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Manoj Kumar

Assistant Professor, Department
of Entomology, RPCAU, Pusa,
Samastipur, Bihar, India

Sountharya R

Ph.D. Research Scholar,
Department of Entomology,
Tamilnadu Agricultural
University, Coimbatore, Tamil
Nadu, India

Munna Yadav

Senior Research Fellow, ICAR-
IINRG, Namkum, Ranchi,
Jharkhand, India

Chandreshwar Prasad Rai

Senior Technical Officer,
Department of Entomology,
SRI, Pusa, Samastipur, Bihar,
India

Corresponding Author:

Manoj Kumar

Assistant Professor, Department
of Entomology, RPCAU, Pusa,
Samastipur, Bihar, India

Management of Brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee)

Manoj Kumar, Sountharya R, Munna Yadav and Chandreshwar Prasad Rai

Abstract

Brinjal is one of the important vegetable crops grown in India and all throughout the world. Among the various pests and diseases of brinjal, the brinjal fruit and shoot borer, *Leucinodes orbonalis* Guenee creates huge losses and is a huge menace to the brinjal production throughout the world. It is regarded as one of the key pests of brinjal. Because of the pest's devastating nature, it is of prime importance to manage the pest by utilizing various pest control strategies. The usual method of control preferred by farmers is application of chemical insecticides. Besides, the pest can also be managed by employing a variety of strategies like cultural, biological, and bio-rational methods, etc. There are also IPM packages for effective management of the pest and to increase the yield of brinjal.

Keywords: Brinjal fruit and shoot borer, management, IPM

Introduction

Brinjal (*Solanum melongena* L.), which is also known as eggplant or aubergine in western countries, is one of the major vegetable crops being cultivated in India and also throughout the entire world. It belongs to the family solanaceae. Being named suitably the "King of Vegetables", on a global scale the crop is being cultivated in an area of more than 2 million acres whereas in India, about 7.3 lakh ha of area is under brinjal. India is the second largest producer of Brinjal (estimated 128.01 lakh MT of annual production for the year 2017-18) in the world next to China^[1]. Just like any other crop, brinjal is also infested by a wide range of insect pests. One of the important pests is brinjal fruit and shoot borer, *Leucinodes orbonalis* Guenee. It belongs to the family Crambidae and is remarkable because of its destructive nature throughout the brinjal growing areas hence it is regarded as one of the key pests of brinjal. The larvae bores into stem as early as immediately after transplanting of the seedlings and in later stages, they bore into the fruits and feed thereby causing damage to the plant as well as reducing the market value of the fruits, in worst cases making the fruit unfit for harvest^[14, 12].^[17] The pest has been a menace for brinjal cultivation throughout India resulting in crop losses of about 20-80 per cent^[15], 85-90 per cent^[10] and 70-92 per cent^[2] during different seasons of the year. Farmers are more dependent on regular and scheduled sprays of chemical insecticides for the management of the pest. Besides chemicals various other methods are also involved in the management, like use of botanical pesticides, chitin synthesis inhibitors and bio-pesticides. In this review, the recent developments in the management of the brinjal fruit and shoot borer have been discussed.

Chemical control

Chemical pesticides have always been the go-to-solution for the farming community against pest menace because of their immediate action. Experiments show that different concentrations of chlorpyrifos, a strong organophosphate insecticide can be used against this infamous insect pest^[4]. Conventional pesticides have been showing good control over the past times, but due to the prominent use of a particular group of chemical insecticides have resulted in higher cost of protection also rendering the pesticide ineffective over time. Increasing concerns about harmful residues in food, effects on non-target organisms and the creation of insecticidal resistance have led to the development of new molecules that are selective and environmentally safe. Because of the growing importance in the area of newer insecticide molecules, few of the newer insecticides like flubendiamide, cyantraniliprole (diamide group)

and imidacloprid (neonicotinoid group) have also been tested for their field efficacy against fruit and shoot borer. ^{[3][13][19]} Lowest percent fruit and shoot infestation had been observed when chemical insecticides like chlorpyrifos, imidacloprid and flubendiamide were used.

