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Biology and morphometrics of plume moth, *E. atomosa* (Wals.) on pigeonpea variety BDN-711 under laboratory condition

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Abstract

Biology and morphometrics of plume moth *Exelastis atomosa* (Wals.) on pigeonpea early cultivar BDN-711 was studied during *Khari*-2017 at the Entomological Research Laboratory VNMKV, Parbhani. And the findings was including incubation period which was varies with an average from 2.22 ± 0.03 days. Eggs were measured 0.40 ± 0.02 , 0.30 ± 0.01 mm in length and width. There were five larval instars with total larval duration with an average 16.18 ± 0.12 days to enter into pupal stage. The pupal period ranged from 7.25 ± 0.23 days and measured 8.25 ± 0.20 and 1.80 ± 0.08 mm in length and breadth, respectively. The life cycle of *E. atomosa* was completed in 33.09 ± 0.35 days. The mean longevity of the adult was 6.32 ± 0.30 days and average length and breadth of adult 6.75 ± 0.30 , 1.40 ± 0.06 mm in diameter.

Keywords: Pigeon pea, BDN-711, *E. atomosa*, biology, morphometrics

Introduction

India has virtual monopoly in pigeonpea production accounting to 90 percent of world's total production and occupies an area of 3.88 million ha with a production of 3.29 million tonnes (Anonymous, 2014) ^[1]. Pigeon pea (*Cajanus cajan*) is one of the major pulse crops grown in India. As many as 250 insect species have been recorded to attack pigeon pea (Upadhyay *et al.*, 1998) ^[4]. However, the most damaging pests of this crop are pod-borers which attack the reproductive parts of the plant. Among the constituents infesting pigeon pea, the plume moth, *Exelastis atomosa* Wals. posses serious threat to its cultivation. In India the area, production and productivity of pigeonpea 5337.89 million ha, 4873.24 million tonnes and 913 kg per hectare, respectively during 2016-17. Whereas In Maharashtra, during 2016-17, it was grown on an area of 14.35 lakh ha, production 1495.75 lakh tons and productivity was 1042 kg per hectare. (Anonymous 2017) ^[2]. The larvae bore into unopened flower buds for consuming the developing anthers more damages is seen during flowering, pod maturing and pod filling stage. It is reported that on an average, the pod damage in pigeon pea to plume moth was 8.9 percent and grain damage was 4.0 percent unfortunately, the journalism available on its biology provides only the fragmentary information on average duration of the life stages of the insect. Such study has not been conducted in Maharashtra particular to Marathwada region growing BDN-711 variety as a source of income to many farmers so far. Hence, the biological and morphometrical study of *E. atomosa* carried out in experimental laboratory.

2. Materials and Methods

Full-grown larvae collected from pigeonpea field and reared in Petri dishes till pupation. Fresh flower and pods were provided daily to larvae as a food. After pupation, the pupae were kept in plastic jars covered with muslin cloth. After emergence, the adults were released in pairs into another plastic jars individually. Honey solution 50 percent soaked in small cotton swab as food source provided to them. After completion of mating, the male was separated and the female was kept inside the jar for recording fecundity. Numbers of egg laid were counted daily with the help of a hand magnifying lens till the death of the adult female. Eggs were removed from the twigs or plant part with a fine camel hairbrush and were placed over moist filter paper in Petri dish ten eggs were kept in each Petri dish and incubation period were recorded. After hatching, twenty larvae were transferred individually to separate Petri dishes keeping single larva in each. Fresh flowers and pods were provided daily as food for the larvae. The total number of larval instars and duration of each instar was determined by examining the cast off

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larval head capsule. The pupal and adult longevity were also recorded. Measurements of various stages were taken with the help of Binocular Microscope and digital vernier caliper.

3. Result

Duration of different developmental stages and data pertaining to morphometrics are presented in Table 1.

