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FRONT LINE DEMONSTRATION FOR THE MANAGEMENT OF BRINJALSHOOT AND FRUIT BORER (*LEUCINODES ORBONALIS* GUENEE) IN SONBHADRA DISTRICT OF UTTAR PRADESH, INDIA

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Abstract: Among the vegetable crops grown in India, brinjal occupies largest area and plays a vital role in total vegetable production. Brinjal is more vulnerable to the damage caused by shoot and fruit borer, *Leucinodes orbonalis* Guenee which acts as a major pest and causes heavy economic loss to the farmers. HERBOGEN, bio-extract for plant integrated pest management strategies has been promoted through front line demonstrations in 10 farmer's field at Sonbhadra district, Uttar Pradesh, India. The results of ten demonstrations conducted during the year 2023-24, revealed that shoot and fruit borer damage was 6.10 per cent in the fields treated with HERBOGEN botanical insecticide and 17.50 per cent when the pest management was done by the use of DDVP and Cypermathrine. Treated plots were regularly sprayed at 7 days interval with Herbogen 5 ml per litre water and compared to the use of chemical insecticides used "as a when required." Fruit damage was found to be less in recommended practice (9.25per cent in demonstration plots treated with botanical insecticide HERBOGEN while in the control plots, where chemical insecticides were used, it was 28.56 per cent. Fruit yield was found to be high (28.50 /ha) in bio extract (Herbogen) field when compared to control plots (22.30 t/ha). Benefit Cost Ratio also was found to be high (3.65) in bio-extract (Herbogen) fields where as the ratio was low (2.05) in chemical treated or control plots.

Keywords*:* Front line demonstrations, brinjal, shoot and fruit borer, (Herbogen) botanical pesticide, impact, adoption

Eggplant or brinjal (*Solanum melongena* L.) is one of the important vegetable crops covering largest area and plays an important role in total vegetable production in India. Brinjal crop is severely attacked by brinjal shoot and fruit borer, *Leucinodes orbonalis*Guenee. It is considered as the main constraint as it damages the crop throughout the year in India. It is known to damage shoot and fruit of brinjal in all stages of its growth. The yield loss due to the pest is to the extent of 70-92 per cent in various states of India [7]. Larvae bore inside the shoots at vegetative phase of crop growth and fruits at reproductive phase and thus it adversely affects plant growth, yield and fruit quality. Farmers rely only on insecticides to combat brinjal shoot and fruit borer damage. The infested fruits become unfit for consumption due to loss of quality and hence, fetch lower price in the market. Growers rely on heavy use of indiscriminate and injudicious application of synthetic insecticides resulting in increased production costs, residual toxicity, and development of extract resistance, resurgence, secondary pest outbreak, health risk environmental threats and destruction of natural enemies. The scarcity of natural sources of resistance in Solanum species against shoot and fruit borer has been a major challenge to breed cultivars resistant to shoot and fruit borer. Hence, use of organic amendments, plant products and microbial origin insecticides can be the novel approaches to manage the pest. Considering the changing scenario in demand of vegetables, there is further need for increasing productivity and profitability along with the quality vegetables production. There is a potential to increase production of solanaceous vegetables by using best production practices and right combination of input at right time. to bridge the yield gap between demonstration trials and farmer's field. Several technologies and management options are developed for protecting the crops, that can significantly reduce the losses due to insect pests, but adoption of these technologies by the farmers has been far less than anticipated.

Though Integrated Pest Management strategies developed long back, the technological knowledge and adoption rate was low in the minds of brinjal farmers. The improved technology package was found beneficially attractive, yet adoption levels for several components were low, hence emphasizing the need for better dissemination innovative large-scale front-line demonstration was planned and implemented successively to diffuse and influence the practices of IPM technology on yield, cost of plant protection, and quantity of extracts consumption and frequency of extracts sprays. Regular sprays of Herbogen have proved a boon in minimizing losses due to shoot borers and fruit borers. Losses due to sucking pest mainly white fly were also reduced.

