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MANAGEMENT OF GRAM POD BORER (*Helicoverpa armigera* Hubner) ON CHICKPEA THROUGH NPV AND *Bacillus thuringiensis*

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Abstract: *Chickpea crop is strongly affected by pod borer Helicoverpa armigera, which damages 90-95% crop during favourable weather conditions due to its high fecundity, migratory and polyphagus nature, resistance against insecticides. The significant decrease was observed in per cent pod damage the use of NPV and Bacillus thuringiensis and they are more effective for better management of H. armigera.*
Key words: *Chickpea, Helicoverpa armigera, NPV and Bacillus thuringiensis.*

Introduction: Chickpea, (*Cicer arietinum* L.) is an important pulse crop in India. Chickpea is the crop of tropical, sub-tropical and temperate region and widely grown in Uttar Pradesh, Madhya Pradesh, Punjab, Rajasthan and Maharastra and popularly used as a protein source. Seeds are widely consumed as pulse, in the form of flour and eaten after roasting. Chickpea is attacked by many species of insect pest and among these gram pod borer *Helicoverpa armigera* (Hubner) considered the most destructive borer because of its high fecundity, migratory behavior, polyphagus nature and resistance against insecticides. The 30-40% average damage of pods during favourable weather conditions and the damage reached upto 90-95%. Farmers are not interested to cultivate chick pea because of heavy yield loss caused by this pest Chemicals adversely affected the soil quality and changed its physico-chemical nature. The pesticides are most expensive, show adverse effect on the environment, lead to health problems and also affect the diversity of non-target organisms. The NPV and *Bacillus thuringiensis* are more effective against survival of pest, eco-friendly, non-hazardous. Application of NPV and *Bacillus thuringiensis* is best alternative of chemical pesticides [1,2 & 3].

Chickpea is grown under diverse agro-ecological niches like rainfed, mixed, monocrop early and late maturing group, low and high input condition, traditional, progressive farming etc. Posing a highly variable spectrum of pest problems which number of more than 50 in chickpea [4]. However, the major damage is caused by the pod borer complex consisting of *Helicoverpa armigera, Autographa nigrisigna and Laphygma exigua* in chickpea. Among these *H. armigera*, commonly called as gram pod borer is the most important and causes considerable damage in and around Kanpur [5]. Due to its polyphagous nature the pest has attained a national status and is causing devastating damage [6]. Climatic changes have also influenced the density of *H. armigera*, population in different pulse crops [7]. The incidence of *H. armigera* has been observed almost throughout the crop growing season. Therefore an attempt has been made to develop an environmentally sound pest management strategy for this pest [8].

NPV (Nuclear Polyhedrosis Virus): Majority of insect viruses used as bio - control agent. [These viruses are characterized by the presence of the ability to form proteinaceous occlusion bodies within infected cells. Nuclear polyhedrosis virus (NPV) is commonly used virus. NPV have the following advantages 1. Species-specific action and hence safe to non-target organisms 2. Nonpathogenic to most beneficial insects and hence fit good into biological control in chickpea crop.

Mode of Action (NPV): The virus unit must be ingested to cause the infection. It passes through the basement membrane of the gut and then goes into haemolymph and haemocoel. On ingestion,

the membrane of polyhedral is dissolved by the alkaline gut juices, setting the virus particle free. The virus particle then penetrates the gut epithelium and come to infect the blood cells, tracheal matrix or epidermal cells. Inside these cells, they enter the nucei, attach themselves to the chromatin and multiply. As multiplication goes on chromatin is consumed. Eventually, the nuclear and cell membrane rupture, releasing the polyhedral into the body cavity to invade other cells. In advanced stage of infection, tissues like silk glands, ganglia imaginal buds etc., which are initially not attacked, may also get infected.

Directions for Use of NPV

- The recommended dosage is 200 ml of NPV/acre or 500 ml/ha containing 100 and 250 larval equivalent (LE) of NPV respectively as active infective material (one LE = 6 x 109 POBs).
- 100 ml of NPV could be diluted in 200-400 litres of water when high volume sprayer is used and in 50-70 litres of water in case of power sprayers.
- Preferable to spray using high volume knap-sack sprayer. Virus should be sprayed during evening hours. Spray should be initiated as soon as some newly hatched larvae are observed or three to five days after a trap catch of 5 moths per pheromone trap. Subsequent sprays should be made at 7-10 days intervals depending upon the pest population.

Bacillus thuringiensis (Bt.): *Bacillus thuringiensis* is a naturally occurring soil bacterium that produces crystal proteins toxic to several insect species during the sporulation stage of its multiplication cycle. The crystalline protein inclusion constitutes 20-30% of the dry weight of sporulated cell allowing for commercial exploitation as a bio pesticide. The potential of this bacterium in the management of several caterpillars especially gram pod borer (*Helicoverpa armigera*) which causing serious damage to the chickpea crop. There are currently more than a hundred products of *Bacillus thuringiensis* registered for the management of important lepidopteran insect pests such as *H. armigera* (Gram pod borer) and other. *Bacillus thuringiensis* occupies approximately 95% share of the microbial bio-pesticide market. The principal reasons for the success of *Bacillus thuringiensis* include the high efficacy and insect specificity of its insecticidal crystal proteins (ICPs) and their bio-degradability. *Bacillus thuringiensis* has a good scope in present and future. The commercial *Bacillus thuringiensis* products are powders containing a mixture of dried spores and toxin crystals. *Bacillus thuringiensis* is applied as a foliar spray best against young caterpillars less than 2 cm long at concentrations between 0.2- 0.3% giving a good coverage on plant surfaces. *Bacillus thuringiensis* is deactivated by sunlight, so spraying in late afternoon or evening or on cloudy days is most effective. Alkaline water (pH of 7.8) or acid water will deactivate the crystals.

Dose of Bt.: *Bacillus thuringiensis* var. kurstaki 5% WP 1000-1250 g/ha.

Compatibility with other Insecticides: The viral pathogens seem to be less sensitive to chemical pesticides. When the combination of pathogen and pesticide is used, sometimes synergistic action is noticed but is recent years mixing of NPV with insecticides is not advisable due to cross resistance problem.

Conclusions: Gram pod borer *(Helicoverpa armigera* Hubner*) is* a major insect pest of chickpea. Which causes extreme loss in chickpea crop production. In 21st century insect pest of gram (chickpea) especially gram pod borer management for reducing yield loss is must to fulfil the demand of growing population for consumption. The use of various bio pesticides (like NPV and *Bacillus thuringiensis*) give good results in the proper management of insect pest and also have eco-friendly and less harmful.

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