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# Biointensive management of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen.: Technology demonstration and impact

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**ABSTRACT:** Studies were conducted to assess the impact of the biointensive management (BIM) module through field demonstrations to manage brinjal shoot and fruit borer (BSFB), *Leucinodes orbonalis* Guen. In Tumkuru district of Karnataka. Results revealed that mean shoot infestation was 6.52% in demonstrated field compared to 29.32% check plot. Initially, the relative level of fruit damage between treated and untreated plot was not prominent. However, in later harvests the treatment effect became more evident. The average fruit infestation of 11.27% was recorded in BIM implemented plot, whereas check plot recorded the highest fruit infestation (31.07%) corresponding to higher yield (280.51q/ha) than control plot (208.02 q/ha). Management of BSFB through this technology resulted in a benefit cost ratio of 2.48 to farmers.

**Keywords:** Biointensive management, egg plant, *Leucinodes orbonalis,* shoot and fruit borer

## INTRODUCTION

Brinjal (*Solanum melongena* L.) is one of the most important vegetable crops grown extensively in India. Among the biotic stresses that hamper the production of brinjal, the shoot and fruit borer (SFB) *Leucinodes orbonalis* Guen. is the most serious one, which occurs throughout the year at all the stages of crop growth. Larvae bore into shoots and fruits and adversely affect plant growth, yield and fruit quality. In spite of repeated spraying of insecticides, the yield reduction could be as high as 70 percent (Dhandapani *et al.*, 2003). Such extensive use of pesticides cuts into profitability of eggplant production, makes eggplant more expensive to consumers, poses health hazards, and causes environmental pollutionand resource degradation. About 47 percent insecticides are used for management of fruit and shoot borer out of the total pesticide consumed in vegetables. In this background major emphasis, now-a-days, is being given on biological control as an alternate to the insecticides for management of any pest. Considering above facts and nature of pest, Indian Institute of Horticultural Research (IIHR), Bengaluru has developed a module of 'Biointensive management of brinjal shoot and fruit borer (BIPM)'. The technology was widely demonstrated in many fields of Tumkuru district in Karnataka. Present study assesses the impact of the BIPM package in comparison to farmers practice through filed level demonstrations.

## MATERIALS AND METHODS

The demonstrations were conducted in 18 selected farmers' fields in six villages covering three taluks *viz.* Tumkuru, Koratagere and Pavagada in Tumkuru Distrct of Karnataka during *kharif* 2013 and 2014. The demonstration plots were treated with all recommended practices under 'Biointensive management of shoot and fruit borer' technology developed by ICAR-IIHR, Bangalore. The components of BIM included erection of pheromone trap @ 1 for 400 sq.m. (lure changed once in 21 days), release *of Trichogramma chilonis* @ 50,000/ha (15000 eggs @ an interval 15 days) and *Bacillus thuringiensis* (Bt) spray at peak flowering @ 1ml/ L (two times at an interval 15 days). Plots in adjacent fields where conventional methods followed by farmers were followed were treated as check plots to compare the effect of treatments. The data on infested shoot was recorded by direct count and but percentage of infested fruits was calculated. Data on adoption of IPM components, input use pattern, spraying of pesticides and bio-pesticides, cost of cultivation, returns and health hazards associated with the spraying of chemicals and beneficial effects of eco-friendly inputs like bio-pesticides were recorded throughout the two cropping seasons. The economic impact of adoption of BIPM technology was assessed using partial budgeting (Birthal, 1997) technique. The important impact indicators used are yield, cost of cultivation, cost of production, net returns

**Table 1. Average Shoot and Fruit borer infestation in the Demo and check plots in Tumkuru District**

| Sequence of observations from vegetative to harvest stage | Shoot borer infestation (%) | | Fruit borer infestation (%) | |
|---|---|---|---|---|
| | Demo Plot | Check Plot | Demo. Plot | Check Plot |
| 1 | 0.00 | 10.16 | 4.81 | 9.47 |
| 2 | 0.00 | 15.05 | 5.48 | 11.48 |
| 3 | 5.98 | 14.46 | 7.13 | 15.25 |
| 4 | 4.18 | 15.31 | 9.41 | 19.65 |
| 5 | 5.48 | 22.55 | 11.06 | 25.84 |
| 6 | 7.33 | 29.56 | 12.02 | 38.68 |
| 7 | 8.36 | 35.27 | 13.10 | 38.94 |
| 8 | 10.07 | 35.68 | 15.05 | 46.56 |
| 9 | 10.63 | 42.53 | 16.95 | 49.54 |
| 10 | 12.51 | 49.21 | 18.34 | 58.81 |
| 11 | 11.84 | 57.71 | - | - |
| Mean | 6.94 | 29.77 | 11.33 | 31.42 |
| S.Em± | 1.95 | 2.11 | 2.09 | 2.47 |
| CD @ 5% | 3.91 | 4.22 | 4.19 | 4.94 |

