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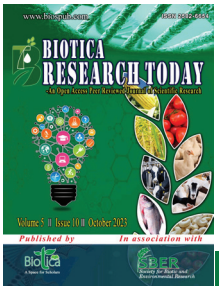

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Biology and Management of *Helicoverpa armigera* (Lepidoptera: Noctuidae)

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Abstract

The *Helicoverpa armigera* Hubner is a highly devasting pest to Tobacco, tomato, okra, cotton, *etc*. *H. armigera* is cosmopolitan insect which mainly distributed in Asia, Africa and Europe. The life cycle of *H. armigera* includes egg-laying, larval, pupal and adult stages, with specific durations for each stage. Identification characteristics of the insect at different life stages are described. Caterpillar cause economic damage by feeding on vegetative part of plant, seed and fruit of crop. The article discusses various management strategies to control *H. armigera*, including cultural methods such as crop rotation, trap crops and fertilizer application. Mechanical control methods, such as manual removal of larvae, are mentioned, along with biological control using parasitoids like *Trichogramma* spp. and *Habrobracon hebetor* wasps. Chemical control options like *Bacillus thuringiensis* (Bt) and Spinosad are also explored.

Keywords: Damage, *Helicoverpa armigera*, Life cycle, Management

Introduction

Helicoverpa armigera, belongs to family Noctuidae (Leopidoptera), is a highly polyphagous and cosmopolitan pest. Recognized as one of the most destructive nuisances for field crops globally, it poses a significant threat to around 300 plant species. This voracious feeder is particularly detrimental to economically important crops such as tobacco (*Nicotiana tabacum*), Tomato (*Solanum lycopercicum* L.), Okra or Bhindi (*Abelmoschus esculentus*), Chickpea or bengal gram (*Cicer arietinum* L.), Cotton (*Gossypium hirsutum* L.), Maize (*Zea mays* L.), Soybean (*Glycine max* L.), *etc*. Its ravaging feeding habits result in significant yield reductions, making it a formidable threat to global agriculture. The economic consequences of this pest, which include both direct crop yield losses and broader financial implications, are estimated to be approximately US$ 5 billion (approx. 220 billion INR) within the nation (Sharma *et al.*, 2011).

Distribution

H. armigera is extensively distributed, spanning Europe, Asia, Africa and Oceania. Within the context of tomato crops, this insect is recognized as a notable pest, causing variable degrees of harm in distinct regions of India, notably in the Solan region of Himachal Pradesh (Sharma *et al.*, 2011).

Life Cycle

- The female of *H. armigera* lays 490 to 560 eggs (Sharma *et al*., 2019).
- Eggs with a hemispherical shape.
- The eggs are characterized by a yellowish-white color (Sharma *et al*., 2019).
- The range of incubation period for insect eggs is between 3 to 5 days (Sharma *et al*., 2019).
- The larval period typically lasts approximately 30 to 38 days on average (Sharma *et al*., 2011).
- A duration of 13 to 15 days characterizes the pupal period (Sharma *et al*., 2019).
- The presence of a bunch of hairs at the tip of the abdomen characterized the female pupa (Sharma *et al*., 2019).
- The adult male has lifespan of 9 to 10 days while the adult female has lifespan 11 to 12 days (Sharma *et al*., 2019).
- The total life cycle of male insects complete in a span of 51 to 53 days, while that of female insects take 53 to 56 days (Sharma *et al*., 2019).

Article History

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• Sex ratio (Male: Female) is arouund 1:2.10 (Sharma *et al*., 2019).

Identification

• A dirty white color observes in the infant larva, which transitioned into shades of pink-brown and pale green as maturity reaches (Sharma *et al*., 2019).

• Male moths exhibit a greenish-grey appearance, while female moths characterize by their orange-brown coloration (Sharma *et al*., 2019).

Nature of Damage

During the initial 1st to 3rd instar larval stages, they typically consume vegetative parts of plant. As they grow larger in later stages, these larvae relocate to developing pods by creating holes or tunnels and feed on the entire developing seeds and inside the fruits causing significant reductions in crop yields (Wakil *et al.*, 2009).

Management

Cultural Method

• Crop rotation serves as an additional cultural control strategy adopted by many farmers. In order to break the life cycle of pests and diseases, crop rotation involves alternating the primary crop with others like maize, wheat and soybeans.

• Cowpeas, sorghum, maize, soybeans, watermelon and pumpkins are frequently used as effective trap crops for managing *H. armigera*.

• Application of nitrogenous fertilizer makes crop area more green bushier more vulnerable for larvae attack and in reverse phosphorus application reduces the larvae population.

• Weeding reduces the infestation of *H. armigera* (Wakil *et al.*, 2009).

Mechanical Control

• Manual removal of larvae by hand (Wakil *et al.*, 2009).

Biological Control

• *Trichogramma chilonis* release at a rate of 30 cards ha^{-1}, with each card containing 1500 eggs (Wakil *et al.*, 2009).

• Parasitoids like *Trichogramma* spp. and *Habrobracon hebetor* wasps function as egg parasitoids and show potential for controlling *H. armigera* (Pratissoli *et al*., 2015).

Chemical Control

• *Bacillus thuringiensis* (Bt) application at a rate of 2 kg ha^{-1} (Wakil *et al.*, 2009).

• Abamectin 1.8 EC @ 120 ml $acre^{-1}$, Emamectin benzoate 1.9 EC @ 100 ml $acre^{-1}$, Indoxacarb 150 SL @ 100 ml $acre^{-1}$, Spinosad 240 SC @ 50 ml $acre^{-1}$ (Javed *et al.*, 2018).

Conclusion

Helicoverpa armigera, a highly polyphagous and widespread pest, poses a significant and costly threat to global agriculture. Understanding the life cycle of *H. armigera*, which spans from egg to adult with distinct stages, is crucial for developing effective management strategies. Various methods have been discussed, including cultural practices like crop rotation and the use of trap crops, mechanical control through manual removal of larvae, biological control. Efforts to manage *H. armigera* must continue to evolve and adapt, as this pest remains a formidable challenge to global food security. Collaboration among researchers, farmers and policymakers is essential to develop sustainable and integrated pest management strategies to safeguard our crops and ensure a stable food supply for growing populations.

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