

## Eco-friendly Management of Pulse beetle (*Callosobruchus chinensis* Linn.) in Storage

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### Summary

Pulses are ancient crops of the Indian Subcontinent, the Middle East, and certain regions of Africa. These are seen to be the greatest foods for vegetarians in India, South Asia, West Asia, and Southern European nations because they offer high-quality protein. Chickpeas are well known for their nutritious grains and high protein content i.e., 25–29%. These grain legumes are, however, vulnerable to many types of Dhor beetle, which are stored as members of the Bruchidae family. Adults are seen emerging and wandering over the surface of the grain, and making exit holes. Grubs are responsible for the formation of cavities in seed kernels. Currently, synthetic pesticides and fumigants are extensively used in insect management technique. The widespread and hazard use of insecticides leads to a natural balancing confrontation with insects, insect recovery, and an epidemic of secondary insects that produces phytotoxicity. Proteins next to the storage space plague to reduce it. With these ideas in mind, research was done to determine how well a variety of native botanical powders worked as pesticides when used as granule protectants next to *Callosobruchus chinensis* bean grains. The evidence suggests that many plant materials that are good for ecosystems have considerable effects against the pulse beetle and can be used as alternative pest control strategies.

### Introduction

Pulses are an important source of protein that forms a major constituent of vegetarian diet for urban and rural people of India. Apart from being an important source of dietary

protein for human being, the pulse crops are also important for the management of soil fertility through biological nitrogen fixation in soil and thus play a vital role in further sustainable agriculture (Kannaiyan, 1999).

Globally, Bengal gram is grown in an area of 137 lakh hectares with a production of 142.4 lakh tonnes and productivity of 1038 kg/ha (FAO STAT, 2019). India contributes 70 per cent of total world Bengal gram production of 116.2 lakh tonnes cultivated under 112 lakh hectares with productivity of 1036 kg/hectare in 2020- 21 (agricoop.nic.in). India is the largest producer of world gram production followed by Australia, Myanmar and Ethiopia (FAO STAT, 2019). In India, Bengal gram takes first position in total pulse production followed by Black gram. In India, there are about 200 species of insect pests which cause damage to stored grains and grain products in storage. Pulses are attacked by different storage insect pests. The insects causing damage to stored pulses are Pulse beetle (*Callobruchuschinensis*Linn.), Khapra beetle, (*Trogodermagranarium*Everts.), Lesser grain borer (*Rhizoperthadomanica*Fab.). Among these, pulse beetle is most important pest as it infests pigeon pea both in field and storage (Rathore and Sharma 2002).

Pulse beetle is primary pest of stored pulses. Its adult is not damaging and having short life span. Only grub causes damage to stored pulses. The grubs cause damage by eating out the entire internal content of the grain, leaving only the shell behind. These damaged grains are unfit for human consumption as well as sowing purpose. The losses caused by this pest to the pulses have been estimated to the tune of 40 to 50 per cent in storage (Mathur and Upadhyay, 1997). The seed quality is affected depending on the damage to embryo/endosperm and mostly damage was done during July-October.

Pulse Beetle /Gram Dhora:

(i) **Scientific name** –

*Callobruchuschinensis*Linn.

(ii) **Taxonomic position:**

- ❖ **Kingdom:** Animalia
- ❖ **Phylum:** Arthropoda
- ❖ **Class:** Insecta
- ❖ **Order:** Coleoptera
- ❖ **Family:** Bruchidae



Fig No. 1 Adult of *Callobruchuschinensis*Linn.

❖ **Genus:** *Callosobruchus*

❖ **Species:** *chinensis*

**(iii) Distribution:** Pulse beetle is distributed throughout the tropical regions of the world viz. India, Sri Lanka, Myanmar, China, Japan, and Indonesia.

