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Evaluation of Bio Intensive Integrated Pest Management Module in Brinjal

Key words : Bio Intensive IPM, Brinjal

Several factors are known to affect the brinjal cultivation, the most important being the pests and diseases. Though various insect pests and diseases are known to affect the brinjal, few of them cause economic losses in India. The most common and notorious pest of brinjal is shoot and fruit borer, *Leucinodes arbonalis* (Guen.). In India it has been estimated that shoot and fruit borer causes damage to fruits ranging from 25.8 to 92.5 % and yield reduction from 20.7 to 60% (Mall *et.al*., 1992). Brinjal crop is also known to be attacked by a range of sucking pests which include leafhoppers, aphids, white flies, thrips and mites which desap the plants, make them weak and reduce the yield and losses range from 25 to 40% (Natarajan *et.al*., 1986, Anonymous, 1999). The application of higher and frequent doses of pesticides for controlling the pests resulted in negative externalities resulting in excess pesticide use, resistance of pests and increased cost of plant protection measures as reflected in cost benefit ratio. The growing awareness of hazards has created a worldwide interest in integration of all possible methods which are biologically active and ecologically safe. So with an objective of educating the farmers about crop protection technology against brinjal pests, Front Line Demonstrations (FLDs) were conducted in the farmer's field.

The study was conducted to evaluate the Bio Intensive Integrated Pest Management (IPM) module as an alternative to spraying of chemical pesticides only in the management of insect pests and diseases on brinjal. The FLDs were conducted during *kharif* 2008, *rabi* 2008-09 and *rabi* 2009 in 8 hectares area at Peravali and Palakoderu mandals of West Godavari district. The important Bio Intensive IPM components (Table 1) included were cultural practices (tolerant variety for bacterial wilt, regular clipping of top shoots infested by shoot borer, root dipping of seedlings); mechanical practices (installation of pheromone traps, yellow sticky traps and bird perches); biological methods (pinning of tricho cards, soil application of *Trichoderma viridae*, foliar sprays of *Bt* products); using botanicals (soil application of neem cake and foliar sprays of 4% Neem Seed Kernel Extract) and finally the need based single time application of Profenophos 0.1% and Cypermethrin 0.005%. The non BIPM plots received only pesticidal sprays, which again included cocktail mixings at higher dosages. Preseason farmers meetings were conducted to emphasize the need of reducing the cost of cultivation and increasing the production through bio intensive IPM module. The crop was raised as per the recommended agronomic practices. Regular field visits, training programmes, group discussions were conducted which help the farmers in identifying the stages of pest, nature of damage, critical stages for intervention and usefulness of low cost, eco-friendly strategies. Populations of sucking pests and *Epilachna* beetle were sampled by selecting three leaves (one each from top, middle and bottom) on ten randomly selected plants at weekly intervals. Number of damaged shoots due to shoot and fruit borer was recorded from twenty five randomly selected plants at weekly intervals starting from 45 days after transplantation of brinjal seedlings in the main field. Observations on percentage of fruits bored by fruit borer were recorded starting form 60 days after transplanting. The incidence of little leaf was recorded at 60 and100 days and wilt at 140 days after transplantation from twenty five randomly selected plants. Also at weekly intervals, the beneficial insects such as lady bird beetles, Syrphid flies, common green lace wings, predaceous bugs and non-insect loads like spiders etc. were recorded from five randomly selected plants. After harvesting of the fruits, separate lots of healthy and damaged fruits were made; fruit count and weights were recorded separately at each harvest throughout the growing season to workout percentage of fruits bored and percent weight of damaged fruits in both bio intensive IPM and non IPM plots. At the end, damaged fruits were cut open to count the number of fruit borer larvae present inside the damaged fruits.

Among the two modules tested, bio intensive IPM module showed the lowest pest

population (Table 2) and it was better than non IPM module. The mean values of the data collected over weekly intervals revealed that there were significantly less percentage of damaged/wilted shoot tips in bio intensive IPM plots (5.07%) compared to check (16.97%). The pooled data of three seasons indicated that implementation of bio intensive IPM has decreased the incidence of fruit borer to 14.78% from 38.56% in non IPM plots. Similar trend was observed in bio intensive IPM plots when the damage due to shoot and fruit borer is evaluated in terms of percent weight of damaged fruits (6.30%) over non IPM plots (34.27%). IPM plots which practiced bio intensive methods mainly application of botanicals and biopesticides promoted build up of many species of bioagents. The populations of most of the bioagents were greater in bio intensive IPM module than insecticide module. Bird perches enhanced the activity of predatory birds in bio intensive IPM module. These interventions might have played an important role in suppressing the population of fruit borers. The observations revealed that there was a high incidence of leaf hoppers among sucking pests during the three cropping seasons. The incidence of other sucking pests was significantly lower in bio intensive IPM plots compared to non IPM plots. The bacterial wilt and little leaf diseases were not occurred in bio intensive IPM blocks as against 28.00% and 17.38%, respectively in non IPM plots and this was attributed mainly due to the use of wilt tolerant variety (Pusa purple cluster) and the soil application of bio agent *Trichoderma viriade*. There was little damage observed due to *Epilachna* beetle and *Spodoptera* caterpillar until the end of trial period as the population was very less in bio intensive IPM plots. It is clear from the study that bio intensive IPM module resulted in substantial reduction in pest infestation, conserved natural enemies and created congenial atmosphere for natural force of defense to act.

