Larval Food Preference and Oviposition of Pieris Brassicae Nepalensis

Dr. Deepalee Das
Associate Professor
Department of Zoology
D. K. College, Mirza, Assam, India

Abstract— Laboratory studies on larval food preference of Pieris brassicae Nepalensis showed that Brassica oleracea Var. capitata was the most preferred larval food plant based on leaf area consumption per unit time, when reared on Brassica oleracea Var. capitata (Cabbage), Brassica oleracea Var. botrytis (Cauliflower), Brassica campestris (Mustard), Cleome rutidosperma (Fringed spider flower, wild) and Tropaeolum majus (Nasturtium). Tropaeolum majus was considered to be the least preferred food plant for P. brassicae nepalensis. In the present investigation Brassica oleracea Var. capitata leaves proved to be the most preferred oviposition substrates for the female P. brassicae nepalensis. Although Tropaeolum majus (Nasturtium) was not preferred as a food plant by the larvae, adult females showed equal preference for Tropaeolum majus and Brassica oleracea Var. botrytis for oviposition. This not only increases the rate of oviposition but also ensures higher larval survivality.

Key words: Larval Food Preference, Pieris Brassicae Nepalensis, Oviposition

I. INTRODUCTION

Certain herbivorous insects show differential preference to host plants (Dutta and Devi, 1995). The food plants play a vital role in the survival and potential growth of insects (Wigglesworth, 1973). The food plants play a vital role in the survival and growth potential of insects (Wigglesworth, 1953). All the food plants differ in dietary efficiency depending upon their chemical makeup (Dutta and Devi, 1995). Oviposition is the most vital activity in the life cycle of an insect. Every animal has the preference for oviposition site. However, no literature is available on the food preference and oviposition of Pieris brassicae nepalensis although the species is abundant in the entire South Kamrup area of Assam, India. Therefore, an attempt was made to study the food preference and oviposition of Pieris brassicae nepalensis by multiple host choices.

II. METHODS

The Food preference of P. brassicae nepalensis was carried out in the Department of Zoology, Gauhati University from July 2005 to January 2006 following the method of Bogawat and Pandey (1967). Five food plants viz. Brassica oleracea Var. capitata (Cabbage), Brassica oleracea Var. botrytis (Cauliflower), Brassica campestris (Mustard), Cleome rutidosperma (Fringed spider flower, wild) and Tropaeolum majus (Nasturtium) were selected for the present experiment. Fresh and full-grown leaves of each host plant was arranged in a circle and kept in a bamboo tray over a moist blotting paper in such a way that they were equidistant from each other. Larvae of each larval instar (II, III, IV and V) were released separately in the middle of the tray for a free choice of their food except instar I larvae which was not an active feeder but nibbled very minute quantity of leaf tissue. The leaf area consumed after 24 hours were measured by digital planimeter. Observations were repeated five times for replication.

For oviposition study the selected host plants were placed randomly inside an enclosure made of mosquito net. Ten gravid females were collected from the field and were released into this enclosure for a free choice of host plant parts for oviposition. Cotton swabs soaked in honey (10%) were offered as food to the adults. Eggs laid on different host plants were counted after six days under a binocular microscope. This test was repeated five times on different dates. Number of eggs laid on different host plants were recorded and subjected to analysis of variance (Steel and Torrie, 1960).

III. RESULTS AND DISCUSSION

Experiments on food preference by larvae (II, III, IV and V instar larvae) of Pieris brassicae nepalensis were carried out and the results were presented in Table 1.

It was observed in the experiments that when the larvae were released separately in the middle of the tray, they remained motionless for some time (5-10 minutes) and then slowly started crawling towards the food plant leaves. Some larvae reached the preferred food plant directly while others roam about freely for some time in the vicinity of different food plant leaves and finally reached the preferred food plant. Similar observations also found by Khan and Hajela (1987) while study on Aluacophora foveicollis.