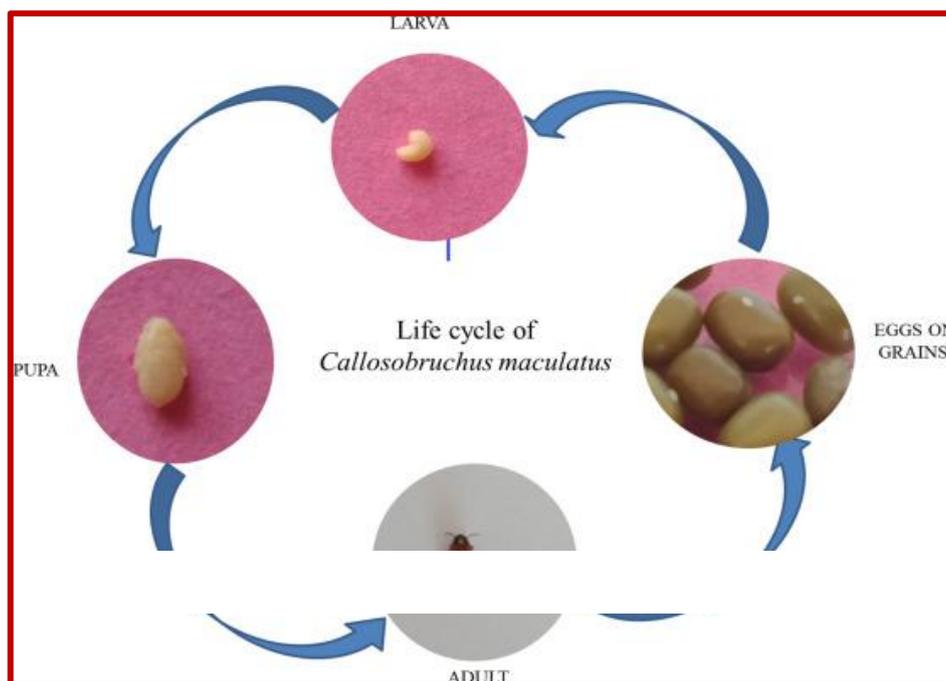
**(iv) Host plants:** *C. chinensis*, is a major pest of all pulses, viz. gram, mung, peas, lentil and Pigeon pea.

**(v) Marks of identification:** Bruchid female' lays egg singly on grains. Fresh eggs are translucent, orange, or cream colored, changing grayish to white later. Eggs hatch into fleshy larva 6-7mm long, curved, creamy white larvae with black mouth parts. Pupation takes place inside seed. Adults are short, active, brownish-gray, 3-4mm long with characteristic spots near the middle of the dorsal side. Adults are harmless on storage products and are short-lived.

**(vi) Nature of damage:** It is an internal feeder. Grubs are responsible for damage in storage products. The adult and grub feed on the grain by making a small hole. Infested stored seed can be recognized by the white eggs on the seed surface and the round exit holes with the 'flap' of seed coat. Kabuli types are particularly susceptible.



**(vii) Life cycle (Bionomics):** The most frequent breeding period of beetle is March to November. The hibernation period occurs in winter season in larval stage. A single female lays about 50-79 eggs in her lifespan. Eggs hatch in 7-14 days, pupa 11-28 days. The average lifespan of an adult is 5-22 days. It completes 7-8 generations in a year. The total lifespan of pulse beetle is 28-36 days in summer and 26-63 days in winter.



### Integrated Pest Management:

#### Cultural Control

- Periodical exposure of the grain to sun helps to check infestations.
- Dry the pods to optimum kernel moisture level of about 7 %.
- Store the pods in polythene-lined gunny bags and fill the top surface of the bag with a layer of 3 cm height sand.
- Mouth of bags should not be stitched or closed to avoid germination loss.
- Care should be taken to avoid breakage
- Broken seeds should not be stored for long periods.
- Dust an inert substance such as ABCD (attapulgate-based clay dust)

#### Mechanical Control

- Dip the old gunny bags in boiled water for 15 minutes.

#### Biological Control

- Coat the seed with small quantities of vegetable oil or mix neem leaves in the stored grain.

#### Chemical Control

- Dip the gunny bags in 10% malathion solution.
- Apply E.D.B. ampoules @ 3 ml/q of seed in air tight storage structure.

- Fumigation with aluminum phosphide protects the seed without affecting the viability



### Conclusions:

This pest is most injurious for pulses, but current research is useful for farmers and extension worker of the state for reducing pulse beetle, *C. chinensis* damage in stored conditions. It is also applicable for understanding biology of pulse beetle. Their infestation starts from field to storage so that it will help for the management purpose.

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