Data related to economic aspects of brinjal in bio intensive IPM plots vs. non IPM plots are given in Table 3. The eco-friendly and bio intensive strategies followed in bio intensive IPM fields resulted in higher marketable fruit yields of 213.8 q ha^{-1} while non IPM fields recorded lesser yield of 189.03 q ha^{-1} registering an increase in yield of 13.12 per cent over non IPM module. The difference in yield in two modules may be due to the difference in pest management operations. The cost of production was less under bio intensive IPM block in comparison to non IPM module reflected lower

Table 1. Different bio intensive IPM components integrated in cultivation of Brinjal during 2008 to 2009.

Parameter	Module	
	BIPM	Non IPM
Cultivar (Wilt tolerant variety)	Pusa purple cluster	Local
Shoot clipping	Regular	Irregular
Root dipping of seedlings	Imidachloprid 200 SL @ 1ml/lt for 30 minutes before transplanting	-
Installation of Pheromone traps	10 ha^{-1}	-
Installation of Yellow sticky traps	25 ha^{-1}	-
Installation of Bird perches	15 ha^{-1}	-
Release of *Trichogramma chilonis*	50,000 /ha. twice during the season	-
Soil application of *Trichoderma viridae*	2-3 kg mixed with 100 kg FYM + 10 Kg neem cake	-
Foliar sprays of *Bt* product, Ecotox	1.25 Kg ha^{-1}.	-
Soil application of neem cake	500 Kg ha^{-1}.	-
Spraying of NSKE	4%	-
Spraying of chemical pesticides	Selective and need based single time application	Indiscriminate and cocktail mixing of pesticides at higher dosages

Table 2. Incidence of important insect pests, diseases and beneficials in brinjal during 2008 to 2009.

Pest parameter	Incidence (Mean of 3 seasons)	
	BIPM module	Non IPM module
% Shoot damage	5.07	16.97
% Fruit damage	14.78	38.56
% Weight of damaged fruits	6.30	34.27
No. of fruit borer larvae/10 bored fruits	8.00	31.50
Whitefly (Population/3 leaves/plant)	1.57	10.28
Leaf hoppers (Population/3 leaves/plant)	0.18	16.35
Thrips (Population/3 leaves/plant)	2.68	6.19
Mites (Population/3 leaves/plant)	0.16	4.27
Epilachna population/ 5 plants	1.35	13.30
Beneficials population/ 5 plants	33.35	6.65
Spodoptera caterpillar / plant	1.33	8.62
% Little leaf	0.00	17.38
% Wilt	0.00	28.00

Table 3. Cost economic analysis of bio intensive IPM in brinjal during 2008 to 2009.

Parameter	Module (Mean of 3 seasons)	
	BIPM	Non IPM
Average marketable fruit yield (q ha^{-1})	213.8	189.03
Yield advantage (q ha^{-1})	24.80	-
% Increase in fruit yield over non IPM	13.12	-
Total cost of cultivation (Rs. ha^{-1})	46400	54525
Gross returns (Rs. ha^{-1})	106900	94515
Net Profit (Rs. ha^{-1})	60500	39990
C:B ratio	1:2.30	1:1.73

cost of plant protection in bio intensive IPM as farmers followed eco-friendly methods. Similarly, the gross income obtained was Rs.106900 and Rs. 94515 ha^{-1} in bio intensive IPM and non IPM modules, respectively. This has finally lead to realizing the highest profit of Rs.60500 ha^{-1} in bio intensive IPM module as compared to non IPM module which was lesser profit of Rs. 39990 ha^{-1}. By integrating the different bio intensive IPM interventions an additional net return of Rs. 20510 ha^{-1} could be obtained which was evidenced from lesser plant protection costs and additional fruit yield obtained by adopting bio intensive IPM module. Hence, the cost: benefit ratio obtained was 1:2.30 as against 1:1.73 in non IPM module.

The present study clearly indicated that the bio intensive IPM module was effective mainly because of the eco-friendly and bio intensive interventions made. Thus the implementation of bio intensive IPM in brinjal was not only found economically feasible in terms of productivity and profitability but also found environmental friendly with less number of sprays of synthetic insecticides. So efforts should be continued for better dissemination of the technology.

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