The results presented in Table 1 clearly show the difference in hostplant preference of P. brassicae nepalensis larvae. Brassica oleracea Var. capitata was the most preferred (P0.01) hostplant followed by Brassica oleracea Var. botrytis, B. campestris, C. rutidosperma and Tropaeolum majus. Devi and Dutta (1994) are of the opinion that the higher rate of food consumption might be due to either some nutritional deficiency of food so that the insects had to eat more to derive sufficient nutrients or food may be adequate but may be nutritionally imbalanced. Dutta and Devi (1995) also observed similar results on Pieris canidia butterfly. Ram Ratan (1978) and Chibbar et al. (1985) also observed that nutritionally inadequate foods are consumed at higher rates to fulfil the nutritional requirement of Acrida exaltata, A. gigantica and Spodoptera litura. Contradictory result was observed in case of Celario euphorbiae larvae by Slansky and Scriber (1985). They found that the total food intake was lower in imbalanced diets than on balanced diets. Hence, from the amount of food intake alone, the suitability of the food plants cannot perhaps be judged as reported by Devi (1994).

The Brassica oleracea Var. capitata fed 2nd, 3rd, 4th and 5th instar larvae consumed as much as 241.20 sq.mm, 411.20 sq.mm, 631.36 sq.mm and 791.24 sq.mm of leaf area in 24 hours, which were significantly more than those recorded on other food plants. The larval feeding rate on C. rutidosperma and B. campestris did not vary

significantly in the 2nd, 3rd and 4th instars but varied significantly in the 5th instar larvae of P. brassicae nepalensis. Leaf areas measuring 75.04 sq.mm, 174.64 sq.mm, 202.70 sq.mm and 225.54 sq.mm were consumed when Tropaeolum majus was offered as food in 2nd, 3rd, 4th and 5th instars, respectively. Tropaeolum majus was considered to be the least preferred food plant for P. brassicae nepalensis. Devi (1994) stated that Tropaeolum majus was also the least preferred food plant for Pieris canidia. This differential feeding response might be due to the presence or absence of plant phago-stimulants, feeding inhibitors or due to the difference in physical parameters of host leaf as reported by Dutta and Devi (1995).

Host plant	Instar II				Instar III				Instar IV				Instar V			
Brassica oleracea Var. capitata	241.20	a	±	1.45	411.20	a	±	0.89	631.36	a	±	0.68	791.24	a	±	1.73
Brassica oleracea Var. botrytis	230.86	b	±	1.18	371.40	b	±	1.34	601.86	b	±	1.07	765.04	b	±	1.11
B. campestris	181.70	c	±	1.72	351.56	c	±	1.44	521.74	c	±	1.42	615.40	c	±	1.14
Cleome rutidosperma	181.86	c	±	1.20	351.10	c	±	0.83	521.46	c	±	1.07	610.30	d	±	5.71
Tropaeolum majus	75.04	d	±	0.63	174.64	d	±	1.39	202.70	d	±	1.95	225.54	e	±	1.21

Table 1: Leaf area consumption (sq.mm) (Mean*±SD over 24 hrs) by Pieris brassicae nepalensis larvae on 5 different hostplants.

Values having different superscripts (a, b, c, d, e) differ significantly (P□0.05) between hostplants.

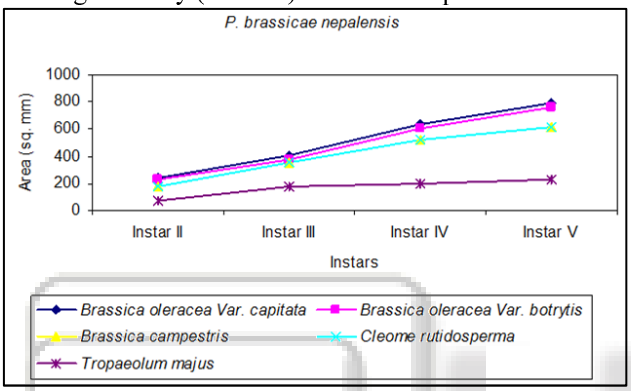

Fig. 1: Leaf area consumption by larvae of (a) Leptosia nina nina, (b) Catopsilia pyranthe and (c) P. brassicae nepalensis on different 5 plants.

