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Biology of *Pieris brassicae* (Linnaeus) (Lepidoptera: Pieridae) under Laboratory Conditions

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Abstract

In two experiments conducted in the Department of Entomology, University of Arid Agriculture, Rawalpindi, the duration of larval, pupal and adult stages of *Pieris brassicae* (Linnaeus) was concluded as 10.25, 7.50 and 5.75 days respectively. The larval, pupal and adult survival was recorded as 83, 62 and 42 percent. The sex ratio was computed as 2.23: 1.00. The average number of eggs laid per female was 141.25, The larvae preferred radish leaves, while medium number of larvae was attracted to cabbage and the lowest to sarson and turnip.

Introduction

Pieris brassicae (Linnaeus), the cabbage butterfly (CBF) is a very serious pest of cruciferous plants (Aslam, 1984, 1994; Fraser, 1997). It attacks cabbage, cauliflower, radish, turnip, sarson, toria and many other cauliflower plants, but the most preferred host plants are cabbage, cauliflower and *Brassica* spp (Shah and Hashmi, 1994; Smith, 1951).

According to Atwal (1976), it is a serious pest of vegetables especially the winter vegetables. It causes severe damage to its host plants and generally attacks leaves and inflorescence. Sometimes the attack is so severe that the whole crop is destroyed (Atwal, 1976). It is a cosmopolitan insect, so it is distributed all around the world wherever the cruciferous plants exist (Hill, 1987). The caterpillars of CBF feed gregariously and sometimes cover the whole inflorescence. Aslam (1994) reported that the caterpillars inflict severe damage to the vegetables through voracious feeding. Shah and Hashmi (1994) observed that the full grown larvae under laboratory conditions left the nest and attached to muslin cloth of the rearing jars to assume the pupal stage.

Biology of CBF was described by Rataul (1959) and Kakakhel *et al.* (1995). Mahmood and Alam (1984) found that duration of larva, pupa, adult male and adult female was 18.90, 10.53, 3.13 and 7.50 days respectively. Atwal (1976) reported the duration of larval, pupal and adult stages as 15-22, 7.7-14.7 and 2.5-12.5 days respectively whereas Edwards and Heath (1964) reported larval period as 28-42 days, Shah and Hashmi (1994) reported number of eggs as 190-390, larval, pupal and adult period as 15-22, 7-14 and 3-13 days respectively. Atwal (1976) reported the number of eggs laid per female as 164 while Mahmood and Alam (1984) reported 273.80 eggs per female.

The objective of this project was to study the biology (duration of different stages, their survival, sex ratio, number of eggs laid per female and host plant preferences of CBF Antixenosis) under laboratory conditions.

Materials and Methods

Duration of Life Stages of CBF: Larvae of CBF (second instar) were collected from the radish field and were released on measured quantities of radish leaves kept in 4 jars (25 larvae in each jar). The leaves were fed daily to the larvae. The jars were cleaned every day and to avoid the risk of humidity and diseases, some dry tissue papers were also placed at the bottom of jars. The mouths of jars were tightly covered by a muslin cloth so that no larvae could get out of them. Activities of the larvae (feeding, duration of life stages and mortality) were observed daily. When adults emerged, males and females were identified to determine the sex ratio.

Pieces of muslin cloth were kept in each jars so that females could lay eggs. The eggs laid were counted to find out the oviposition rate per female.

Food Preferences of CBF (Antixenosis): In another experiment, measured quantities of sarson (*Brassica campestris*), turnip (*Brassica rape*), radish (*Raphanus sativus*) and cabbage (*Brassica oleracea* var. *capitata*) leaves were placed in the corners of 4 different rearing boxes at random following Kogan (1994). In each box, 25 second instar larvae were released in the center. On the expiry of 24 hours, the larvae found on different leaves were counted following Dahms (1972) so as to find out the preference of these larvae (Antixenosis) to different host plants.

Results and Discussion

Duration of Life Stages of CBF: Table 1 reveals that the average larval, pupal and adult lives of CBF were 10.25, 7.50 and 5.75 days respectively. Mahmood and Alam (1984), reported 18.90, 10.53, 3.13 and 7.50 days as duration of larva, pupa adult male and adult female respectively. According to Atwal (1976) the duration of larval, pupal and adult stages was 15-22, 7.7-14.7 and 2.5-12.5 days respectively. Shah and Hashmi (1994) reported

Aslam and Suleman: *Pieris brassicae*, Antixenosis, biology, sex ratio

larval, pupal and adult life as 15-22, 7-14 and 3-13 days respectively. Edwards and Heath (1964) reported larval period as 28-42 days. More variations in the larval period may be attributed to the fact that the larvae used in this study were of second instar. It was also observed that the full fed larvae attached themselves to the muslin cloth to assume pupal stage. This observation was similar to that observed by Shah and Hashmi (1994).

The survival of the larvae, pupae and adults was 83, 62 and 42 percent respectively (Table 1). The average number of males and females identified was 7.25 and 3.25 respectively. The sex ratio (male; female) computed was 2.23: 1.00. The average number of eggs laid per female was 141.25.

Table 1: Average duration and percent survival of different life stages of *Pieris brassicae* (Linnaeus) under laboratory conditions

	Life stage		
	Larva	Pupa	Adult
Duration (Days)	10.25	7.50	5.75
Survival (%)	83.00	62.00	42.00
Males	-	-	7.25
Females	-	-	3.25
Sex ratio	-	-	2.23:1
No. of eggs laid per female	-	-	141.25

Table 2: Average number of larvae of *Pieris brassicae* (Linnaeus) attracted to leaves of different plants under laboratory conditions

Host plants (leaves)	No. of larvae Attracted
<i>Brassica compestris</i> (Sarson)	3.75
<i>Brassica rapa</i> (Turnip)	3.50
<i>Raphanus sativus</i> (Radish)	8.25
<i>Brassica oleracea</i> var. <i>capitata</i> (cabbage)	5.25

According to Atwal (1976), it was 164. Shah and Hashmi (1994) reported 190-300 eggs per female. Based on Mahmood and Alam (1984), 273.80 eggs were laid per female. The variation may be attributed to variations in the environmental conditions.

Food Preferences of CBF (Antixenosis): The highest number of the larvae of CBF was attracted to radish. The cabbage attracted the medium number and sarson and turnip attracted the lowest number of the larvae. Based on Shah and Hashmi (1994) and Smith (1951), the most preferred hosts of CBF were cabbage, cauliflower and *Brassica* species (Table 2).

The reasons why the highest number of larvae were attracted to radish may be attributed to the fact that radish leaves fed were more tender as compared to the leaves of sarson, turnip and cabbage. Also with the passage of time the insects may change their trend of feeding on different host plants. More research is needed in the area to confirm the results.

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