The integrated pest management (IPM) techniques could provide satisfactory control, but it should be simple and economic. Some IPM models have been suggested in the past and the farmers were given training on IPM. However, the impact of the IPM training was ambivalent, as the farmers increased the level of extract use after receiving training [11]. The IPM strategy is composed of healthy seedling production, use of resistant cultivars, and sex pheromone to continuously trap the adult males, prompt destruction of pest damaged eggplant shoots and fruits at regular intervals, and withhold extract use to allow proliferation of local natural enemies to encourage the pest suppression. In this context, the importance of extending bio-extract technologies for management of brinjal shoot and fruit borer, *L. orbonalis* in brinjal crop at farmers field, frontline demonstrations were conducted to increase the productivity and profitability in brinjal.

MATERIALS AND METHODS

Bio Extract (Herbogen) management strategy for shoot and fruit borer

The main objective of frontline demonstrations is to demonstrate the efficacy of botanical insecticide Herbogen in reducing losses to farmers in brinjal crop due to borers in lie to chemical insecticides used for the killing of the same. Brinjal covers largest area and plays an important role in total vegetable production in India. Due to lack of awareness of new technologies among the farmers, front line demonstration on integrated pest management for brinjal fruit and shoot borer was conducted by the Directorate of Extension, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, and Uttar Pradesh, India during Rabi season 2023-24 on farmer's field of adopted villages in Sonbhadra district of Uttar Pradesh, India. The bio-extract Herbogen effect to reduce the losses of borers was studied and comparison was made with the traditionally used chemical insecticides. Demonstrations were carried out in 20

farmers field with local type brinjal in a total area of 8 hectares. Paired plot design was adopted. Observations on healthy shoots and shoots droopedat vegetative phase and healthy fruits and fruits with bore hole during each harvest weremade and then per cent shoot and fruit damage was calculated.

$$\text{Per cent shoot damage} : \frac{\text{No. of shoots drooped/}}{\text{Total no. of shoots}} \times 100$$

$$\text{Per cent fruit damage} : \frac{\text{No. of fruits with bore hole}}{\text{Total no. of fruits}} \times 100$$

For yield assessment, fruits were picked on twice weekly basis from demonstration plot and control plots during the entire growing period, weighed and the cumulative perplot yield of all the pickings were taken and converted into total yield in quintals per hectare. The data were then subjected to statistical analysis and the means were compared with Duncan Multiple Range Test (DMRT).

About Bio extract (Herbogen)

This product Bio Extract (Herbogen) is made by the Hari Organic Manure Limited, Janakpuri, district Saharanpur. Herbogen is a botanical extract which is used to reduce insect's losses in various crops through its effect on the reproductive and digestive process of insects.

Key Features of Herbogen

1. **Pest Management**: Herbogen disrupts the reproductive and digestive systems of sucking and chewing insects, thereby reducing damage caused by pests such as borers, sucking insects and caterpillars. It helps in reducing losses in crops like sugarcane, cotton and vegetables.
2. **Phloem friendly**: This product is "phloem friendly", Which means it effectively goes from leaves to even root through phloem and targets insects that feed on the vascular system of the plant. It works well as a spray on leaves but is not generally recommended for soil drenching
3. **Non-Stressful**: Unlike chemical extracts, Herbogen does not cause plant stress, making ita gentle alternative that can be used up to a day before harvest.
4. **Contraindications**: Herbogen does not cause resistance in insects, so there is no need to increase the dose over time.
5. **Safe Use**: Since Herbogen is a botanical extract and does not contain chemicals or preservatives, it is safe for use on a variety of crops and is suitable for Integrated Pest Management (IPM) strategies.

RESULTS AND DISCUSSION

Bio-extract (Herbogen) pest management strategy for shoot and fruit borer

The study revealed that there was much difference in the yield of brinjal in the demonstration and control plots during 2023-24. The results indicated that plots treated with HERBOGEN had average shoot damage during vegetative phase as shoot damage was 6.10per cent in comparison to 18.35per centin control plots treated with chemicals. Fruit damage was found to be low 8.71 per cent in treated plots while in control plots it was 29.88 per cent. Fruit yield was found to be high in plots treated with the regular use of HERBOGEN botanical insecticide (29.38 t/ha)as when compared to control plots which recorded the fruit yield of 22.72 t/ha with the use of chemical insecticide. The yield of brinjal was increased by 22.95 per cent by the regular use HERBOGEN over control. An average net profit of Rs. 2,85,195 / ha was recorded in demonstrated plots whereas it was Rs. 1,97,250/ ha in control plots. Since calculated t value 3.67 were more than table t value (2.311), the treatment was found to be significant at 5per cent. Benefit cost ratio also was found to be high in recommended practice with the uses of bio extract insecticide HERBOGEN (3.69), whereas the ratio is low (2.08) in chemical insecticide (Table 1).

