

BIOLOGY OF AMALTAS LEAF STITCHER, *PIESMOPODA OBLIQUIFASCIELLA* HAMPS (LEPIDOPTERA: PYRALIDAE) IN THE LABORATORY

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Abstract

Biology of *Piesmopoda obliquifasciella* a leaf stitcher of amaltas (*Cassia fistula*) was studied in the laboratory during 1996-97. Studies on the biology showed that the fecundity of a single female moth was on an average 37.71 ± 0.91 eggs with maximum of 45 and minimum 30 eggs. The oviposition, incubation, larval and pupal periods lasted for 1-3, 3-5, 8-18, 6-18 days, respectively while the adults remained alive for 4-17 days. There were seven generations in a year with an average life cycle of 1st, 2nd, 3rd, 4th, 5th, 6th and 7th generation was 32.5, 27.5, 26.5, 23.0, 27.5, 37.5 and 44 days in April-May, May-June, June-July, July-August, August-September, September-October and November-March, respectively. The pest hibernated in larval as well as pupal stages during December-February at $13.85 \pm 3^\circ\text{C}$ (maximum), $4.81 \pm 0.69^\circ\text{C}$ (minimum) temperature and $68.5 \pm 6.58\%$ relative humidity. An inverse proportion was found between temperature and longevity of life span. High temperature combined with high relative humidity caused more profound impact on lessening life span rather than high temperature singly.

Key words: Amaltas leaf stitcher, *Piesmopoda obliquifasciella*, Biology, Laboratory

Introduction

Cassia fistula L. (amaltas) is a tree species with multifarious uses as its wood is used for making fine furniture, agricultural implements, tool handles, support posts, cart wheels and axles (Hora, 1989; Sheikh, 1993), fruit pulp, extract of flowers, bark and leaf are used as purgative, against diabetes, pustules,

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pimples, gout, rheumatism and ringworm (Baquar, 1989). From entomological point of view, Jaipal *et al.* (1983) have reported a noticeable juvenilizing effect of crude extract of bark and leaves against fifth instar nymph of *Dysdercus koenigii* (the cotton stainer).

Unfortunately such a precious tree species is attacked by more than 70 insect species in the world (Browne, 1968; Hutacharern and Tubtin, 1995). Among these insect species amaltas leaf sticher *Piesmopoda obliquifasciella* Hamps. (Lepidoptera; Pyralidae) is a serious pest. The caterpillars stitch the leaves together and feed within them. Thus causing serious growth loss of the tree and also ruin the whole complexion of the avenue for which the tree is mainly grown. General foliage damage has been reported from 44 to 70% annually (Shah, 1990; Kazi, 1992).

First time Hampson in 1896 recorded this pest from Darmsalam (India) and named it *Phycita obliquifasciella*. Later on the pest was renamed as *Piesmopoda obliquifasciella* Hamps. In Pakistan, Alam *et al.* (1969) reported *P. obliquifasciella* on *C. fistula* from districts Rawalpindi and Peshawar. Similarly Chaudhry *et al.* (1970) recorded this pest from Hazara (Charrapani) on Batti *Xylosoma longifolium*.

Studies on extent of damage and control have been carried out by Khawaja *et al.* (1982) & Khawaja *et al.* (1983), population dynamics by Chaudhry and Bajwa (1993) and sampling methods for damage assessments by Bajwa and Gul (1995). The studies on biology of *P. obliquifasciella* has not so far been discoursed. Therefore, being a notorious pest causing serious damage through out the year, it was imperative to study the biology for finding out the weaker links for effective and safer management of the pest.

Materials and Methods

For the study of biology of *P. obliquifasciella* in the laboratory the larvae of different stages were collected from field at the Pakistan Forest Institute, Peshawar Campus during different months in 1996-97. The larvae were reared in the laboratory upto adult stage for further studies. Two tender leaves of *C. fistula* were clipped together and placed in a black folded paper. In each set of clipped leaves four larvae collected from the field were released and kept in petri dishes (8.5 cm dia). The leaves were renewed after every 24 hours. During pre-pupal stage they were shifted on well pulverized and even moist soil for pupation and the soil was covered with glass chimneys. Small twigs of *C. fistula* fixed in

glass vials with water were placed in chimneys for oviposition. The twigs were replaced after every 24 hours for fecundity estimation. Adults were provided with 2% sugar and 2% honey solution on cotton swab as food. Hence eggs were obtained from laboratory reared adults and were used for further biological observations following above procedure. Studies were carried out at natural day/night rhythm. The meteorological elements, i.e. maximum & minimum temperature and relative humidity were also recorded during the whole study period. Standard deviation and t-test were applied on the data of different life stages and climatic observations. Observations recorded on different developmental stages of *P. obliquifasciella* and climatic conditions are given below:

Results and Discussion

Description of the Pest

Adult

Small sized moth with 10-15mm wing expanse. Head and thorax clothed with fuscous and pink scales. Forewing brown interrupted with grey; an oblique pink and grey antemedial band. The outer half of costa suffused with pink; two indistinct dark discocellular specks; a marginal series of dark specks. Hind wings semi-hyaline with a marginal brown line.

