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Deviation in nitrogen metabolism of Ridge gourd (*Luffa acutangula.* Roxb.) infected with three strains of water melon mosaic virus

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Abstract

The effect of three strains of Watermelon mosaic virus (WMV) infection on the nitrogen metabolism of *Luffa acutangula* leaves were studied and found that the infected levels of total nitrogen, total protein, nitrate and nitrate nitrogen and some of free amino acids (aspartic, proline, serine & cysteine) were higher in comparison to healthy plants, but ammonical nitrogen, threonine, alanine and lysine were low.

Key Words : *Ridge gourd, nitrogen metabolism, WMV.*

Introduction

A virus disease found to be most prevalent in eastern U.P. on *Luffa actangula* Roxb. was characterized by severe mosaic and reduction in leaf size, distortion and chlorotic spotting and considerable loss in the yield of crop. The causal agent was earlier reported to be a strain of watermelon mosaic virus (Shukla *et al.* 2004) Physiological disturbances which are induced by the viral infection have been reviewed by many workers (Bawden, 1959; Diener, 1963; Yarwood, 1967). In India, work on physiology of virus infected plants is studied for a very few diseases (Sadashivan.1963). The present investigation was therefore, undertaken to study the deviation in nitrogen metabolism of *Luffa acutangula* leaves infected by watermelon mosaic virus.

Materials and methods

Luffa acutangula (Roxb.) plants were used as host and three strains of Watermelon mosaic virus (WMV) viz., WMVVB, WMVMM and WMVC were used as pathogen. Five day old plants were taken into four groups, each containing fifteen seedlings. Seedlings of the first, second and third groups were inoculated mechanically by usual method with all three strains of Watermelon mosaic virus, while seedling of the fourth group served as healthy control. A random method of composite samplings was used for estimation and extraction were obtained from fifty days old healthy and diseased plants of uniform size. Three replicates were taken for each estimation and the average of same is reported in the results. Total nitrogen was determined in day samples by ash analysis method of Snell & Snell (1949.) Protein nitrogen and non-protein nitrogen by method of Pregal (1945). Nitrate nitrogen and nitrite nitrogen by Humphries (1956), ammocical nitrogen by Stronganov (1964) and free amino acid was determined according to Draper (1963).

Results and discussion

It is evident from the result given in Tables 1 and 2 that total nitrogen and protein were higher in diseased leaves, maximum in WMVVB followed by WMVMM and WMVC strain. The level of nitrate nitrogen was lower in the diseased leaves. Nitrite nitrogen was higher in diseased leaves but ammonical nitrogen was lower, in diseased samples. whereas protein nitrogen was higher in diseased leaves. Non-protein nitrogen was reduced in diseased leaves. Among free amino acids, aspartic serine, glutamic acid, cystine and proline were higher, but threonine, alanine, glycine and lysine were lower in diseased leaves.

It is now almost generally agreed the host viral infection of plants should be regarded as change in the nitrogen metabolism of the host (Bawden 1959). The increased levels of different nitrogenous fractions in virus infected plants is in accordance with previous observations (Diener, 1963, Harman *et.al.* 1970) Ammonical nitrogen decreased in virus infected leaves. Similar observations were found by Commoner & Dietz. (1952). Nambiar (1966) reported that the increased activity of nitrate reductase may be one of the reasons for increased nitrite nitrogen, as developed here due to viral infection.

Luffa acutangula Roxb. leaves infected with three strains of Watermelon mosaic virus reveals pronounced changes in the free amino acid pool. Infected leaves in comparison to healthy leaves contain higher levels of some amino acids (aspartic, glutamic, serine, praline & cystine) and lower levels of others (threonine, alanine, glycine and lysine). Similar results have been reported by Mohanty & Sridhar (1982) in RTV-infected rice plants.

Selman *et al.* (1961) observed that increased nitrogenous fractions may be due to check of growth and normal protein synthesis. Goodman *et al.* (1967) and Commoner and Dietz. (1953) reported the active utilization of non-protein complex for the synthesis of virus during nitrogen deficient conditions results in the decrease of some amino acids.

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Table 1. Influence of three strains of Watermelon mosaic virus infection on nitrogenous fractions (µg/100 µg dry wt.) of *Luffa acutangula Roxb. leaves.*

Nitrogen fraction	Healthy	Diseased			S.D.
		WMVVB	WMVVB	WMVC	
Total N_2	3.50	4.08	3.95	3.85	0.219
Protein	11.20	13.90	13.50	13.24	1.112
Nitrate N	0.128	0.142	0.138	0.133	0.005
Nitrite N	15.44	16.82	16.52	16.26	0.613
Ammonical N	0.142	0.126	0.122	0.119	0.011
Protein N	5.60	6.41	5.81	5.63	0.429
Non-proteinN	2.85	3.95	3.77	3.64	0.537

Table 2. Influence of three strains of Watermelon mosaic virus infection on nitrogenous fractions (µg/100 µg dry wt.) of *Luffa acutangula Roxb. leaves.*

Amino acids	Healthy	Diseased			S.D.
		WMVVB	WMVVB	WMVC	
Aspartic	20.8	292.5	286.7	281.5	102.615
Glutamic	19.6	228.4	216.3	211.8	97.81
Threonine	46.1	16.2	15.2	14.8	14.422
Serine	11.8	32.4	31.7	31.5	9.304
Alanine	72.4	23.9	22.8	21.8	26.75
Glycine	26.3	18.5	17.5	16.3	4.418
Proline	11.1	14.5	14.0	13.8	1.705
Cysteine	50.8	60.6	61.4	60.8	5.132
Lysine	30.9	24.8	23.5	22.6	3.628