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Biology of pulse beetle, *Callosobruchus chinensis* (L.) on stored black gram, *Vigna mungo* (L.)

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Abstract

The biology of pulse beetle, *Callosobruchus chinensis* (L.) on black gram, *Vigna mungo* (L.)” was studied during July – December, 2019 under laboratory conditions at the Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur. The study revealed that the mean hatching period of pulse beetle eggs was 4.10 days. The mean larval and pupal period was 26.57 days. The mean pre-oviposition, oviposition and post-oviposition period of female pulse beetle were 5.83, 4.77 and 1.77 days, respectively. The mean male and female longevity were 8.43 and 12.37 days, respectively. Total life cycle of male and female pulse beetle were completed in 39.03 and 42.97 days, respectively. The mean fecundity of female was 89.30 eggs and ranged from 81 to 97 eggs.

Keywords: Biology, black gram, fecundity, life cycle, longevity, pulse beetle

Introduction

Pulses, a vital constituent of Indian diet, play an important role in the agriculture economy. Where the consumption of animal protein expect milk is still considered a religious and social taboo. The area under pulse crops is approximately 299.93 Lakh hectares and the total production is 25.23 million tonnes in the India ^[1]. Among the pulse crops, black gram (*Vigna mungo* L.) is being cultivated extensively throughout different parts of African, European, American and Asian continents. India is one of the prominent black gram growing countries in Asian continent ^[2]. In India, it is grown in many states, namely Andhra Pradesh, Bihar, Gujarat, Haryana Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal and Tripura ^[3] and nearly 31 per cent of total pulse acreage and over 21 per cent of total pulse production in India is contributed by Urd, Mung and Cowpea ^[4]. Black gram (*Vigna mungo* L.) also known as urdbean, mash, mungobean, black mapte etc. It contains protein (25-26%), carbohydrates (56.8%) and fats. Pulses are more difficult to store than cereals as these suffer a great damage during storage due to the insect pest attach. Generally they are stored for food, feed and seed purpose. The availability of pulses may go down due to heavy losses caused by insect during storage. Important pests infesting stored pulses are *Callosobruchus chinensis* L., *Pachymerus quadrimaculatus* Fab., *Bruchus analis* Fab., *B. albocollus* Pic, *B. phaseoli* Gyll., *Laria affinis* Frol., *Laria emarginatus* and *Laria pisorum* Linn. Among them *Callosobruchus chinensis* L. is an injurious and common pest of pulses ^[5]. The complete knowledge of biology of *C. chinensis* on black gram plays a great role for identifying the life stages and also for planning IPM strategies. Keeping in view the above facts, for the management purpose we should require the biology of pulse beetle.

2. Material and Methods

The biology of pulse beetle, *C. chinensis* on stored black gram was studied under laboratory conditions at the Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur during July – December, 2019. The nucleus culture of pulse beetle, *C. chinensis* was obtained from the laboratory of Department of Entomology, RCA, MPUAT, Udaipur. This culture was maintained at ambient conditions of temperature and relative humidity. For the experiment, three plastic containers (250 ml capacity) containing 100gm seeds were taken where in freshly emerged single pair of *C. chinensis* was released in each container. Identification of the sexes was made by employing the method suggested by Pandey and Singh ^[6]. Mouth of the containers were covered by muslin cloth and secured with rubber bands and later maintained at ambient conditions of temperature and relative humidity in the

laboratory. Adults were removed from these containers after death.

The observations on the different biological parameters viz., incubation period, larval + pupal period, pre-oviposition, oviposition, post-oviposition period, adult male and female longevity, duration of total life cycle completed and fecundity of *C. chinensis* was recorded.

3. Results and Discussion

The result on biology of pulse beetle, *C. chinensis* has been presented in table-1. The hatching period of eggs of pulse beetle on blackgram var. Nirali was ranged from 4-5 days with the mean of 4.10 days. Similarly, the incubation period of *C. chinensis* ranging from 5-6 days at room temperature on different pulses^[7].

The average incubation period ranging from 9-13 days on blackgram^[8]. Mean incubation period was 4.8 days which varied from 3 to 7 days in which could be due to the impact of temperature and humidity^[9].