Larva

Newly hatched larva is whitish green, head brownish black and rectangular with 0.16-0.24mm head capsule width. Full grown larva is dark green with two dorsal concurrent light yellow green bands on thorax and abdomen. Between these two bands there is a third one of white colour which is interrupted intersegmentally. Before pupation it turns reddish brown, however sternum remains green. Body length of a full grown larva is 1.2-1.4cm with 0.97-1.12mm head capsule width.

Pupa

Reddish brown except green sternum; before adult emergence head and thoracic region turns black brown. Its body length is 0.7 x 0.9mm. Female pupa is longer than male.

Egg

Freshly laid whitish, turns pale yellow; ovate; size is 0.28x0.42 mm.

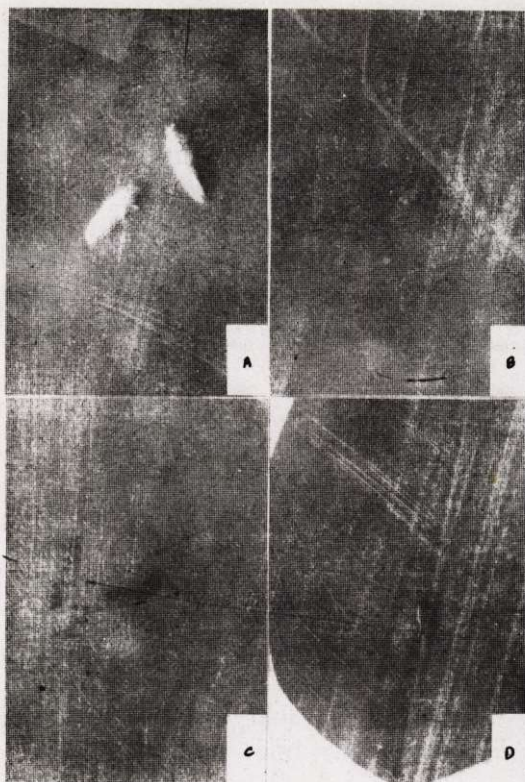


Fig. 1: Life-cycle of amaltas leaf stitcher *P.obliquifasciella*.
A. Adult; B. Egg; C. Larva; D. Pupa

Life History

The larvae/pupae overwintered in soil during December-February and adults emerged at the end of March or beginning of April. Mating started 2-3 days after emergence and oviposition began after 1-2 days of mating and elapsed for 1-3 (avg. 2.07 ± 0.45) days. Incubation period was 3-5 (3.86 ± 0.56) days. Eggs were laid singly as well as in batches of 2-25 on tender leaves. Average eggs laid were 37.71 ± 0.91 with maximum 45 and minimum 30 eggs per female. Newly hatched larvae were whitish green and fed openly by nibbling for about 24 hours hereafter they stitched two or more leaves together and fed in between them by gnawing epidermis. They were gregarious feeder and upto 25 larvae were recorded in one pair of stitched leaves. Larval period prevailed over 8-18 (avg. 12.21 ± 2.43) days during which they moulted four times. Just before pupating larvae stopped feeding, came out from stitched leaves, colour changed

to reddish brown and became very active. Pre-pupal stage lasted for 24-30 hours. Pupation which normally occurred in soil persisted for 6-18 (avg. 9.5 ± 3.78) days. Whereas, adults lived for 4-17 (avg. 7.57 ± 3.23) days. During day time adults reposed at 45° . *P. obliquifasciella* completed its life cycle in 20-44 (avg. 31.21 ± 7.33) days and there were seven overlapping generations in a year.

