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Biology of Pulse Beetle, *Callosobruchus chinensis* (L.) in Stored Chickpea under Laboratory Condition

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ABSTRACT
A laboratory study on the biology of pulse beetle, Callosobruchus chinensis (L.) (Coleoptera: Bruchidae) in stored chickpea under laboratory condition during 2016-17. The average incubation period, larval + pupal period, and adult longevity of male and female were 4.17, 27.7, 7.07 and 8.8 days respectively. The average of the total developmental period (egg to adult) was 34.62 days, and pre-oviposition, oviposition and post-oviposition period and Fecundity were 0.4, 6.35, 1.95 and 89.7 days, respectively. The sex ratios of C. chinensis in case of chickpea produce more males as compared to females, resulted in 1:0.92
Keywords: *Callosobruchus chinensis, Chickpea, Biology.*

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INTRODUCTION

Pulses are important food crops due to their high protein and essential amino acid content. Apart from being an important source of dietary protein for human consumption, the pulse crops are also important for the management of soil fertility due to nitrogen-fixing ability [5]. Chickpea (*Cicer arietinum* L.) is a highly nutritious pulse cultivated throughout the world and is placed third on the importance list of the food legumes. India is the largest producer of this pulse contributing to around 63% of the world's total production [4]. Chickpea is used in arrange of different preparation in our cuisine and has a good source of energy i.e. 416 calories/100gm chickpeas. It contains protein (18.22%) carbohydrates (52-70%) fat (4-10%), minerals (calcium, phosphorous and iron) and vitamins. It is already a traditional component of the Indian diet but is becoming increasingly scarce. Likewise, chickpea can be an important contributor to soil fertility and organic matter to soil [6]. It is recorded that 55- 60 percent loss in seed weight and 45.50 to 66.30 percent loss in protein content of pulses is due to infestation caused by pulse beetle [3]. Plant-derived materials are more readily biodegradable, relatively specific in the mode of action and easy to use. They are environmentally safe, less hazardous, less expensive and readily available [2]. There is a steady increase in the use of medicinal plant products and edible oils as a cheaper and ecologically safer means of protecting stored products against infestation by insects. The above studies emphasize the need for controlling the pulse beetle *Callosobruchus chinensis* through plant-derived oil extract and edible oils.

MATERIAL AND METHODS

The biology of *Callosobruchus chinensis* was studied in the laboratory of Department of Entomology, S.V.P. University of Agriculture and Technology, Meerut. Twenty-five pairs of one-day-old adults were released for egg laying in a plastic container containing 100 grams of grains. The grains containing eggs were collected on next day morning. To observe the developmental period, one egg on each grain was kept, while others were removed with the help of a needle and kept in a glass vial (20 x15 cm). Like that 100 eggs were kept separately in a plastic jar (20 x15 cm) under lab conditions. Observations were recorded on hatching of eggs, larval-pupal and adult period. Newly emerged adults were released in 10 pairs to record the pre-oviposition, oviposition, post-oviposition and longevity period. The male beetle was distinguished with the female ones by antenna i.e. male having pectinate antenna whereas females having a serrate antenna. The number of eggs laid by each female during lifetime was observed to study the

fecundity recorded. The grains with eggs were replaced daily by healthy grains and the number of eggs laid by an individual was recorded till the female died.

RESULT AND DISCUSSION

The mean incubation period was 4.17 ± 0.37 days (Table 1& Fig. 1). The eggs duration was 3 to 5 days. The mean larval + pupal period was 27.07 ± 3.28 days respectively. Similar results were also reported by Verma and Anandhi [8] the average incubation period, larval + pupal period, and adult longevity of male and female were 4.0, 16.4, 11.0 and 9.6 days respectively The larval + pupal duration was ranged from 22 to 35 days. The mean adult duration was 6.9 ± 0.86. The adult duration was ranged from 5 to 9 days. The mean total lifespan of *C. chinensis* on chickpea was 34.62 ± 3.48 days and ranged from 26 to 43 days. The mean pre-oviposition (hours), oviposition and post-oviposition period of *C. chinensis* on chickpea was 5-9 ± 6.97 ± 0.75hours, 6.35 + 0.91 days and 1.95 ± 0.48 days respectively. Similar results were also reported by Chakraborty and Mondal [1] the adult lifespan for a male was 4.76 ± 0.64 days and 6.01± 0.13 whereas for female 8.36 ± 0.12 and 9.13 ± 0.09 days. Similar results were also reported by Pokharkar and Mehta [7] the pre-oviposition, oviposition and post-oviposition periods were 7.46 ± 0.99 hours, 7.88 ± 1.20 days and 1.56 ± 0.58 days, respectively. Such differences may be due to food as well as environmental condition. The mean adult longevity of the male of *C. chinensis* on chickpea was 7.07 ± 0.84 and ranged from 5 to 9 days. The mean adult longevity of the male of *C. chinensis* on chickpea was 8.8 ± 1.14 and ranged from 6 to 12 days. Such difference in adult longevity may be due to differences in temperature and relative humidity. The average eggs laid by the female of *C. chinensis* on chickpea were 80-89. The sex ratios of *C. chinensis* in case of chickpea produce more males as compared to females, resulted in 1:0.92. Similar results were also reported by Pokharkar and Mehta [7] the sex ratio of male and female was 1:0.96.

Table. 1 Duration of different stages, pre-oviposition, oviposition, post oviposition period and adult longevity of *Callosobruchus chinensis*

S.No.	**Stage**	**Duration of days**	
		Range	Average ± S.D.
1.	Egg	3-5	4.17±0.37
2.	Larval + Pupal	22-35	27.7±3.28
3.	Adult longevity	5-9	6.9±0.86
a)	Male	5-9	7.07±0.81
b)	Female	6-12	8.8±1.14
4.	Total developmental period	26-43	34.62±3.48
5.	Pre-oviposition(hours)	5-9	6.97 ± 0.75
6.	Oviposition	4-9	6.35±0.91
7.	Post-oviposition	1-3	1.95±0.48
8.	Fecundity	80-98	89.7±3.02

Table 4.2 Hatchability of eggs, egg laying capacity and sex ratio of *Callosobruchus chinensis*

Egg laying capacity	Number of females observed	Number of eggs laid by 5 females	Average egg laid by female
	5	380	76
Hatchability	Number of egg observed- 100	Number of egg hatched- 90	Percent hatchability- 90
Sex ration of male and female	Adult observed	Sex development percentage	Sex ratio
	50	Male- 52%	1:0.92
		Female- 48%	

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