Adoption of bio-extract integrated approaches resulted in reduction in the shoot damage (66.56 per cent) and fruit damage (70.71 per cent) which lead to the increased fruit yield of 23.68 per cent with the uses of bio extract insecticide HERBOGEN. Khorsheduzzaman *et al.* (1998) reported that the inundative release of bio agents, particularly egg parasitoids in pest management may be more advantageous. The shoot and fruit borer adult activity were monitored using sex pheromone traps and the moth catch was recorded during the growing period. Adoption of IPM strategies resulted in reduction in the no. of sprays to 48.0 per cent which is in conformity with the findings of who reported that IPM adopters sprayed extracts 52.6per cent less often than non - IPM farmers.

Table- 1: Impact of bio-extract Herbogen integrated approaches on mean shoot and fruitdamage, yield and economics during 2023-24

Treatment	Shoot damage (%)	Reduction over control (%)	Fruit damage (%)	Reduction over control (%)	No. of sprays	Yield (t/ha)	Increase over farmers practice (%)	Net Return (Rs./ha)	BCR *	Increase in adoption (n=50) (%)
Regular spray of Herbogen at weekly interval	6.1	66.56	8.71	70.71	24	29.38	22.92	2,85,125	3.69	83.25
Use of chemical insecticide as and when needed	18.35	-	29.88	-	6	22.72	-	1,97,250	2.08	-
Technology gap(t/ha)	-	-	-	-	-	7.21	-	-	-	
* Economics to be worked out based on total cost of production per unit area and not on critical inputs alone ** B:C ratio = Gross return/Gross cost										
# Yield (t/ha) - SE (d) - 0.45, Calculated t value - 3.39 and Table t value - 2.262 at 5per cent level of significance										

* Mean of 10 farmer's field

In a column, means followed by a common letter (s) are not significantly different by DMRT (P=0.05)

Front line demonstration of recommended bio-extract (HERBOGEN) IPM technology revealed that yield potential and net income from brinjal cultivation can beenhanced to greater extent. There was significant difference observed in yield of brinjal in bio- extract technology than in control plots treated with chemical insecticides. B: C ratio of brinjal crop under bio-extract practices was higher than control. It showed the impact of bio- extract pest management practices on brinjal. The factors responsible for low B: C ratio under control was "more flower dropping due to the stress" created by chemical insecticide and higher losses due to sucking pest's mainly white fly. In consequence, gross monetary return (GMR) increased by 38per cent in brinjal, indicating the importance of need based plant protection through botanical extracts.

CONCLUSIONS

Shoot and fruit borer causes extensive yield loss in brinjal. Farmers manage it by frequent the use of hazardous chemicals. These not only are stressful to plants but are a cause of many human diseases mainly cancer and do not greatly increase yield. On the contrary use of bio extract HERBOGEN does not stress the plant and is environment and human friendly. It also increases the yield if used regularly. The adoption of HERBOGEN in brinjal particularly shoot and fruit borer reduced the shoot and fruit damage by 48 per cent, which lead to increase in fruit yield by 22.92 per cent and higher benefit cost ratio. Besides, adoption of bio-extract IPM strategies alleviated the above said problems without altering the insect fauna (predators and parasitoids) which automatically maintains the pest defender ratio in brinjal ecosystem.

The use of **botanical extracts** for plant pest management, as seen in the study with the bio insecticide **HERBOGEN**, aligns well with the current trend of **organic farming**. This shift reflects farmers' growing interest in sustainable agriculture, where there is a focus on reducing reliance on synthetic chemicals and adopting natural alternatives and has increasingly gained attention from both consumers and the government over time.

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