ECOPHYSIOLOGICAL STUDIES ON GROWTH AND FACTORS GOVERNING THE SPECIES SPECIFICITY OF SOME INSECT PESTS IN RELATION TO THEIR HOST PLANTS

(ABSTRACT)

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ABSTRACT

Population study of two representative species of Pierid butterflies viz. Pieris brassicae (L) and Pieris napi montana Venity, in relation to their host plants reveals that the absolute density of eggs, larvae and adults of these butterflies varies with different environmental factors like temperature, humidity and rainfall, in the study area. Density of eggs is more in Pieris brassicae (L) than in P. napi montana Venity, since the former lay more number of eggs at a time than the latter, but the egg distribution is more in P. napi montana even if the adults lay their eggs singly. Larval density is also higher in case of Pieris brassicae than in P. napi montana, but adults of P. napi montana are uniformly more in number than that of P. brassicae. Both the species synchronized their life cycles with the availability of their accepted host plants in the fields. Sunny weather and open areas are preferred by adults of both the species, especially for mating and oviposition. Density of adults, larvae and eggs is always high during the winter months, i.e. October to January, and decline during the summer months, i.e. March to August in both the species.

Life cycle studies shows that Pieris brassicae (L) spent the shortest duration, i.e. from incubation period till adult emergence, on knol khol (Brassicae oleracea var. gongylodes L.) and longest on cabbage (B. oleracea var. capitata L.), while P. napi montana spent the shortest life cycle duration on cabbage (B. oleracea var. capitata L.) and mustard (B. campestris var. sarson Prain.) and longest on cauliflower (B. oleracea var. botrytis L.).

Hymenopteran flies have been found to parasitize the larval stages of both the species of butterflies studied. In case of Pieris

brassicae (L) the main parasite inflicting their larval stages is Apanteles glomeratus (L) while in P. napi montana Venity, the larval parasite is not yet identified. Due to heavy parasitization by these hymenopteran parasites, the larvae of both the butterflies species die prematurely, hence affecting larval growth, life cycle duration and population of both the host species in general.

Rate of consumption, growth and conversion efficiencies of Pieris brassicae varies with different host plants on which they are fed and also during various stages of larval life.

Analysis of total organic nitrogen, total free amino acid and sugar, reveal that there exists a difference among acceptable host plants and even between different age groups of the same host plant. Mustard (B. campestris var. sarson Prain) and raddish (Raphanus sativus L.) contain very high amount of total organic nitrogen as compared to other larval host plants. Cabbage (B. oleracea var. capitata L.), cauliflower (B. oleracea var. botrytis L.) and knol khol (B. oleracea var. gongylodes L.) contain very high amount of total free amino acid than other acceptable host plants, while the total free sugar contents does not vary much between them.

Qualitatively, fifteen free amino acids are present in cabbage (B. oleracea var. capitata L.) and cauliflower (B. oleracea var. botrytis L.) and knol khol (B. oleracea var. gongylodes L.), fourteen in mustard (B. campestris var. sarson Prain) and thirteen in raddish (Raphanus sativus L.). Only two free sugars are present in all host plants viz. glucose and galactose. Ten free amino acids are present in the different larval stages of P. brassicae (L.) and only eight are present in the larvae of P. napi montana Venity. Glucose and galactose are the only two free sugars present in the larval stages

of both the butterflies. Same pattern of free amino acids and sugars are present in the larval fecal matter of both the species of butterflies but the quantity differs individually.

Larval stages of Pieris brassicae (L) do not feed on other host plants except their known host plants, as observed by preference tests. Larval preference for selective feeding exist even among different host plants known. Mustard (B. campestris var. sarson Prain) is best preferred other than raddish (R. sativus L.) and cauliflower (B. oleracea var. botrytis), while cauliflower and raddish are more preferred than knol khol (B. oleracea var. gongylodes L.) or cabbage (B. oleracea var. capitata), as revealed by 'arena' choice tests experiments.

Six inorganic salts viz. sodium acetate, cadmium acetate, lead acetate, potassium nitrate, magnesium sulphate and manganous sulphate out of ten salts tested, show inhibitory effect on the feeding behaviour of P. brassicae larvae when tested on host plants, while the other salts do not exhibit this. Only two water soluble amino acids viz. DL-methionine and glycine from amongst the twelve amino acids tested, stimulated feeding in P. brassicae larvae while others are inhibitory.

Ascorbic acid only from amongst the four organic acids tested stimulated feeding in P. brassicae larvae, while other acids show inhibitory effects. Out of ten sugars, only galactose stimulated feeding of P. brassicae larvae, while others sugars are, to a great extent, inhibitory in character when tested on accepted host plants.

Cauliflower (Brassica oleracea var. botrytis L.) is the most preferred host plant for oviposition by adults of P. brassicae (L) followed by knol khol (B. oleracea var. gongylodes L.) and cabbage

(B. oleracea var. capitata L.), Mustard (B. campestris var. sarson Prain) is less preferred and raddish (Raphanus sativus L.) is the least preferred host plant for oviposition by these adults in experimental field conditions.

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