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## Ovicidal activity of botanicals (Turmeric powder) against the pulse beetle, *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae)

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### Abstract

*Callosobruchus chinensis* (L.) is the major insect pest of stored grains especially several pulses, in India. Ovicidal activity of turmeric was evaluated against pulse beetle on store split green gram seeds “Mung bean” (*Vigna radiata* L.). In the laboratory of “Zoology department, Hindu college, University of Delhi” during the period from September to October 2022. Efficacy of turmeric powder was evaluated in the respect of % adult eclosion in control and treatment container. Turmeric powder was found to be quite effective in checking the eclosion of adult in the experimental jar containing moong bean seeds and turmeric powder in comparison to that in the control jar; % eclosion in treatment and control being 34 and 59 respectively.

**Keywords:** Turmeric powder, *Callosobruchus chinensis* (L.), *Vigna radiata* L, pulse beetle

### Introduction

The pulses have been considered poor man's meat and are the best source of plant protein (20-30%) in diet since long (Sharma, 1984) [5]. Green moong (*Vigna radiata*) is a popular pulse crop in India cultivated in several central and northern states. Sometimes, the storage of pulses are required for few months before they are being sold out in market in order to get good reward. Pulses are more difficult to store than cereals because they sustain more damage from insects, vermin and microbes while being stored (Anon, 1978) [1]. Gram seeds kept in godowns and farmer buildings provide bruchids with an ideal environment for growth and reproduction. Because of the pulse beetle infestation, seed suffer qualitative and quantitative losses and lose their suitability for human consumption (Atwal, 1976) [2]. Chemical pesticides have been used for a long time to protect pulse from beetle in storage, but doing so poses severe health risk and their aftereffects can be seen in the grain that has been restored as well as in the surrounding environment (Fishwick, 1988; Singh, 1989) [6, 7].

In several nations, efforts are being made to find alternative insect control strategies that make use of botanicals product in light of this worrying situation. Natural botanicals are relatively precise in their mode of action, biodegradable and simple to employ (Das, 1986) [3]. It has been claimed that combining stored grain with leaf, bark, seed powder, oil or plant extract can lower the rate of oviposition and adult bruchid emergence while also lowering the amount of damage caused (Onu and Aliyu, 1995) [8]. The present study was performed to investigate the bio-efficacy of turmeric powder against pulse beetle (*Callosobruchus chinensis*) on split green moong seeds.

### Materials and Methods

The investigation entitled “Ovicidal activity of botanicals (Turmeric powder) against the pulse beetle, *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae)” was carried out in the laboratory of “Zoology department, Hindu college, University of Delhi” during September to October 2022. The experiment was carried out in B.O.D. incubator pre-set at temperature of 28 (+ -) 2 degrees Celsius and 14 LL: 10 LD cycle. Insect stages were separated from pulse after sieving it through sieve to prevent further infestation and kept in separate container with pulse. On 29 September 2022, five replicate of control and test were taken with 25 gram of split green moong pulse in both.

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Test jar was added with 1mg of powdered turmeric and 20 infested seeds each with single eggs on its smooth surface was released in all the containers. The jars were covered with muslin cloth on the top and tied with rubber bands including the control; then capped.

The bottles were suitably labeled and kept in an incubator at 28 degrees Celsius (+-) 1-degree Celsius temperature. Eclosion was recorded and adult were separated for further study on weekly basis before observation of first eclosion then daily. The data obtained were statistically analyzed by adopting suitable statistical tests.

#### Life cycle of *Callosobruchus chinensis* (L.) (Hosamani G.B., Jagginavar S.B. and Karabhantanal S.S., 2018) <sup>[4]</sup>

- Incubation Period:** The incubation period varies from 4-6 days on different hosts. On green moong pulse, it is 4-5 days.
- Larval Period:** Larval period varies from 12-20 days depending on different hosts. On green moon pulse, it is 12-19 days.
- Pupal Period:** Pupal period varies among the different pulses from 7-10 days. It is 7-8 days on green moong pulse.
- Adult Longevity:** The adult longevity varies from 7-20 days depending upon the type of pulse as host. On green moong pulse it is 7-18 days.
- Total life Cycle:** The average duration of life cycle

