

# Field Biology of Cabbage butterfly *Pieris brassicae nepalensis* (Doubleday) in Chitwan, Nepal

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**Abstract:** The study about the Field biology of insect, *Pieris brassicae Nepalensis* (Doubleday) was conducted in Fields of Agriculture and Forestry University, Chitwan, Nepal. Activity of *Pieris brassicae nepalensis* was observed from nursery to harvesting stage of the crop in non-treated plots. Eggs hatched in 4-7 days with an average of 5.43 days. The insect had five instars and the mean duration of first, second, third, fourth and fifth instars were 3.43, 6.47, 13.0, 19.7 and 29.3 days respectively. The average length of first, second, third, fourth and fifth instar-larvae were 1.7 mm, 5.71 mm, 11.29 mm, 25.29 mm and 36.29 mm respectively. The mean pupal period and total life cycle duration from egg to adult emergence was 11.71 days and 80-110 days respectively. Average adult Body Length and Wing span was measured 23.43 mm and 62.57 mm Respectively.

**Key Words:** —Cabbage butterfly, *Pieris brassicae nepalensis*, Biology.

## I. INTRODUCTION

Cabbage butterfly (*Pieris brassicae nepalensis* Doubleday) also known as large white butterfly, cabbage caterpillar or cabbage worm belongs to the family Pieridae and order Lepidoptera (Molet, 2011). In Nepal, four species of cabbage butterfly are recorded. These species are *P. Brassicae*, *P. brassicae nepalensis*, *P. canidia* and *P. canidia indica* (Thapa, 1987). In the Terai and inner Terai regions of Nepal, *P. brassicae nepalensis* predominates followed by *P. Candida* (Thapa, 1987).

*P. brassicae* readily feeds on five main plant families, including: Brassicaceae (=Cruciferae), Tropaeolaceae, Capparaceae, Resedaceae, and Papilionaceae (Feltwell, 1982). However, *P. brassicae nepalensis* prefers Brassicaceae (=Cruciferae) the most. One of the most important hosts of *P. brassicae nepalensis* is cabbage (*Brassica oleracea* var. *capitata*) (Feltwell, 1982).

Cabbage Butterfly undergoes complete metamorphosis. Adults feed on plant nectar of a variety of species (Ferrerres et al., 2007) and are active on hot days. Adult *P. brassicae nepalensis* have black Antennae with white tips. Wings are dorsally white. Forewing tip is black and front margin of hind wing possess black spot. Female forewing has 2 black spots and black dash on each. (Brooks & Knight, 1982; USDA, 1984). In India, adults breed on rapeseed-mustard during September and are active until April (Ali & Rizvi, 2007). Eggs are laid in batches on the underside of leaves. First laid the eggs are a very pale straw color and within twenty-four hours this has darkened to yellow and few hours before hatching the eggs turn black (Gardiner, 1974).

Larvae eat their eggshells and will often eat the top of eggshells of larvae that have yet to hatch. As a group, larvae spin a silken pad and rest on the pad when they are not feeding (Gardiner, 1974). Larval body fawn with black patches, yellow longitudinal stripes, covered with short white hairs. First instar head black; final instar head black and gray, frons yellow (USDA, 1984). Larvae are gregarious unlike other similar species (i.e., *P. rapae*) and go through five instars.

Larvae can travel great distances 100+ m (328 feet) when looking for pupation sites (Feltwell, 1982). Pupae are creamy white with yellow brown marks and with black dots (USDA, 1984).

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Diapause occurs in the pupal stage and can last from 6 to 8 months which can withstand severe and prolonged winter conditions (Gardiner, 1974).

*P. brassicae* butterflies are migratory in nature. In plains of Punjab, India, the insect appears on the cruciferous plant from beginning of October and remains active up to the end of April. From the end of May to end of September, the insect is absent in plain but present in hilly tracts, such as Kulu valley, throughout the season (Rataul, 1959).

## II. MATERIALS AND METHODS

Field Biology of cabbage butterfly was observed. Activity of *Pieris brassicae nepalensis* was observed from nursery to harvesting stage of the crop in non-treated plots in winter season. The freshly laid egg mass of cabbage butterfly was identified in the field and the plant with egg mass was tagged and observed throughout the lifecycle of cabbage butterfly. The data about date of egg laying, hatching of egg, development of larvae at different instars and pupal duration. Larvae and Adults were collected from field and their morphometric parameters were observed in laboratory. Measurements were done through digital Vernier calipers whereas very small measurements were done with help of ocular micrometers and microscope.

## III. RESULTS AND DISCUSSION

Activities of *Pieris brassicae nepalensis* were observed in field condition from the time of nursery to harvesting. Their daily activities were observed visually over the field. Maximum activity of adults was observed during 11 a.m. to 2 p.m. following results were obtained from the study of their life cycle.