Incubation period of pulse beetle on blackgram ranged from 4-5 days with the mean of 4 days^[10]. The incubation period of the eggs under laboratory conditions ranged from 4 to 6 days with a mean of 4.6 ± 0.70 days^[11].

The larval and pupal period of *C. chinensis* on blackgram seeds was ranged from 24-28 days with the mean of 26.57 days. Similarly, pupal periods of 7-9 days on blackgram and 7.2 ± 0.18 days on pigeonpea, respectively^[12].

The larval + pupal period of pulse beetle completed in 27.7 days on chickpea^[9]. Mean larval and pupal period of pulse beetle on blackgram were 13.0 and 6.0 days, respectively^[10]. That mean larval and pupal period of pulse beetle was 33.3 days^[13].

The pre-oviposition, oviposition and post-oviposition period of female pulse beetle on blackgram seeds ranged from 5-8, 4-6 and 1-3 days with the mean of 5.83, 4.77 and 1.77 days, respectively.

Pre-oviposition, oviposition and post-oviposition period of female pulse beetle on greengram were 5.8 ± 1.62 days, 4.9 ± 1.66 days and 3.6 ± 0.97 days, respectively^[9]. The pre-oviposition, oviposition and post-oviposition periods on chickpea were 6.55 ± 0.94 hours, 8.10 ± 1.25 days and 1.85 ± 0.48 days, respectively^[14].

The mean male and female longevity were 8.43 and 12.37 days, which were ranged from 7-9 and 10-14 days, respectively on blackgram. Similarly, the mean longevity of male was 6.2 days and 8.6 days for the female on greengram^[9].

The adult longevity of pulse beetle ranged from 7-14 days with the mean of 8 days on blackgram^[10]. The females lived for a period of 8-12 days with a mean of 9.50 ± 1.58 days whereas the males lived for 7 to 11 days with a mean of 8.30 ± 1.25 days^[11].

Total life cycle of male pulse beetle on blackgram var. Nirali was completed in 39.03 days with range from 37-42 days, while female life cycle completed in 42.97 days with range from 40-47 days, respectively. Similarly, total developmental period (egg to adult) of pulse beetle on blackgram was 34.5 days^[15].

The total life cycle completed in 30 days on blackgram^[10]. The mean fecundity of female on blackgram var. Nirali seeds was 89.30 eggs and ranged from 81 to 97 eggs. Similar finding was the average egg laying per female by *C. chinensis* to be 110 eggs^[6].

The fecundity of pulse beetle female on greengram varied

from 78 to 102 eggs with an average of 90 eggs^[9].

Table 1: Biology of Pulse beetle, *C. chinensis* Black gram var. Nirali (n=30)

Insect stages	Mean \pm SD	Range (days)
Incubation period	4.10 \pm 0.31	4.00 – 5.00
Larval + Pupal period	26.57 \pm 1.07	24.00 – 28.00
Pre oviposition period of female	5.83 \pm 0.99	5.00 – 8.00
Oviposition period of female	4.77 \pm 0.73	4.00 – 6.00
Post oviposition period of female	1.77 \pm 0.63	1.00 – 3.00
Adult longevity:		
i. Male	8.43 \pm 0.68	7.00 – 9.00
ii. Female	12.37 \pm 1.30	10.00 – 14.00
Total life cycle (egg to adult):		
i. Male	39.03 \pm 1.43	37.00 – 42.00
ii. Female	42.97 \pm 1.96	40.00 – 47.00
Fecundity/female (number of eggs)	89.30 \pm 5.15	81.00 – 97.00

SD = Standard deviation

4. Conclusion

The present biological studies concluded that mean incubation, larval + pupal, pre-oviposition, oviposition, post-oviposition, male and female longevity of *C. chinensis* on stored black gram were 4.10, 26.57, 5.83, 4.77, 1.77, 8.43 and 12.37 days, respectively. The total life cycle of male and female was completed in 37-42 and 40-47 days, respectively. The fecundity of pulse beetle female was ranged from 81 to 97 eggs.

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