Data on the number of eggs laid by P. brassicae nepalensis on five different host plants are presented in Table 2. Significant effect (P□0.01) of host plants on oviposition by P. brassicae nepalensis was observed. Adult females of P. brassicae nepalensis preferred Brassica oleracea Var. capitata (Cabbage) as the most preferred host plant for laying eggs as shown in the Table 2. As many as 73.00 eggs were laid by the female of P. brassicae nepalensis on Brassica oleracea Var. capitata leaves during the initial six days of oviposition period, which was significantly more than the number of eggs laid by the female during that period on all other host plants.

Host Plants	Eggs laid/female over 6 days			
Brassica oleracea Var. capitata (Cabbage)	73.00	a	±	2.00
Brassica oleracea Var. botrytis (Cauliflower)	62.80	b	±	1.92
B. campestris (Mustard)	34.40	c	±	0.89
Cleome rutidosperma (Fringed spider flower)	33.20	c	±	0.84
Tropaeolum majus (Nasturtium)	63.20	b	±	0.84

Table 2: Number of eggs (Mean±SD) laid by females of Pieris brassicae nepalensis on 5 different hostplants.
*Values having different superscripts differ significantly (p<0.01) between hostplants.

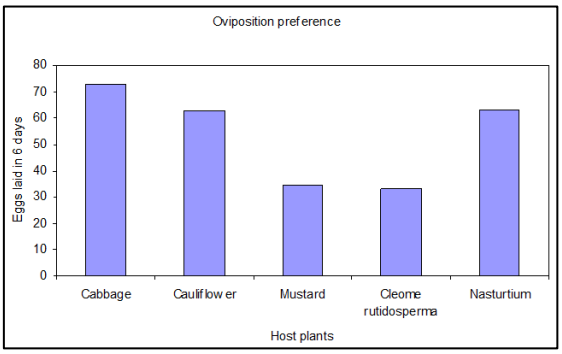

Fig. 2: Oviposition preference of Pieris brassicae nepalensis on 5 different hostplants.

Although Tropaeolum majus (Nasturtium) was not preferred as a food plant by the larvae, adult females showed equal preference for Tropaeolum majus and Brassica oleracea Var. botrytis (Cauliflower). This may be due to similar colour pattern and glabrous leaf surface of Tropaeolum majus with preferred food plant of P. brassicae nepalensis. While B. campestris (Mustard) and Cleome rutidosperma (Fringed spider flower) were the least preferred hostplants. This may be due to the fact that the insect do not prefer these two plants for larval feeding. Bogawat (1967); Pandey et al. (1968); Beckwith (1970); Perumal et al. (1972); Rao and Patel (1974); Singh and Baboo Ram (1987) and Devi (1994) stated that host plants are the most suitable substrate for oviposition of phytophagus insects. This not only increases the rate of oviposition but also ensures higher larval survivality.

IV. Conclusion

From the experimental observations, the following points of interest could be brought about.

1) It was observed from the investigations on food preference that the larvae of P. brassicae nepalensis preferred B. oleracea Var. capitata host plant, which was followed by B. oleracea Var. botrytis. Tropaeolum majus was the least preferred host plant.
2) Brassica oleracea var capitata (cabbage), B. oleracea Var. botrytis (cauliflower) and B. campestris (mustard) are major economic crops of this region. An abundant population of P. brassicae nepalensis thus poses a major threat to the economy of small farmers.
3) Intercropping of the wild plants (C. rutidosperma and Tropaeolum majus) with B. oleracea Var. capitata, B. oleracea Var. botrytis and B. campestris can also be

considered, as this will help to minimize the pest effect on the cultivated crops, without the use of pesticides, thereby increasing the farmer's profit.

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