



Eco-friendly Integrated Pest Management of Gram Pod Borer (*Helicoverpa armigera*) (Hübner) in Chickpea Ecosystem

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Globally, chickpea (*Cicer arietinum L.*) is an important cool season food legume. Chickpea and pigeonpea are the major pulse crops grown in India. A number of factors limit achieving the targeted production, biotic constraints are the most important. Among the biotic stresses, diseases and insect pests are the major yield limiting factors causing a yield loss of about 30 percent. Chickpea is attacked by 57 insect species but *Helicoverpa armigera* is a key pest that causes heavy economic loss throughout the country, due to its polyphagous nature the pest has attained a national status and is causing devastating damage. They are highly fecund and voracious feeder and therefore make insecticidal applications inevitable for cultivation of cruciferous crops. Besides higher cost, these insecticides cause undesirable side effects to the human health and thus, non-chemical control methods are now gaining importance day by day. In this article, some important eco-friendly practices have been suggested to overcome damage by this noxious pest. These can be reduced by effective pest management practices such as Integrated Pest Management (IPM).

Introduction

Chickpea and pigeonpea are the major pulse crops grown in India. These occupy more than 50 percent of total area under pulses, and contribute 60 percent to total pulses production. The average productivity of chickpea and pigeonpea is about 800 kg/ha and 750 kg/ha, respectively, which is much lower than their potential yields. A number of factors limit achieving this potential, biotic constraints are the most important. Among the biotic stresses, diseases and insect pests are the major yield limiting factors causing a yield loss of about 30 percent.

On the back of higher income received by the pulses farmers in India during 2011-12, the sowing for the current season has reached 13.71 lakh hectares so far and is higher by 10.15 lakh hectares than last year, according to the Department of Agriculture. India is expected to produce around 17.28 million tons for 2011-12 while the domestic consumption is estimated at 21 million tons (Department of Agriculture and Cooperation). The per capita availability of pulses in India has declined 52% to 31.6 grams a day in the past five decades due to increasing population and stagnant production in the past 10 years.

Chickpea is attacked by 57 insect species but, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae), is a highly polyphagous pest which infests many host plants (Attique *et al.*, 2000; Sarwar, 2012). The *H. armigera*, commonly known as cotton bollworm or American bollworm, is a major polyphagous noctuid pest in Asia, causing heavy damage to agricultural, horticultural and ornamental crops (Talekar *et al.*, 2006). Patanker *et al.*, (2001) reported that *H. armigera* is the most serious pest of chickpea and other crop plants all over the

world. In severe cases, it causes about 75 to 90% losses in seed yield, and it was pointed out that gram pod borer damaged leaves, tender shoots, apical tips, floral buds and pods.

Host range

Helicoverpa armigera and *H. punctigera* are major pests of cotton, pigeonpea, chickpea, sunflower, tomato, maize, sorghum, pearl millet, okra, *Phaseolus* spp., vegetables, tobacco, linseed, a number of fruits (Prunus, Citrus, etc.), and forest trees. In recent years, *H. armigera* damage has been reported in carnation, grapevine, apple, strawberries, finger millet, etc. *Helicoverpa punctigera* is a major pest of cotton, corn, sorghum, tomato, chickpea and other grain legumes.

Nature of Damage

Helicoverpa females lay eggs singly on leaves, flowers, and young pods. The larvae initially feed on the foliage (young leaves) in chickpea and a few other legumes (Fig. 1), but mostly on flowers and flower buds (Fig. 2) in chickpea, pigeonpea, etc.

