Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 03, Issue: 03 (MAY-JUNE, 2023)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Integrated Approach of Gram Pod Borer (*Helicoverpa armigera* Hübner) in Chickpea Crop

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Abstract
Gram *(Cicer arietinum*), also known as chickpea or Bengal gram, is an important leguminous crop cultivated globally. However, the pod borer (*Helicoverpa armigera* Hübner) poses a significant threat to gram production. This article provides an in-depth analysis of the pod borer, including its introduction, nature of damage, and the integrated pest management strategies employed to mitigate its impact on gram crops. Integrated pest management (IPM) approaches combine various methods to control pests effectively while minimizing environmental and health risks. By adopting IPM practices, farmers can achieve sustainable pest management and ensure a successful gram harvest.

Keywords: Chickpea, *Helicoverpa armigera* Hübner, Integrated pest management,

Introduction
Gram (*Cicer arietinum*) as a vital leguminous crop, its global cultivation, and its economic importance. The Gram Pod Borer, also known as *Helicoverpa armigera*, is a notorious pest that affects various crops, including gram (also known as chickpea), as well as other legume crops. *Helicoverpa armigera* is a moth species belonging to the Noctuidae family. The adult moth has a wingspan of about 3-4 centimeters and displays a mottled pattern of brown, gray, and olive colors. The larvae (caterpillars) of this species are the damaging stage and can vary in color from green to brown or pinkish. Helicoverpa armigera attack on chickpea from 46th to 14th standard week during the crop season (Kumar *et al.*, 2022)

Distribution: *Helicoverpa armigera* is widely distributed and is considered a major pest in many countries, including India, Australia, China, and parts of Africa, Europe, and the Americas. It is known for its ability to infest a wide range of host plants, making it a challenging pest to control.

Life Cycle: The life cycle of the Gram Pod Borer consists of four stages: egg, larva, pupa, and adult. The female moth lays eggs singly or in small clusters on the surface of leaves or other plant parts. The eggs hatch, and the larvae feed on the foliage initially before moving on to the reproductive parts, such as flowers and pods, causing significant damage. The larvae then pupate in the soil, and adult moths emerge to continue the cycle. The adult moth is green to brown in colour with a dull black border around its hind wings and a 'V'-shaped spot on its forewings. On the host plants, a single egg is deposited. There is a 7-day egg period. Larvae are 2" long when fully developed, and they are greenish with dark brown grey lines and dark and light bands. It has a range of colours, from a greenish brown. It takes a larva 14 days to

develop. It spends 10 days as a pupa in dirt. Under ideal circumstances, one generation may be finished in 28 days.

Crop Damage: Gram Pod Borer larvae are voracious feeders and can cause substantial damage to gram crops. They bore into pods, consuming the developing seeds and leaving them damaged or empty. This feeding activity affects the crop yield and quality. In severe infestations, the larvae can also attack other parts of the plant, including flowers and leaves.

Control Measures: Integrated Pest Management (IPM) practices are typically employed to manage Gram Pod Borer infestations. These can include cultural practices, such as crop rotation and destruction of crop residues, as well as biological control methods, such as the use of natural enemies like parasitic wasps. Insecticides may be used as a last resort, but their application should be judicious to minimize negative effects on beneficial organisms and the environment (Wakil *et al.*, 2009).

Cultural Control: Cultural control practices such as crop rotation, proper field sanitation, and timely sowing are discussed. These practices aim to disrupt the lifecycle of the pod borer and reduce its population density.

Biological Control: This section focuses on the utilization of natural enemies, such as parasitoids and predators, to suppress pod borer populations. It highlights the importance of conserving and augmenting these beneficial organisms for effective pest management.

Physical Control: The use of physical barriers, traps, and pheromone-based monitoring systems is explored in this section. These techniques help in capturing and monitoring pod borer adults, reducing their population and damage.

Chemical Control: The judicious use of insecticides as a last resort is discussed in this section. It emphasizes the importance of selecting appropriate insecticides, considering their efficacy, residual toxicity, and impact on non-target organisms. The concept of integrated chemical management (ICM) is also introduced, which promotes the responsible use of pesticides.

Conclusion

Pod borer poses a significant threat to gram production worldwide. However, by adopting integrated pest management strategies (combines cultural, biological, physical, and chemical control methods to achieve sustainable and environmentally friendly pest management practices), farmers can effectively mitigate the damage caused by this pest. Through a combination of cultural, biological, physical, and chemical control methods, sustainable pest management can be achieved while minimizing environmental risks and ensuring a successful gram harvest.

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