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Role of bio-control agents in the integrated pest management of *Helicoverpa armigera* (Hubner)

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Abstract

In India, there has been crop damage due to various insect pests from decades and one of them has been *Helicoverpa armigera* present in various crop ecosystems. Recently, advancement in field of bio-control of pest of pulses is applied again in 177 natural enemies approximate recorded on *Helicoverpa armigera*. Among the pulse crops, egg parasitoid *trichogramma* has great effect in crop of pigeon pea and chickpea. Larval parasitism by dipterans and hymenopterans is considerable. Ichneumonid parasitoid *Camplotis chloridae* is predominant species in chickpea which regulates pod borer population. Another potential one is exotic Dipteran larval parasitoid *Chrysoperla carnea* proves to be effective predator in cotton suppressing both sucking and chewing pest population but not in pulses. Among predatory birds Black Drago plays commendable role in pigeon pea ecosystem in pulse bowl of south India. To search prey caterpillars, erecting inanimate or animate bird perches are useful. *Ha*NPV is the most effective insecticide claiming 90% mortality in field. Recommended dose varying from 250 to 500 LE per hectare by adding UV protectants and phagostimulants, effectiveness can be increased. Another control method using bacterial insecticide i.e. *Bacillus thuringiensis* gives great result but is cost prohibitive. In contrast, use of fungicide which are entomopathogenic, eg. *Nomuraea rileyi* and *Metarhizium anisopliae* and nematodes are also effective in chickpea. For the effectiveness of natural enemies, intercropping system in cotton, pigeon pea and vegetables seems to be giving a maximum result which encourage natural enemies build up population in crops.

Keywords: *Helicoverpa armigera,* biocontrol, parasitoid, phagostimulants*, Bacillus thuringensis.*

Biopesticides: An Eco-Friendly Approach for Sustainable Agriculture and Environmental Conservation

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Abstract

The use of chemical pesticides in agriculture has been of great concern due to their adverse effects on human health and the environment. There is a need to come up with alternative ways of controlling insect pests and diseases. An eco-friendly alternative to chemical pesticides is biopesticides, which encompasses a broad array of microbial pesticides, biochemicals derived from micro-organisms and other natural sources, and processes involving the genetic incorporation of DNA into agricultural commodities that provide safeguards against pest damage. The potential benefits to agriculture and public health programmes through the use of biopesticides are considerable. The interest in biopesticides is based on the disadvantages associated with chemical pesticides. The total worldwide production of biopesticides is over 3,000 tons/year, which is increasing at a rapid rate. India has a vast potential for biopesticides. However, its adoption by farmers in India needs education for maximizing gains. Biopesticides currently account for 5% of the pesticide industry in India, with at least 15 microbial species and 970 microbial formulations registered with the Central Insecticides Board and Registration Committee (CIBRC). The stress on organic farming and on residue free commodities would certainly warrant increased adoption of biopesticides by the farmers. Biopesticides being target pest specific are presumed to be relatively safe to non-target organism including humans. In India, some of the biopesticides like *Bacillus thuringiensis*, NPV, *Beauveria bassiana*, *Verticillium lecanii*, *Metarhizium anisopliae*, *Pseudomonas flourescens, Paecilomyces lilacinus, Trichoderma spp.*, neem based pesticides, etc. have already been registered and are being practiced. Application of products must be easy, economical, effective, and timely to the appropriate site of action. The application of biopesticides fits the modern strategy of integrated pest management (IPM) which combines all suitable control techniques harmoniously with one another and integrates them with other crop production practices, to suppress pest populations below economic injury levels, while maintaining the integrity of the ecosystem.