**Table 2. Economic impact of BIM technology**

| Parameter | Tumkuru | | Koratagere | | Pavagada | | Mean | Mean |
|---|---|---|---|---|---|---|---|---|
| | Demo. Plot | Check Plot | Demo. Plot | Check Plot | Demo. Plot | Check Plot | Demo. Plot | Demo. Plot |
| Shoot borer infestation (%) | 6.14 | 29.94 | 8.39 | 29.47 | 6.30 | 29.90 | 6.94 | 29.77 |
| Fruit borer infestation (%) | 11.68 | 32.53 | 11.67 | 32.53 | 10.63 | 30.06 | 11.33 | 31.42 |
| Yield (q/ha) | 282.28 | 207.46 | 291.90 | 218.53 | 267.35 | 198.08 | 280.51 | 208.02 |
| Gross returns | 253248.0 | 184884.0 | 261960.0 | 195168. | 239460.0 | 177228.0 | 251556.0 | 185760.0 |
| Gross cost | 101313.5 | 108707.0 | 101313.5 | 108707.0 | 101313.5 | 108707.0 | 101313.5 | 108707.0 |
| Net returns | 151934.0 | 76177.0 | 160646.5 | 86461.00 | 138146.50 | 68521.00 | 150242.50 | 77053.00 |
| B C Ratio | 2.50 | 1.70 | 2.59 | 1.80 | 2.36 | 1.63 | 2.48 | 1.71 |

and benefit cost ratio (BCR). To understand the beneficial effects of BIM on health, information was also collected about the type of health hazards faced by the farmers during and after the spraying of chemicals. The main constraints faced by the farmers in the adoption and spread of IPM (as opined by farmers) were also elicited from the sample farmers.

## RESULTS AND DISCUSSION

It was evident from the analysis of data that, the pest damage to both shoot and fruits was substantially lower in demo plots compared to check plots. The maximum shoot borer infestation was observed in check plot (32.22%) in the year 2014 compared to demo plot (7.37%) which indicates the extent of effectiveness of

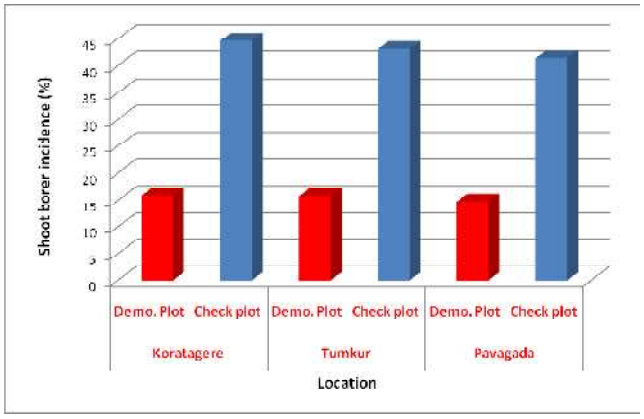


**Fig. 1. Brinjalshoot damage due to borer at different demonstration locations**

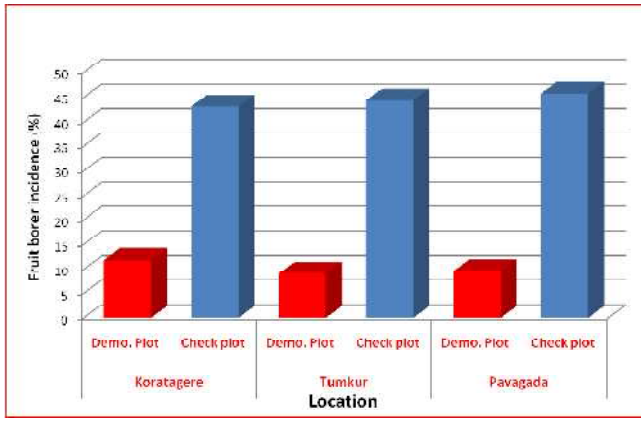


**Fig. 2. Brinjal fruit damage due to borer at different demonstration locations**

BIPM components in controlling the pest incidence. The BSFB was present throughout the season as evidenced by adults trapped in pheromone-baited traps as well as pest damage to the fruit. The numbers of moths trapped and fruit damage were high enduring warmer days and declined there after. Substantial differences in shoot damage was found between demo plot and check plot (Table 1).

