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### SUMMARY

**Biology of hawk moth, *Agrius convolvuli* L. was studied on green gram under laboratory conditions at the University of Agricultural Sciences, Dharwad, Karnataka, during Kharif 2009. The adult moth laid small bright bluish coloured eggs individually on all parts of the plant. The incubation period was  $7.65 \pm 1.78$  days. The larval stage passed through five instars and the total larval period was  $24.85 \pm 2.33$  days. The pre-pupal and pupal periods occupied  $2.9 \pm 0.73$  and  $14.45 \pm 2.71$  days, respectively. Average fecundity was  $138.8 \pm 8.09$  eggs/female. Total life cycle was completed in  $49.85 \pm 7.55$  days. The longevity of the female and male moths was  $14.3 \pm 0.94$  and  $11.3 \pm 0.82$  days, respectively.**

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### Key words :

Green gram,  
Biology, Hawk  
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convolvuli*

Green gram is one of the thirteen food legumes grown in India after chickpea and pigeonpea. In India the total production of green gram is 1.24 metric tonnes from an area of 3.30 million ha with productivity of 425 kg per ha (Anonymous, 2009). Among all pulse crops, green gram is frequently grown as short duration crop in Kharif followed by Rabi crops like jowar, wheat, chickpea and safflower. It is quite versatile crop grown on residual soil moisture or as a latch crop. It is drought resistant and suitable for dry land farming and intercropped with cereals, oilseeds, sugarcane or cotton.

The low yield of green gram in our country may be attributed to wide variety of factors, among which the ravage of insect pest is a paramount factor. Among different pests, *A. convolvuli* has gained major pest status on green gram and other pulses in recent years. The pest is causing enormous economical damage to the crop in the area. It attacks crop at 35 to 40 days (vegetative stage) after planting till pod formation stage. It has been reported

to defoliate green gram completely (Ayyer, 1937), cause damage up to 50 per cent in potato (Faure, 1914). Keeping this in view, the present studies were carried out on biology of this pest.

### MATERIALS AND METHODS

The larvae were collected and reared on green gram for the maintenance of pure culture in the laboratory. Freshly cut green gram plants were placed in a bottle containing water to maintain the turgidity of the plant and provided daily for egg laying. Cotton leaf dipped in 10 per cent honey solution was provided as food for the moths. The male and female moths after eclosion were allowed to mate and oviposit on green gram leaves. Fecundity was studied by enclosing ten pairs of adult moths individually in the cage with food. The observations on pre-oviposition, oviposition and mating period were recorded. Freshly laid eggs were kept on green gram leaf in Petriplates provided with wet blotting paper at the bottom to protect the eggs from desiccation. The larvae that hatched from

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these eggs were used for further studies. The fresh green gram leaves were provided as food for developing larvae daily. Observations were recorded on egg, larval, pre-pupal, pupal and adult stages and periods.

## RESULTS AND DISCUSSION

The results on morphometric data and developmental periods of hawk moth are presented in Tables 1 and 2. The biology of the pest is illustrated in Fig 1. Bright bluish coloured eggs were laid individually on all parts of the green gram plant. The eggs were short ovoid, slightly concave at one end and the surface of the egg was smooth and shining. The incubation period lasted for 5 to 10 days with a mean of  $7.65 \pm 1.78$  days. Egg measured 0.97 to 1.06 mm in length with an average of 1.10 mm. Similar observations were made by Nagaraja (1993) and Jayaram

(2006) on green gram; Anonymous (1927) and Viswanath and Agarwal (1982) on sweet potato.

First instar lasted for 4 to 5 days with an average of  $4.70 \pm 0.45$  days. Larvae measured from 4.0 to 8.0 mm in length with an average of  $5.80 \pm 1.39$  mm and head capsule width was 0.70 to 0.82 mm with an average of  $0.76 \pm 0.04$  mm. Second instar started feeding from the margin of the leaves and lasted for 2 to 4 days with an average of  $3.50 \pm 0.84$  days. This instar measured 11.0 to 17.0 mm in length with a mean of  $13.80 \pm 2.10$  mm and head capsule width was 0.95 to 1.35 mm with a mean of  $1.04 \pm 0.14$  mm. Third instar occupied 4 to 5 days with an average of  $4.60 \pm 0.65$  days. It measured 23.0 to 30.0 mm in length with an average of  $26.90 \pm 2.40$  mm and head capsule width was 1.64 to 2.24 mm with an average of  $1.91 \pm 0.19$  mm. Fourth instar lasted for 5 to 7 days with an average of  $5.45 \pm 0.68$  days. The instar measured 39.0 to 49.0 mm in length with an average of  $43.40 \pm 3.53$  mm and head capsule width was 2.50 to 3.46 mm with an average of  $3.05 \pm 0.34$  mm. Fifth instar occupied 6 to 7 days with an average of  $6.60 \pm 0.61$  days. It measured 54.0 to 65.0 mm in length with an average of  $60.00 \pm 3.62$  mm and head capsule width was 4.50 to 5.50 mm with an average of  $5.18 \pm 0.35$  mm in diameter. Both (fourth and fifth) instars fed on entire leaves leading to complete defoliation. Similar studies were made by Nagaraja (1993) and Jayaram (2006) on greengram who noticed larval period of 25.39 days and 25.65 days, respectively. Youssef *et al.* (1969) and Bellotti *et al.* (1994) observed similar larval period on brinjal and cassava, respectively.