### 3.1. Egg

Eggs were laid on masses of 18 to 185 with an average of 99.57 ( $\pm 48.6$ ) eggs per egg mass on the under surface of the leaf, mostly 5 cm from the leaf apex (Table 1). The color of the egg mass was light yellow, which changed gradually to dark yellow, orange and blackish before hatching. Incubation period varied from 4 to 7 days, which was 5.43 days on an average. These findings were also supported by studies of Rataul (1959) and Thapa (1987).

### 3.2 Larvae

Freshly hatched larvae were light yellow in color and cylindrical in shape with a prominent dark brown head. Body length of 1<sup>st</sup> instar larvae were found between 1.2 to 2.3 mm (Table 2). The larvae consumed their egg shell after hatching. The body of the larvae turned green starting from head to the posterior side. First molting occurred 3 to 4 days after hatching. The 2<sup>nd</sup> instar larvae measured 5-6 mm in length. Second molting was observed after 6-8 days after hatching and the 3<sup>rd</sup> instar measured about 10-12 mm. A triangular, white spot was observed at 3<sup>rd</sup> instar. The larvae turned into 4<sup>th</sup> instar after 12-14 days and measured about 24- 28 mm (Table 1 & 2). Fourth moulting took place after 18-21 days after hatching and the final instar larvae measured 30- 42 mm in length. The larvae began to pupate after 28-30 days. Rataul (1959) and Thakur and Deka (1966) also observed similar size of larvae and larval duration.

### 3.3 Pupa

The pupal period ranged from 8-16 days (Table 1) which coincided with finding of Shood and Bhalla (1996), but differed from those of Rataul (1959) and Thapa (1987). Some pupae did not change to adult. After attaining full size, larvae stopped feeding and started to search for darker places. They attached themselves firmly to the surface. Within 2- 3 days they changed into pupae.

Table.1. Total number of eggs per egg mass, incubation periods, larval periods and pupal periods of *Pieris brassicae nepalensis* at Rampur, Chitwan, 2015

No of Observation	No. of egg / egg mass	Incubation Periods (Days)	Larval Periods (Days after Hatching)					Pupal Peroids (Days after Pupation)	Adult Duration * (Days)	Total lifecycle Duration (Days)
			1 <sup>st</sup> Inst ar	2 <sup>nd</sup> Inst ar	3 <sup>rd</sup> Inst ar	4 <sup>th</sup> Inst ar	5 <sup>th</sup> Inst ar			
1	91	7	4	6	14	20	30	8	(2-10) <sup>1</sup>	
2	94	6	3	5	12	21	30	11	(1-2) <sup>2</sup>	
3	18	5	3	8	14	19	30	8	(6-8) <sup>3</sup>	
4	108	4	4	5	13	19	29	16		
5	185	4	3	8	13	21	29	11		
6	94	7	3	6	13	18	28	13		
7	107	5	4	8	12	20	29	15		
Average	99.57	5.43	3.43	6.57	13.0	19.7	29.3	11.71	5	
Range	18-185	4-7	3-4	6-8	12-14	18-21	28-30	8-16	1-10	80-110

\* 1= Rataul (1959), 2= Thapa (1987), 3= Ahmad, Shankar, Monobrullah, Kaul and Singh (2007)

Table.2. Larval body length, adult body length and adult wingspan of *Pieris brassicae nepalensis* at Rampur, Chitwan, 2015

No of Observation	Larval Body Length (mm)					Adult Body Length (mm)	Wingspan (mm)
	1st instar	2 <sup>nd</sup> instar	3 <sup>rd</sup> instar	4 <sup>th</sup> instar	5 <sup>th</sup> instar		
1	1.9	6	12	24	32	25	54
2	1.7	6	11	28	42	26	71
3	1.2	6	12	26	30	23	56
4	1.7	5	10	25	37	23	65
5	2.3	5	11	25	42	22	62
6	1.6	6	11	25	36	23	62
7	1.5	6	12	24	35	22	68
Average	1.70	5.71	11.29	25.29	36.29	23.43	62.57
Range	1.2-2.3	5-6	10-12	24-28	30-42	22-26	54-71

### 3.4 Adult

Adults emerged 8-16 days after pupation and adult duration ranged 1-10 days (Table 3). Body of the adults was black and hairy above the thorax. Body length ranged from 2.2- 2.6 cm and wingspan ranged 5.4- 7.1 cm (Table 4) which were similar to the observation of Thakur and Deka (1996). Fore wing had black margin at the tip and two roundish black spots on the upper sides in the female but in lower or both sides on male.

## IV. CONCLUSION

Field Biology of cabbage butterfly was observed from nursery to harvesting stage of the crop in the non-treated plots. Eggs were laid on masses of 99.57 eggs per egg mass. Range of incubation period of 4-7 days, larval period of 28-30 days, pupal period of 8-16 days and adult duration of 1-10 days was observed. Total lifecycle ranged from 80-110 days.

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