

## CONSUMPTION AND UTILIZATION OF VARIOUS PLANTS BY PARASITIZED AND UNPARASITIZED LARVAE OF CABBAGE BUTTERFLY (*PIERIS BRASSICAE* L.)

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### ABSTRACT

Preference and non-preference responses of cabbage butterfly *Pieris brassicae* were studied by offering 27 different food plants based on consumption and utilization under laboratory conditions, in the University of Agriculture, Faisalabad. The extent of parasitism, in the larvae of cabbage butterfly was also determined by releasing *Apanteles* in one set of the experiment and number of larvae parasitized were counted. The tender larvae of cabbage were found to be the most preferred by unparasitized larvae of cabbage butterfly showed maximum consumption (44.71%) and thereafter cauliflower (30.76%) and radish (30.43%). Long melon, krund and kale were refused totally by the larvae. The extent of parasitism is more in radish showing maximum number of *Apanteles* larvae (24.50%), whereas in castor oil. It was zero.

### INTRODUCTION

Cabbage butterfly, (*Pieris brassicae*) is serious pest of cruciferous vegetables especially cauliflower, cabbage and radish (Ter-Simonyan *et al.*, 1982). The economic damage occurs when the percent destroyed leaf area reach within 3.97-10.41 in early cabbage, 10.75-13.76 in the late cabbage, 13.80-16.89 in early cauliflower and 7.79-9.63 in late cauliflower (Strake, 1979; Jogar *et al.*, 2005).

Yadaya *et al.* (1979) reported on consumption of *P. brassicae* on radish was negatively related to be the initial weight, whereas, assimilation and tissue growth were positively related to the amount of food consumed, with increase in age and biomass, the assimilation efficiency declined but the efficiency of conversion of digested food into living tissue increased up to the forth instar and then declined.

Kaushal and Wats (1983) determined energy budgets per larval development of *P. brassicae* and reported that food consumption, assimilation and tissue growth were highest on cabbage and lowest on nasturtium.

Karnavar (1984) found that the body weight of larvae of *P. brassicae* was greatly reduced as a result of parasitism by *A. glomratus*, varying from 177.94 to 466.65 mg. the average weight of the parasites in each host was 268.54 mg and of the individual parasites 3.12 mg.

Surani (1984) reported that the consumption of Berseem was the highest and that of bhindi was the lowest of all the plants tried. The coefficient of utilization of sugarcane, bhindi, bathu, guara, cotton and berseem were more than others. Mushtaque and Mohyuddin (1986) reported that they were cabbage and cauliflower were preferred the most by *P. brassicae* in the field, knolkohl (kohlrabi), mustard (*B. compestris*) var., sarson, swede *B. napus*, radish, *Eruca sativa*, the

ornamental plants, *Tropaeolum majus* and the wild plants, *Sisymbrium irio* and *Cardaria draba*.

Tewari and Kashyap (1988) studied the feeding, growth, development and oviposition preference of *P. brassicae* reported that sarson, cabbage *B. juncea* (Indian Mustard) and cauliflower were preferred more, while toria was less, Adults oviposited only on cruciferous plants. No eggs being laid on wheat, gram (*Cicer arietinum*) or pea. The maximum number of eggs (3929) were laid on cauliflower followed by cabbage (3526) and Indian mustard (3508), development was faster on Indian mustard, toria, cauliflower and cabbage than on sarson. The greatest number of adults emerged on cabbage and the growth index was highest on this food plant. It was concluded that cabbage is the most susceptible to attack by *P. brassicae*, followed by cauliflower, Indian mustard, sarson and toria.

The present studies have been carried out on the potential of *A. glomeratus* by parasitizing cabbage butterfly on one hand and for already established alternate host plants on the other under laboratory conditions. It is hoped that these investigations will go a long way in devising the further insect pests control strategies at least to overcome the notorious cabbage butterfly in Pakistan.

### MATERIALS AND METHODS

Studies on consumption and utilization of different food plants by parasitized and unparasitized cabbage butterfly (*Pieris brassicae* L.) were carried out in rearing room of Department of Agriculture Entomology, University of Agriculture, Faisalabad. A large number of eggs of cabbage butterfly, collected from farmer's field were brought in laboratory and liberated into two wooden cages (each measuring 18\* 14\* 16).

On hatching, fresh and tender leaves of cabbage were offered to the larvae as food to maintain the rearing stock, upto 4<sup>th</sup> instar.

