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Some metabolic changes in pea (*Pisum sativum* L.) infected with pea mosaic virus

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SUMMARY

Primary and secondary metabolites viz.carbohydrates, proteins, amino acids and phenols have received considerable attention in relation to resistance in plants against diseases. Total carbohydrate, amino acid and protein in different parts of infected plants by pea mosaic virus and healthy plants were carried out. Root nodulation and root abnormality were also observed. Carbohydrate amount of healthy and infected leaves, stem and root increased, with the increase in growth of plants. Amino acid amount in different counter parts of diseased plants were higher as compared to healthy. Protein content was always higher in infected plant parts (leaf, stem and root) than their healthy counterparts, but maximum protein content was found in diseased leaves (18.70 mg/g) followed by root and stem (12.10 and 9.85 mg/g). The results revealed, that pea mosaic virus infection was also found to reduce the number, size and fresh weight of root nodules. The number of secondary roots and nodules decreased significantly in diseased plants. The phenolic content decreased with the increase in infection in plants.

Key words : *Pisum sativum*, Pea mosaic virus, Protein, Carbohydrate, Amino acid, Phenol.

Virus infection alters the entire metabolism of the host plant by changing the biochemical processes. Carbohydrate, proteins, amino acids and phenols have received considerable attention in relation to resistance in plants against diseases. During host-pathogen interaction, amino acids may act as substrates for the pathogen (Fric, 1964,Titarenko *et al.*, 1993). Increase in the carbohydrate constitution due to severity of the disease may serve as easily metabolized carbon source for the fungal pathogen (Patil *et al.*, 1985, Jeun and Hwang, 1991). These effects are brought-about; possibly, through the virus-induced synthesis of new proteins by the host, some of which are biologically active substances and can interfere with the normal metabolism of the host. Effect of virus pathogen on vegetative growth on plant has been recorded by several workers (Bawden, 1959, John, 1963, Farakas and Solymosy, 1965, Srivastava, 1971, and Ram *et al*.1984).

Based on the above informations, attempts have been made to study the changes in total carbohydrate, protein, amino acid and phenolics in pea plants infected with pea mosaic virus.

MATERIALS AND METHODS

The effect of virus infection on certain aspects of metabolic changes of the host was studied. Ten days old seedlings of the test plants were taken into two groups of 120 each. The first group of plants was left as healthy control after inoculation with only neutral phosphate buffer, while those of the second group were inoculated with pea mosaic virus. Twenty plants of each group were harvested on 30,35,40 and 45 day of inoculation.

One gram of fresh leaves was macerated with 5 ml of chloroform, methanol and water in ratio 1:1:1. The extract was filtered, through Whatman filter paper No.1and the residue was extracted with 5ml. of extraction solvent. The extract was pooled together to obtain a volume of 10ml. extract. On keeping the mixture for sometime the lower layer clearly settled down (chloroform layer) and upper layer (methanol & water layer) was separated. Then, the lower layer consisting of chloroform extract was further evaporated to dryness. The precipitate was redissolved in methanol, water (1:1) total phenolic content. Total phenol was estimated spectrophotometrically by Prussion blue method at 700nm as modified by Graham (1992).

The upper layer was utilized for the estimation of total carbohydrate (Sadasivam and Manikam, 1996), total protein (Lowry *et al.*, 1951 and Bergersen, 1980) and total amino acid (Yemm and Cocking, 1955). The solvent was evaporated to dryness under vacuum and redissolved in 5ml. of 0.6mM phosphate buffer (pH 6.2). From this extract carbohydrate, amino acid and protein were estimated as per the standard protocols (Danial, 1991).

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