Table 1: Duration of different stages (days) and morphometrical dimension of *E. atomosa* on pigeonpea variety BDN-711

Biological Parameters		Morphometrical dimension (Mean \pm SE)		
Parameters	Mean \pm SE	Stages of pest	Dimensions	
			Length (mm)	Breadth (mm)
Incubation period	2.22 \pm 0.03	Egg	0.40 \pm 0.02	0.30 \pm 0.01
Larval period		Larva		
1 st Instar	1.10 \pm 0.22	1 st Instar	1.50 \pm 0.02	0.45 \pm 0.03
2 nd Instar	2.35 \pm 0.04	2 nd Instar	2.30 \pm 0.04	0.55 \pm 0.01
3 rd Instar	3.50 \pm 0.01	3 rd Instar	3.98 \pm 0.01	1.20 \pm 0.01
4 th Instar	4.22 \pm 0.05	4 th Instar	5.22 \pm 0.05	1.51 \pm 0.05
5 th Instar	5.01 \pm 0.45	5 th Instar	7.01 \pm 0.10	2.25 \pm 0.08
Total Larval Period	16.18 \pm 0.12	Pre-pupa	7.98 \pm 1.03	2.09 \pm 1.04
Pre pupal period	1.12 \pm 1.44	Pupa	8.25 \pm 0.20	1.80 \pm 0.08
Pupal period	7.25 \pm 0.23	Adult	6.75 \pm 0.30	1.40 \pm 0.06
Longevity of Adult	6.32 \pm 0.30			
Total Life Cycle (Egg - adult)	33.09 \pm 0.35			

3.1 Biology and Morphometrics of *E. atomosa*

Biology and morphometrics of *E. atomosa* studied on pigeonpea early variety BDN-711 during *Kharif*-2017 at Entomological Research Laboratory VNMKV, Parbhani.

3.1.1 Egg

Incubation period with an average of 2.22 \pm 0.03 days and eggs lay singly on the pods sometimes on flower buds and occasionally on leaves. The average length and breadth of eggs were 0.40 \pm 0.02 and 0.30 \pm 0.01 mm, respectively. These are in close agreement with the findings of Vijaya Chander and Arivudainambi (2007) [5] who reported that the incubation period of *E. atomosa* ranged from 3-4 days on redgram.



Pupa



Early instar larva



Adult



Late instar larva

3.1.2 Larval Duration

During the period of larval development, five instars were observed and the details of the instars are as follows.

The newly hatched larva was green or brown in colour. The duration of the first instar larva with an average of 1.10 \pm 0.22 days whereat the length and the breadth 1.50 \pm 0.02 and 0.45 \pm 0.03 mm, respectively. The duration of second instar larva with a mean of 2.35 \pm 0.04 days. The length and breadth of the larva were 2.30 \pm 0.04 and 0.55 \pm 0.01 mm, respectively. The third instar larval duration with a mean of 3.50 \pm 0.01 days. The body length and width of third instar larvae were 3.98 \pm 0.01 and 1.20 \pm 0.01 mm, respectively. The fourth instar larva with a mean of 4.22 \pm 0.05 days. The length and breadth were 5.22 \pm 0.05 and 1.51 \pm 0.05 mm, respectively.

The full grown caterpillar was long, cylindrical, greenish brown, with many setae. The duration of fifth instar larva with a mean of 5.01 ± 0.45 days. The length and width were 7.01 ± 0.10 and 2.25 ± 0.08 mm, respectively. Whereas the total larval period with an average of 16.18 ± 0.12 days. These findings are close agreement with Subharani and Singh (2008) [3] who reported that the total larval period with an average 23.12 ± 0.93 days.

3.1.3 Pre-Pupal and Pupal Stage

The duration of pre-pupa was found with an average of 1.12 ± 1.44 days. The dimensions of length and width of pre 8.01 pupa were 7.98 ± 1.03 and 2.09 ± 1.04 mm, respectively. Pupation took place on the pod surface. The pupa was also fringed with short hairs also soft, green or brown in colour. Pupal duration found with an average 7.25 ± 0.23 days. Pupal length and breadth were 8.25 ± 0.20 and 1.80 ± 0.08 mm, respectively.

3.1.4 Adult Longevity and Total Life Cycle

The adult moth is characterized by fissured wings. The longevity of adults observed with an average of 6.32 ± 0.30 days. The present findings are in close agreement with the observations made by Subharani and Singh (2008) [3], who reported that the mean longevity of the adult plume moth was 6.59 ± 0.34 days when reared under laboratory conditions on redgram during 2004-05. In the present investigations, the total life cycle of *E. atomosa* i.e. from egg to adult ranged from 40 to 41 days with an average of 40.2 days. The present findings less equal to Subharani and Singh (2008) [3], who reported that the total life cycle of *E. atomosa* was completed in 40 to 42 days.

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