Pre-pupal stage occupied two to four days with a mean of  $2.90 \pm 0.73$  days and pre-pupal length varied from 53-58 mm with an average of  $55.80 \pm 1.90$  mm. Pupa was obiect type, jug shaped and leather brown with prominent eyes. Pupal stage lasted for 12 to 18 days with

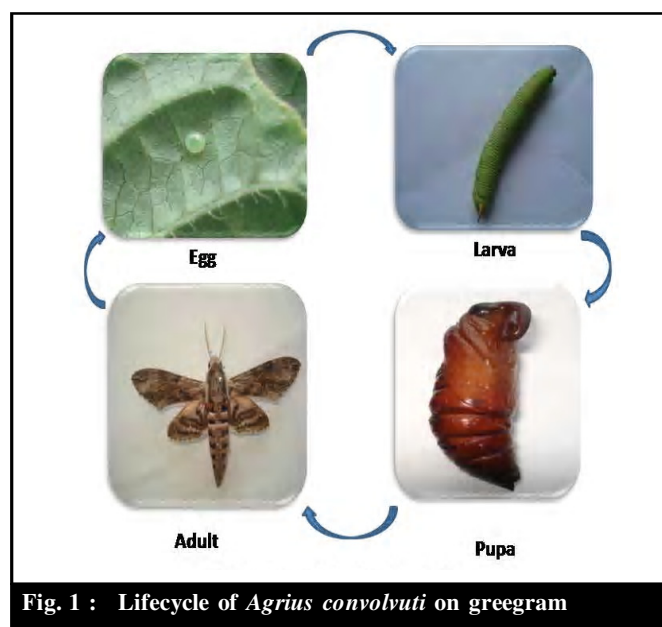


Fig. 1 : Lifecycle of *Agrius convolvuti* on greengram

Table 1: Morphometric data on different life stages of *Agrius convolvuti*

Stage	Length (mm)*		Head capsule width (mm)*	
	Range	Av.± S.D.	Range	Av.± S.D.
Egg	0.93-1.10	1.01±0.05	-	-
<b>Larval instars</b>				
I	4-8	5.80±1.39	0.70-0.82	0.76±0.04
II	11-17	13.80±2.10	0.95-1.35	1.04±0.14
III	23-30	26.90±2.40	1.64-2.24	1.91±0.19
IV	39-49	43.40±3.53	2.50-3.46	3.05±0.34
V	54-65	60.00±3.62	4.50-5.50	5.18±0.35
Pre-pupa	53-58	55.80±1.90	-	-
Pupa	51-56	52.79±1.41	-	-

\*Average of 20 observations

**Table 2 : Developmental periods of hawk moth, *Agrius convolvuli* on green gram**

Stages	Duration (days)*	
	Range	Av.± S.D.
Egg period	5-10	7.65±1.78
<b>Larval period (Instar wise)</b>		
I	4.0-5.0	4.70±0.45
II	2.0-4.0	3.50±0.84
III	4.0-5.0	4.60±0.65
IV	5.0-7.0	5.45±0.68
V	6.0-7.0	6.60±0.61
Total larval period	21-30	24.85±2.33
Pre-pupal period	2-4	2.9±0.73
Pupal period	12-18	14.45±2.71
<b>Adult longevity</b>		
Male	10-12	11.3±0.82
Female	13-16	14.3±0.94
Pre-oviposition period	2-3	2.5±0.52
Oviposition period	7-8	7.30±0.48
Mating period (Minutes)	27-30	28.7±2.80
Fecundity (No. of eggs/female)	125-153	138.8±8.09
Total life cycle	40-62	49.85±7.55

\*Average of 20 observations

an average of  $14.45 \pm 2.71$  days. Nagaraja (1993) and Jayaram (2006) recorded pupal period of 14.22 and 14.25 days, respectively on greengram and is more or less in confirmation with present study. Pupal length varied from 51-56 mm with an average of  $52.79 \pm 1.41$  mm. Under laboratory conditions the hawk moth completed one generation (egg to adult) in 40 to 62 days with a mean of  $49.85 \pm 7.55$  days.

The male and female ratio was 1:1. Moth eclosion usually occurred during night. However, emergences do occur during day time but rare. The longevity of the female ranged from 13-16 days with an average of  $14.3 \pm 0.94$  days. While in case of male it was 10-12 days with an average of  $11.3 \pm 0.82$  days on green gram. The present findings are in conformity with Jayaram (2006) who reported longevity of 11.30 days and 14.7 days for male and female, respectively. Mating was observed during night hours a day after emergence, copulation lasted for 30 minutes. Eggs were laid individually during night hours on the green gram leaves or on the sides of the cages in

the absence of the host. Under captivity oviposition commenced from 3<sup>rd</sup> day after emergence and continued till 11<sup>th</sup> day. Considerable variation was observed in the egg laying by each female and ranged from 125 to 153 with an average of  $138.8 \pm 8.0$ . The similar results have been reported by Nagaraja (1993) and Jayaram (2006) on greengram.

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