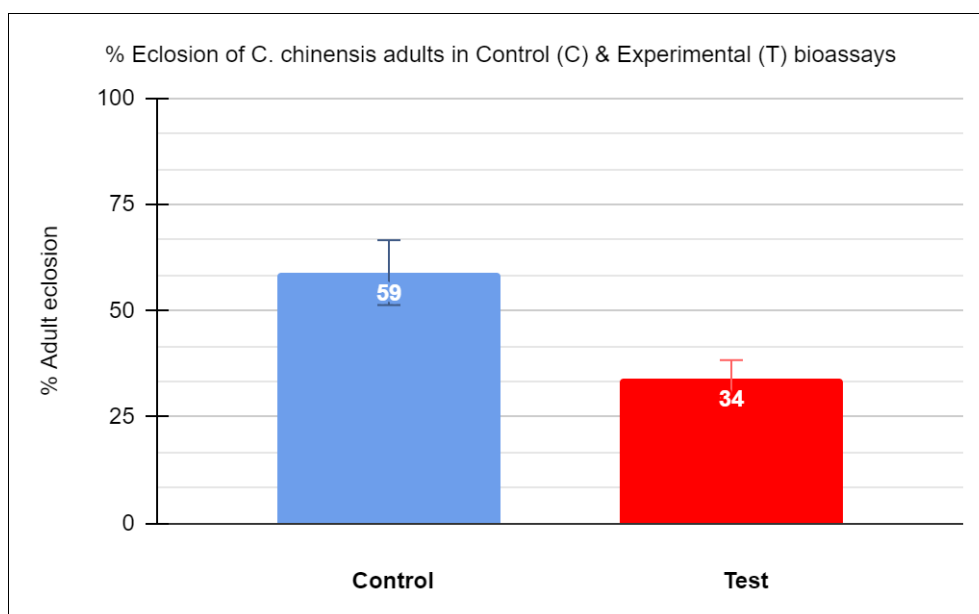
varies significantly from 29-39 days on different pulses. On moong pulse it is 29-32 days.

#### Observation and Result

The eclosion of adult was firstly observed on 17th October 2022, with the number Shown in Table (1). Clear morphological differences between male and female were observable. Female were larger and heavier than male beetle. The antennae were pectinate in male and serrate in females the adult beetles emerged from the seeds through holes and data on its emergence was recorded on different days. The infestation in seeds clearly visible which was significantly higher in control as compared to that in the test jars. The highest number of adult emergences were recorded in control (59%) and lowest in test (34%). The graphical representation of % eclosion of control and test is depicted by blue and red bar respectively in Fig (1). This observation clearly shows that the effect of turmeric powder was clearly observable in treatment jars and turmeric powder was able to check the eclosion of adult from eggs. Firstly, the number of adults which emerged on a particular day in the test jar was less than that in control jars. Secondly, number of adults which emerge in test jar (T<sub>1</sub> and T<sub>2</sub>) is more than control which may be due to prolonged (incubation, larval, pupal) any one or more period. Increase in number of days in life cycle of beetle can be used has advantage to check their growth imaging their life cycle to a great extent.

**Table 1:** Record of % eclosion of *C. chinensis* adults from split green moong seeds infested with its eggs in Experimental containers (containing turmeric powder along with split green moong seeds) and Control containers (containing split green moong seeds only).

Dates of observation	C1	C2	C3	C4	CS	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
17/10/2022	8	6	6	7	10	5	4	5	2	5
20/10/2022	2	4	2	3	3	0	1	1	2	1
25/10/2022	1	1	1	2	3	2	2	1	2	1
No. of adults emerged/eclosed	11	11	9	12	16	7	7	7	6	7
%Eclosion	55	55	45	60	80	35	35	35	30	35
Mean % Eclosion + S.D.	59+12.94					34+2				



**Fig 1:** Record of eclosion of pulse beetle, *Callosobruchus chinensis* adults on split green moong seeds in Control (C) and Experimental (T) bioassays.

**Experimental/ Treatment (T):** Insect rearing containers containing eggs of pulse beetle, split green moong seeds and turmeric powder.

**Control (C):** Insect rearing containers containing eggs of pulse beetle and split green moong seeds (without turmeric powder)

### Conclusion

The pulse beetle *Callosobruchus chinensis* has a great tendency to damage the pulses. Turmeric powder can be used as an effective, economical and eco-friendly method to prevent infestation of pulses stored in household or market. Since turmeric is an edible product and commercial, also used as an essential condiment in India cuisine. It has no side effects and thus can be used safely.

Further studies are required to quantify by the amount of turmeric powder that can be recommended for safe packaging and commercial sale of packaged pulses in the grocery shops, etc.

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