At Pavagada, the crop in six check fields suffered an averageof 29.90 percent shoot borer compare to substantial reduction in demo plot (6.30%). Similarly at Koratgere, shoot damage was 8.39 percent on the demo field, whereas in check fields it was recorded almost 29.47 percent. There is no significant difference in shoot borer damage as shown in table.1 in consecutive two seasons, because of similar weather conditions prevailed. The average least incidence of shoot borer was recorded in demo plot (6.94%) compare to check plot (29.97%) as shown in the Table 2, Fig. 1. With regard to fruit infestation, the highest protection was obtained in BIM field (11.33%) compared to check plot (31.42%) in both the years as shown in the Table 2. There was no significant difference between extent of fruit damage in all locations. Initially, the relative level of fruit damage between demo and control plot was not prominent. However, in later harvests the treatment effect of demo plot became more pronounced. These studies were similar to that of studies made by Satpathy *et al.*, (2009) and Sardana *et al.*, (2004) who reported that, the relative level of fruit damage between treated and untreated plot was not prominent. In later harvests the treatment effect became more pronounced. During the peak infestation period at 90 DAT, the fruit infestation in control plot was 84.32 percent compared to 58.00 percent in treatment plots Fig. 2.

The impactof BIPM in terms of yield, returns and cost revealed a definite positive trend. The yield was higher in BIM adapted plots (280.51 q/ha) than control plot (208.02 q/ha). The net returns were also higher by Rs. 73189.33/ha in demo plot compared to check plot The benefit cost ratio was higher (2.48) from demo plots than control plots (1.71).

The reduced cost of cultivation to an extent of Rs. 7393.50 is due to reduction in quantity of sprays. The reduction in number of sprays was mainly due to egg parasitoid activity of *T. Chelonis* in BSFB management. Farmers were satisfied with the effectiveness of egg parasitoid as well as Bt. However, one of the main constraints expressed by farmers that the egg parasitoids are not available through any local pvt.lab other than IIHR and KVK.

About 25 percent of the non-IPM farmers reported health hazards like head ache, eye irritation, stomach upsets, cramps, weaknesses etc. to the labourers while spraying synthetic pesticides. But, none of the BIPM farmers expressed the incidence of such health hazards while spraying bio-pesticides. The farmers strongly felt that the use of eco-friendly inputs on BIPM farms has brought down the incidence of health hazards associated with the spraying of chemicals. BIPM farmers were also proud that they were producing Brinzal without using much pesticides and thus promote environmental protection. Our studies clearly demonstrated that BSFB can be effectively managed by using non-chemical

means like parasitoids and pheromones supplemented with spraying of Bt formulation. These demonstrations help in convincing farmers who are under false impression that profitable cultivation of brinjal crop is not possible without resorting to multiple sprayings of expensive insecticides.

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## REFERENCES

Birthal, P. S. and Jha, D. 1997. Socio-economic impact analysis of integrated pest management programmes. In: National Symposium on IPM in India – Constraints and Opportunities, Indian Agricultural Research Institute, New Delhi. October 23-24.

Dhandapani, N., Shelkar, U. R. and Murugan, M. 2003. Bio-intensive pest management in major vegetable crops: An Indian perspective. *Journal of Food, Agriculture and Environment,* **1**(2): 330-339.

Sardana, H. P, Arora, S., Singh, D. K. and Kadu, L. N. 2004. Development and validation of adaptable IPM in egg plant, *Solanum melongena* L. in a farmers participatory approach. *Indian journal of Plant Protection*, **32**: 123-128.

Satpathy S, Shivalingaswamy T. M., Akhileshkumar and Mathura rai, 2005. Biointensive management of egg plant shoot and fruit borer (*Leucinodes orbonalis* guen.) *Vegetable Science*, **32(**1): 103-104

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