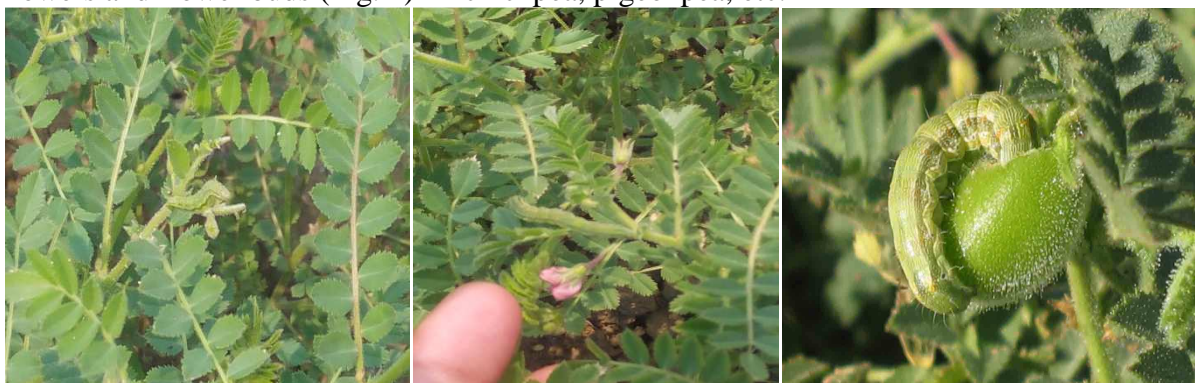


Fig: 1. Damage at vegetative stage **Fig: 2.** Damage at flowering stage **Fig: 3.** Larvae bore in pod

The young seedlings of chickpea may be destroyed completely, particularly under tropical climates in southern India. Larger larvae bore into pods/bolls and consume the developing seeds inside the pod (Fig. 3). In Australia where the climate is cooler, the *Helicoverpa* populations build up in spring, attacking chickpea in late spring before moving on to summer crops growing in the sub-tropical regions.

Non-chemical Management

1. Regular surveillance of pests and defenders, especially different predators and parasitoids of pod borer, *H. armigera*.
2. Growing of resistance varieties/ genotypes *i. e.*, ICC 12475, ICC 12478, ICC 12479, ICC 14876, ICC 12495 and ICC 12494 suggested that water soluble compounds in the leaf exudates (malic and oxalic acid) were primarily responsible for the resistance of the genotypes to *H. armigera*.
3. Conserve native natural enemies of the pod borer *e. i.*, egg parasitoids (Trichogramma wasp, Telenomus wasp), larval parasitoids (*Microplitis demolitor*, *Netelia product* and *Tachinid flies*) and pupal parasitoids (Banded caterpillar parasite, *Ichneumon promissorius*) etc.
4. Don't spray chemical pesticides during heavy natural parasitism.
5. Provision of bird perches at 1 m height above ground level on the gram crop (bird perches @ 40 ha¹) or planting of tall crops that serve as resting sites for insectivorous birds such as Myna (*Acridotheris tritis*) and Drongo (*Dicrurus macrocercus*) helps to reduce the numbers of *H. armigera* larvae.
6. Spraying of NSKE 5% or other neem based formulations at recommended doses.

Chemical Management

Spraying should be done only when insect population is more than economic threshold level (ETL), one larvae per meter row length at the time of flowering and pod formation stage and it should be undertaken during evening time to avoid damage to pollinators. Need

base spraying with either Profenophos 50 EC @ 2 lt. ha⁻¹ or Indoxacarb 14.5 SC @ 400 ml ha⁻¹ should be done.

Integrated Pest Management Modules against Gram Pod Borer, *H. Armigera*

Use of Pheromone traps @ 20 ha⁻¹ for the monitoring of moths for estimation of ETL of *Helicoverpa*. Spraying of Profenophos 50 EC @ 2 lt ha⁻¹ followed by *Bt. kurstaki* @ 1.0 Kg ha⁻¹ with installation of bird perches @ 40 ha⁻¹ or Indoxacarb 14.5 SC @ 400 ml ha⁻¹ followed by HaNPV should be sprayed @ 500 LE ha⁻¹.

All the spraying will be done based on economic threshold level. ETL on chickpea is 1 larva/m row length at full flowering or podding stage, respectively. The interval between two applications of biorationals will be 10-12 days, whereas the gap between the applications of synthetic insecticides will be of 15 days. The HaNPV will be sprayed @ 500 L ha⁻¹ with 0.1% teepol, 0.5% jiggery. The HaNPV will be sprayed along with adjuvant in the early evening, to avoid the harmful effect of UV rays on HaNPV.

Conclusion

A single management strategy may not be so effective against *Helicoverpa armigera* and that will lead to developing resistance against that particular strategy; therefore IPM strategies based on economic threshold level should be adopted to combat the damage. Chemical spraying operation should be done during evening or such a time that there is no damage to bio-control agents and pollinators.

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