL PHENOLIC CONTENT AND POLYPHENOL OXIDASE ACTIVITY IN BRINJAL *(SOLANUM MELONGENA)* AS A RESULT OF LITTLE LEAF INFECTION

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Changes in phenol content and polyphenol oxidase activity in four brinjal varieties infected with little leaf disease were studied at different stages of disease development. Both phenol content and polyphenol oxidase activity decreased in the three varieties, at all stages of the disease. However, the variety Pusa Purple Long reacted in a different way.

INTRODUCTION

Plant diseases bring about radical metabolic changes in the host tissues and the little leaf disease of brinjal is no exception (Diener, 1963; Goodman *et al.*, 1966; Kapur & Weathers, 1971; Barbara & Wood, 1972). Effects of little leaf disease, on the respiration and enzymatic activities of brinjal *(Solanum melongena)* at a particular stage of infection were studied earlier (Mitra *et al.*, 1976). In the present paper, effect of little leaf disease on total phenol content and on polyphenol oxidase activity in four brinjal varieties during the disease development are reported.

MATERIALS AND METHODS

Four brinjal varieties—Pusa Purple Long (PPL), Pusa Purple Round (PPR), Arka Navneet (AN) and T_2—were selected as test plants. Healthy and infected plants were raised by following the methods described earlier (Mitra *et al.*, 1976). Uniform and comparable leaf samples were obtained 20, 30, 40 and 50 days after the initial symptoms were observed.

Samples were collected in the early hours, washed thoroughly and blotted dry. Leaf discs of 8 mm were punched off. For phenol estimation the discs were dried at 80°C for 24 hours, when a constant dry weight was obtained. Polyphenol oxidase (PPO) activity was assessed following the method of Matta and Dimond (1963) with some modification. Enzyme activity was expressed as the change in optical density (Δ OD) at 410 nm/2.5 mg of fresh sample for 15 sec. and was measured in a Hitachi 124 spectrophotometer.

Total phenolic content was estimated according to Bray and Thorpe (1954). Phenol was extracted by boiling 100 mg of dry sample in 10 ml of 95% ethanol in

a water bath for 5 minutes. It was then centrifuged at 2000 r.p.m. and the supernatant decanted off. The process was repeated twice. The ethanol extraction was pooled and evaporated to remove the alcohol and then diluted to 100 ml with distilled water.

The phenol extract was then allowed to react with Folin-Ciocalteu reagent which was prepared according to A.O.A.C. (1965). Nine millilitre of distilled water, 1 ml of reagent and 1 ml of extract were thoroughly mixed and allowed to stand for 3 min. One millilitre of 20% $Na_2 CO_3$ was mixed with the reaction mixture and heated in a boiling water bath for 5 min. when blue colour developed. The mixture was cooled, filtered and the absorbance was measured in a Klett Summerson Colorimeter using red filter. The amount of phenol present was calculated from the standard curve for phenol.

Results and Discussion

Total phenol content (Table I) and PPO activity (Table II) decreased in diseased leaf tissues of PPR, T_2 and AN at all stages of disease development. The response of PPL was different; PPO activity decreased at 20 and 30 days after infection while at the later stage it increased in the diseased tissue. Total phenol content

TABLE I

Total phenol content (mg/g of dry wt) of the host tissue as a result of little leaf infection

Variety	Period (in days) after infection			
	20	30	40	50
PPL				
Healthy	17	24	20	30
Diseased	32	34	32	26
% increase/decrease (+/−)	+88	+42	+60	−13
T_2				
Healthy	31	28	25	30
Diseased	22	21	21	21
% decrease (−)	−29	−25	−16	−33
PPR				
Healthy	19	25	17	17
Diseased	17	15	16	17
% decrease (−)	−10	−40	−6	0
Arka Navneet				
Healthy	24	20	20	22
Diseased	20	15	13	14
% decrease (−)	−25	−25	−35	−36

was higher in PPL up to 40 days after first symptom appearance and then decreased. Considerable difference in PPO activity and total phenol content was also observed among the varieties tested. The varieties T_2 and AN showed maximum reduction in PPO activities and total phenol content at 40 and 50 days after infection, respectively, while the same was observed at 50 and 30 days after infection, respectively, in case of PPR. In general, more reduction in phenol content and PPO activity was observed in round varieties PPR and AN, compared to that in long varieties PPL and T_2.

From the results presented in Tables I and II, it is evident that throughout the disease development, total phenol content and PPO activity decreased in all the brinjal varieties as a result of infection. However, it was interesting to note that the reaction of PPL was not in conformity with the other varieties tested. This anomaly in metabolic imbalance in PPL warrants further investigation.

Increase in enzymatic activities and higher phenol content in the host plants as a result of infection by fungi, bacteria and viruses has been reported by several workers (Farkas & Kiraly, 1958; Farkas *et al.*, 1960; Goodman *et al.*, 1966;

TABLE II

Polyphenol oxidase activity (OD) of the host plant as a result of little leaf infection

Variety	Period (in days) after infection			
	20	30	40	50
PPL				
Healthy	0·050	0·055	0·037	0·040
Diseased	0·030	0·040	0·050	0·055
% increase/decrease (+/−)	−40	−27	+35	+37
T_2				
Healthy	0·075	0·075	0·065	0·040
Diseased	0·055	0·055	0·045	3·040
% decrease	−27	−27	−30	0
PPR				
Healthy	0·045	0·050	0·045	0·040
Diseased	0·035	0·020	0·025	0·015
% decrease	−22	−60	−44	−62
Arka Navneet				
Healthy	0·055	0·085	0·057	0·047
Diseased	0·040	0·630	0·017	0·017
% decrease	−27	−65	−70	−64

Barbara & Wood, 1972). The present investigations showing the descrepancy in the metabolic imbalance is in compliance with our earlier studies (Mitra *et al.*, 1976), where respiration rate and activities of oxidative enzymes were reported to be decreased.

Since little leaf disease of brinjal is supposed to be caused by mycoplasma (Anjaneyulu & Ramakrishnan, 1969 ; Varma *et al.*, 1969), the discrepancy may be attributed to the casual agent of the disease. However, whether this typical alteration of metabolic activities in little leaf infected brinjal is a rule in case of mycoplasma diseases or an exception, remains to be seen.

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