Adults of *Apanteles* spp. were also collected from farmers field, brought into laboratory and were released in cage containing eggs of cabbage butterfly. Eight parasitized and 8 healthy 4<sup>th</sup> instar larvae of cabbage butterfly were picked out from the cages each put into 400 ml capacity eight beakers (one larvae for

one beaker). The beaker represent one replication for each host plant. There were two treatments with 8 repeats. The following twenty seven host plants were tested.

#### List of Host Plants

Sr. No.	Common name	Botanical name	Family
1	Cauliflower	<i>Brassica aleracea</i> var. botryis Linn.	Cruciferae
2	Cabbage	<i>Brassica oleracea</i> var. capita Linn.	Cruciferae
3	Radish	<i>Raphanus sativus</i> Linn.	Cruciferae
4	Spinach	<i>Spinaea oleracea</i> Linn.	Chenopodiaceae
5	Lettuce	<i>Lactuca sativa</i> Linn.	Sompositae
6	Cucumber	<i>Cucumis sativus</i> Linn.	Cucubitaceae
7	Long melon	<i>Cucumis fliexuoruo</i> Linn.	Cucubitaceae
8	Pumpkin	<i>Cucurbita pepo</i> Linn.	-do-
9	Brinjal	<i>Sohnum melongena</i> Linn.	Solaneceae
10	Jungli Haloon	<i>Coronopus didymus</i> L.	Fruciferae
11	Aksen	<i>Withania somnifera</i>	Solanaceae
12	Bathu	<i>Chenopodium album</i> Linn.	Chenopodiaceae
13	Krund	<i>Chenopodim murale</i> Linn.	-do-
14	Jangli Palak	<i>Rumes dentatus</i> Linn.	Polvoanaceae
15	Itsit	<i>Trianthema portulacstrum</i> Linn.	Aizoaceae
16	Dodak	<i>Sonchus asper</i> Vill.	Compositae
17	Maize	<i>Zea mays</i> Linn.	Gramineae
18	Berseem	<i>Trifolium alexanderium</i> Linn.	Leguminoseae
19	Lucern	<i>Medicage sativa</i> Linn.	-do-
20	Arwan	<i>Phaseaiuos vulgaris</i> Linn.	-do-
21	Sarson	<i>Brassica campestris</i> Linn.	Cruciferae
22	Gulabbassi	<i>Mirabilis jalapa</i> Linn.	Nyctaginaceae
23	Kalee	<i>Cana indica</i> L.	Cannaceae
24	Dhreek	<i>Malia azedarach</i> L.	Meliaceae
25	Mulberry	<i>Moris leavigata</i> Wall.	Moraceae
26	Poplar	<i>Populas euphratica</i> Oliv.	Salicaea
27	Casteroil	<i>Ricinus communis</i> L.	Euphorbaceae

The liberated larvae (in beakers) were starved for 18 hours. Then two gram fresh tender larvae of each host plant were given to the larvae as food. The beakers were covered with muslin cloth. The larvae were allowed to feed in the beakers for 24 hours. As equal quantity of leaves of each host plant was dried in an oven at 100 °C for 24 hours to calculate dry weight of the leaves fed to the larvae.

Left over leaves after 24 hours were taken from each beaker and dried them at same temperature and weight. They were left for further 24 hours in the same beaker without food with the objective to collect faeces. The faeces thus collected were transferred to 50 ml. glass beakers and were die by putting in the oven at 100 °C for 24 hours. The dried faeces were weighed. The consumption of each lot was measured by directly subtracting in final dry weight of the left over leaves

from calculated can dry weight of the initial amount of leaves provided to the insects. The coefficient of utilization was calculated by using the following formula.

$$\text{Coefficient of utilization} = \frac{A-B}{A} \times 100$$

A= Dry weight of food consumed  
B=Dry weight of faeces produced

The data were analysed statistically using IBM compatible computer. The means were compared by DMR test at P = 0.05 (Steel and Torrie, 1980).

## RESULTS AND DISCUSSION

The results (Table 1) revealed that the leaves of cabbage food plants were consumed the maximum by cabbage butterfly larvae in unparasitized condition (44.71%) consumed which indicated the most preferred host followed by cauliflower and radish with 30.77% consumed. The tender larvae of melon, krund and kale were completely refused by the larvae of cabbage butterfly under unparasitized conditions. The other host plants may be used as potential food for unparasitized

larvae of cabbage butterfly with consummation values ranged from 0.960 to 21.54. These findings can reported that food consumption by *P. brassicae* assimilation and tissue growth were highest on cabbage and lowest on nasturtium. However, these findings can not be compared with the findings of Yadaya *et al.* (1979), Ter-Simonyan *et al.* (1982), Mushtaq and Muhyddin (1986) and Metspalu *et al.* (2003) because of differences in their materials and methods.