Table 1. Observations on the biology of amaltas leaf sticher *P.obliquifasciella* in the laboratory at Pakistan Forest Institute, Peshawar

Life stages	G E N E R A T I O N S														Average \pm SD (Days)
	I		II		III		IV		V		VI		VII		
	April-May		May-June		June-July		July-Aug.		Aug-Sept.		Sept.-Oct.		Nov.-March		
	R/D	A/D	R/D	A/D	R/D	A/D	R/D	A/D	R/D	A/D	R/D	A/D	R/D	A/D	
Pre-oviposition period	3-5	4.0	3-4	3.5	2-3	2.5	2-3	2.5	3-4	3.5	4-5	4.5	4-5	4.5	3.57 \pm 0.84
Oviposition period	1-3	2.0	1-2	1.5	2-3	2.5	1-2	1.5	2-3	2.5	1-3	2.0	2-3	2.5	2.07 \pm 0.45
Incubation period	4-5	4.5	2-4	3.0	3-5	4.0	3-4	3.5	3-4	3.5	3-5	4.0	4-5	4.5	3.86 \pm 0.56
Larval period	12-15	13.5	11-13	12.0	10-11	10.5	8-10	9.0	9-12	10.5	13-15	14.0	14-18	16.0	12.21 \pm 2.43
Pupal period	8-9	8.5	7-8	7.5	6-8	7.0	6-7	6.5	7-8	7.5	12-14	13.0	15-18	16.5	9.5 \pm 3.78
Longevity of adult	8-9	7.5	5-7	6.0	4-6	5.0	5-6	5.5	6-7	6.5	7-9	8.0	12-17	14.5	7.57 \pm 3.23
Total life cycle	28-37	32.5	24-31	27.5	23-30	26.5	20-26	23.0	24-31	27.5	33-42	37.5	39-49	44.0	31.21 \pm 7.33
Fecundity/no. Of eggs	35-40	37.5	33-39	36.0	32-44	38.0	30-45	37.5	37-41	39.0	34-42	38.0	33-43	38.0	37.71 \pm 0.91

R = Range, D = Days,

A = Average

Impact of mean maximum & minimum temperature and relative humidity on life span in each generation of the pest is displayed in Table-2.

Table 2. Mean temperature and humidity in laboratory and life span of different generations of *P. obliquifasciella*

Generations	Time	Temperature ($^\circ\text{C}$)		Relative humidity \pm SD	Life span (days)
		Maximum \pm SD	Minimum \pm SD		
1st	April-May	30.58 ± 4.58	17.65 ± 2.36	61.16 ± 6.82	32.5
2nd	May-June	34.9 ± 11.0	7.65 ± 2.36	52.53 ± 4.80	27.5
3rd	June-July	41.06 ± 1.46	27.94 ± 0.88	56.86 ± 6.08	26.5
4th	July-August	40.34 ± 1.38	24.02 ± 2.42	71.52 ± 5.06	23.0
5th	August-Sept.	39.31 ± 1.24	22.06 ± 1.42	70.29 ± 3.05	27.5
6th	Sept.-Oct.	33.39 ± 3.34	16.73 ± 3.19	62.6 ± 5.39	37.5
7th	Nov.-March	22.0 ± 3.16	14.49 ± 3.26	62.5 ± 6.45	44.0
Hibernation	Dec.-Feb.	13.85 ± 3.60	4.81 ± 0.69	68.5 ± 6.58	-
	C.L. (5%)	8.041	6.373	5.535	6.774

The highest maximum ($41.06 \pm 1.47^{\circ}\text{C}$) and minimum ($27.94 \pm 0.88^{\circ}\text{C}$) temperature was recorded in the months of June-July. The maximum relative humidity ($71.52 \pm 5.06\%$) was recorded in July-August however, in these months temperature differed marginally from that of June-July, while relative humidity in June-July ($56.86 \pm 6.08\%$) was markedly low than that of July-August. The lowest maximum and minimum temperature was recorded in December-February. While the relative humidity was lowest during May-June (Table 2).

The shortest life span recorded was 23 days which was during July-August when temperature and relative humidity was 40.34°C (maximum), 24.02°C (minimum) and 71.52% respectively. Similarly the longest life span was 44 days during November-March, excluding the hibernation period of December-February. Though the longevity of life cycle varies during 2nd to 5th generation but that difference was insignificant *viz-a-viz* maximum temperature and minimum temperature which fluctuated in the range of $5-6^{\circ}\text{C}$. High temperature (40.34°C) and relative humidity (71.52%) in combination reduced the life cycle of fourth generation considerably to 23 days. Another important factor which may have played role is day/night rhythm. Change in day/night length also results change in maximum and minimum temperature ratio.

The results showed an inverse proportion between temperature and longevity of life cycle. Increase in temperature reduces the length of life span and vice versa. High temperature combined with high relative humidity have profound impact on shortening the life span.

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