Traps in management

Use of traps is one of the major components in survey and monitoring the pest population based on which the further pest management strategy can be devised. The study of commercial Traps and indigenous bottle trap retention patterns on moths revealed a substantially different design between trap types ^[6]. Using indigenous bottle trap and placement of the trap at the level of the crop canopy attracted maximum moths.

Use of bio- pesticides

Biological and botanical means have been used in pest management since time immemorial because they are eco friendly and environmentally safer than chemical methods. Botanicals and biological agents like azadirachtin, karanjin, *Beauveria*, *Bt* have been tested at field level and used as an effective solution against both the shoot and fruit damage caused by the pest ^[8, 19]. Bio rational means like indigenous products and bio-nutrients along with reduced levels of fertilizers have a considerable impact on the incidence of insect pests of brinjal. Nutrient combinations of 50% recommended dose of fertilizer + Bio-NPK with chemical insecticides carbosulfan 25 EC and spinosad 45SC could help combat the population of brinjal fruit and shoot borer ^[9]. Besides having better pest control, azadirachtin 1% EC @ 2ml/l, chlorantraniliprole were also better for high yields of up to 250.30 q / ha ^[19].

Indigenous technical knowledge practices

The adverse effects posed on the crop ecosystem as well as the health of the consumers by overuse of chemical insecticides have created a shift towards utilizing organic and natural amendments in pest management programs. Therefore the use of locally available and indigenous technologies against pests is ecologically viable, environmentally safe and an economically feasible option. Such inputs like neem oil, jatropa leaf extract, Papaya leaf extract have been observed to be effective for the management of the *Leucinodes orbonalis* both during the vegetative and reproductive stages of the brinjal crop. Sangma *et al.*, (2019) ^[16] conducted an experiment to study the effects of some locally available indigenous botanical insecticides on the brinjal shoot and fruit borer. The experiment comprised of 8 treatments including control. The treatments were applied at the interval of 15 days. All treatments against *Leucinodes orbonalis* showed significant performance over untreated check. Observations on shoots and fruits were recorded on number basis. They also found that neem oil @ 2% treatment was also economically viable (cost-to-benefit ratio to the tune of 1:3.11).

IPM Technologies

Few studies have been conducted by using combinations of more than one source of pest control so as to assess their compatibility and effectiveness towards IPM programs. Such combinations also bring out the synergistic effect, enhancing their potency but for that they need to be tested in a scientific experimental setting. Strategies that are recommended to the

farmers include combinations of botanical insecticides along with chlorantraniliprole 9.3% + lambda cyhalothrin 4.6% ZC and emamectin benzoate 5 SG, combination of *Trichogramma chilonis* and cypermethrin ^[7, 11]. Integrated pest management strategies are also devised for brinjal growing farmers since brinjal shoot and fruit borer is a major pest causing heavy losses in yield and a few studies have been done to test their effectiveness against the pest. IPM strategies had been promoted through front line demonstrations in 10 farmer fields to avoid ill effects of insecticides. The IPM strategies promoted include clipping and disposal of infested shoots, removal of fruits with boreholes, installation of pheromone traps @ 12/ ha, release of *Trichogramma chilonis* @ 8 cc/ ha for 4 times at weekly interval, spraying of *Bacillus thuringiensis* @ 1 kg/ha and flubendiamide 20 WDG 7.5 g /10 lit ^[18]. The AESA based IPM practices that consisted of cultural and mechanical components also proved to be an ideal management strategy against brinjal shoot and fruit borer ^[5]. In terms of yield also the IPM practices showed better results to when recommended to the farmers. IPM field was found to be giving high fruit yield to the tune of 32.8 t/ha with high B:C ratio (4.05) when compared to farmers practice (Non IPM with B:C ratio of 3.1) ^[18].

Conclusion

Since brinjal fruit and shoot borer is wreaking havoc in cultivation of brinjal, leading to tremendous economic damage, more research is needed in strengthening the various experimental findings against the pest. Promising results are obtained from researchers all over the world as well as throughout India for control of the pest, which should be used as bases for further experimentation and refinement. Emphasis should be placed on alternative methods of pest control which would help eliminate the ill-effects of chemical pesticides on environment as well as the consumers. The strategies can be combined into IPM strategies against the pest and such standard packages are need of the moment in our combat against the pest.

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