**TABLE 1**

### CONSUMPTION AND COEFFICIENT OF UTILIZATION OF TENDER LEAVES OF DIFFERENT FOOD PLANTS FED BY PARASITIZED AND UNPARASITIZED LARVAE OF CABBAGE BUTTERFLY

Host Plants	Consumption (%)		Coefficient of Utilization (%)		Number of <i>Apanteles</i> in Parasitized larvae	
	un-parasitized larvae	parasitized larvae	un-parasitized larvae	parasitized larvae		
Cauliflower	30.77 b	13.77 a	76.77 ab	81.46 a	18.75 ab	
Cabbage	44.71 a	11.53 a	71.88 abc	84.58 a	21.50 abc	
Radish	30.43 b	3.80 bcd	68.38 abcd	76.67 ab	24.50 a	
Spinach	7.03 fg	2.34 bcdef	47.08 de	19.38 fg	19.63 abc	
Lettuce	7.14 fg	2.67 bcdef	36.46 ef	18.75 fg	18.63 bc	
Cucumber	13.57 def	3.22 bcdef	69.97 abcd	42.71 cdef	16.75 c	
Long melon	0.00 i	0.00 f	0.00 g	0.00 g	16.50 c	
Pumpkin	21.54 c	4.25 bc	75.98 ab	57.08 abcde	18.25 bc	
Brinjal	12.01 ef	3.43 bcde	78.30 ab	66.46 abcd	18.75 bc	
Jungli Halon	10.36 efg	3.34 bcde	57.44 abcde	43.75 cdef	17.50 bc	
Aksin	0.00 i	0.00 f	0.00 g	0.00 g	18.50 bc	
Bathu	2.13 hi	0.00 f	48.75 cde	0.00g	20.00 abc	
Krund	0.00 i	0.00 f	0.00 g	0.00 g	21.00 abc	
Jungli Palak	9.61 efg	4.32 bc	61.46 abcd	58.13 g	21.00 abc	
Itsit	12.50 ef	2.58 bcdef	68.13 abcd	31.25 efg	20.00 abc	
Dhodhak	6.94 fg	0.92 def	54.79 bcde	20.00 fg	16.75 c	
Maize	6.94 fg	1.94 bcdef	74.79 ab	47.08 bcdef	18.00 bc	
Berseem	12.17 ef	2.95 bcdef	65.98 abcd	37.50 def	16.75 c	
Lucern	8.80 efg	1.70 bcdef	76.83 ab	38.75 def	18.50 bc	
Arwan	14.86 cde	4.72 b	72.21 abc	75.42 abc	21.50 abc	
Sarsoon	20.35 cd	2.49 bcdef	80.70 a	39.38 def	23.50 ab	
Gulabbasi	0.96 i	0.00 f	19.38 fg	0.00 g	17.00 c	
Kalee	0.00 i	0.00 f	0.00 g	0.00 g	19.38 abc	
Dhreek	6.85 fg	1.40 cdef	71.82 abc	48.75 bcdef	18.88 bc	
Mulberry	2.36 hi	0.43 ef	56.46 bcde	20.00 fg	18.63 bc	
Popular	7.39 efg	1.78 bcdef	73.54 ab	38.13 def	18.88 bc	
Castor Oil	4.01 ghi	0.44 ef	63.13 abcd	20.00fg	0.00d	

Means sharing similar letters are not significantly different by DMR test  $P = 0.05$

The consumption of parasitized larvae of cabbage butterfly fed on tender leaves of different host plants was adversely suffered as compared to normal condition. The tender leaves of cauliflower and cabbage were preferred the most, whereas, leaves of long melon, aksin, bathu, krund, gulabbassi and kale were completely refused by the larvae resulting in zero percent consumption.

The extent of utilization in parasitized larvae was significantly lesser than unparasitized larvae in all the food plants.

The response was found to be significantly different in case of food plants utilized by cabbage butterfly. The trend was, however, found to be similar as that of consumption, there were, however, some exceptions. Sarson plant was found to be the most utilized by cabbage butterfly which was found similar statistically from most of the host plants except, spinach, lettuce, long melon which showed zero percent utilization. The present findings can partially be compared with those of Kaushal and Wats (1983) and Messchendorp *et al.* (2000) who reported that food consumption, assimilation and tissue growth are highest on cabbage by cabbage butterfly. But these findings can not be compared with those of Surani (1984), Tewari and Kashyap (1988), due to differences in materials and methods.

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