

IPM Strategies Available in Controlling Eggplant Fruit and Shoot Borer (*Leucinodes Orbonalis*) in India

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How to cite this article:

Debbarma R, Das PK, Sehgal M et al. IPM Strategies Available in Controlling Eggplant Fruit and Shoot Borer (*Leucinodes Orbonalis*) in India. *Int J Agric Env Sustain* 2021; 3(2): 30-32.

Date of Submission: 2021-11-02

Date of Acceptance: 2021-11-25

I N T R O D U C T I O N

Eggplant (*Solanum melongena*) is also commonly known as Brinjal or baingan in India. India is the second most eggplant producing country and shares more than 26% of the world eggplant production which has grown over 55000 ha (Statista Research Development 2021). Recently Eggplant Fruit and Shoot Borer (EFSB), *Leucinodes orbonalis* causes major damage in eggplant production in the country which is characterized by the larvae bore on fruits and shoots resulting in an adverse effect on fruit quality and thus making the fruit unfit for consumption. Several studies suggested that up to 70% yield reduction of eggplant has been observed due to infestation of EFSB (Islam and Karim, 1991; Dhandapani et al., 2003). Moreover, due to lack of proper knowledge and unavailability of standard management strategies tremendous misuse of pesticide were employed by farmers to combat EFSB infestation which exceeded several folds increase chemical application per week during the summer season. As a result, eggplant receives the highest share of insecticide used among the vegetables which lead to the development of insecticide resistance. Therefore, several Integrated Pest Management (IPM) strategies were recently developed by World Vegetables to minimize EFSB problems in eggplant under Indian geographical conditions. The following strategies were adopted in IPM to control EFSB in India:

- Use of Resistant Cultivar
- Sex Pheromone
- Cultural and Mechanical Control
- Local Natural Enemies

Resistant Cultivars

The resistant cultivar is one of the most important components IPM in any insect pests. So far no resistant eggplant cultivar has been reported against EFSB in India, due to the very limited screening the germplasm collection has made. However, recently few wild *solanum* species were identified against EFSB namely *anomalum*, *gilo*, *indicum*, *integriifolium*, *incanum*, *khasianum*, *sisymbriifolium*, *xanthocarpum* etc. (Khan et al., 1978; Sharma et al., 1980; Behera and Singh, 2002).

Sex Pheromone

Sex pheromones play an important role in mass-trapping male insects as well as monitoring the pest numbers in the field. Chemically EFSB sex pheromone is known as (E)-11-hexadecenyl acetate (E11-16:OH) (Zhu et al. 1987). E11-16:Ac is the only active ingredient of EFSB pheromone which act either alone or in combination with E11-16:OH and attract the male moth at a concentration of 300-500 µg per trap. (Srinivasan and Babu, 2000). Few workers also suggested that the pheromone gland consists of E11-16:Ac as a major and E11-16:OH as a minor component (Cork et al. 2001).

Infield application, for effective attraction the traps should be placed at every 10 m or less (Prasad et al., 2005). Several studies suggested that the optimum density of pheromone traps is around 100 per ha (Cork et al., 2003).

Cultural and Mechanical Control

Cultural control and mechanical strategies play an important role disrupt the life cycle of the pest by involving the

manipulation of crop environment as well as management resulting interfere the reproduction, shelter and feeding in the following ways:

- Destruction or Removal EFSB alternative host plants viz., *Solanum nigrum*, *S. indicum*, *S. torvum*, *S. myriacanthum* and other solanaceous vegetables by burning or uprooting
- Burn the crop residue from the previous season may act as a reservoir of inoculum which may initiate EFSB infestation
- Remove the symptomatic EFSB shots and fruits at regular intervals to minimize the inoculum build-up
- To restrict the inter-field movement of EFSB effectively make nylon barrier about 2m height around the eggplant

Local Natural Enemies

Several workers have been reported as natural enemies against EFSB in India in the following Table 1.

Table 1. Diseases Pulse Crops Considered in the Knowledge Base

Natural enemy species	Family and Order	Country recorded	Reference
Predators			
<i>Campyloneura</i> sp	Miridae, Heteroptera	India	Tewari and Moorthy, 1984; Tripathi and Singh, 1991
<i>Cheilomenes sexmaculata</i> , <i>Coccinella septempunctata</i> , <i>Brumoides suturalis</i>	Coccinellidae, Coleoptera	India	Kadam et al., 2006
Parasitoids			
<i>Pseudoperichaeta</i> sp	Tachinidae, Diptera	India	Patel et al., 1971
<i>Phanerotoma</i> sp	Braconidae, Hymenoptera	India	Patel et al., 1971; Tewari and Moorthy, 1984; Tripathi and Singh, 1991;
<i>Trathala flavoorbitalis</i>	Ichneumonidae	India	Yasodha and Natarajan, 2006
<i>Itamoplex</i> sp	Ichneumonidae, Hymenoptera	India	Verma and Lal, 1985
<i>Eriborus argenteopilosus</i>	Ichneumonidae, Hymenoptera	India	Tewari and Sardana, 1987
<i>Diadegma apostate</i>	Ichneumonidae, Hymenoptera	India	Krishnamoorthy and Mani, 1998
Entomopathogens			
Fungus (<i>Bipolaris tetramera</i>)		India	Tripathi and Singh, 1991
Baculovirus		India	Tewari and Singh, 1987
Nuclear polyhedrosis virus		India	Tripathi and Singh, 1991

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