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Research Article

BIPM: A BOON FOR YIELD ENHANCEMENT IN RICE

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Abstract: Bio-intensive integrated pest management practices were compared with farmer's practices at Thandalai and Velliyankundram Villages of Madurai District during 2016-17 and 2017-18 respectively. BIPM practices involved Seed treatment with *Pseudomonas fluorescens* 10 g/ kg of seed, Bund crop with blackgram/ green gram/redgram, Use of light trap at a rate of 1/ ha, Use of biocontrol agents- *T. japonicum* and *T. chilonis*, Foliar spray with NSKE 5 % and use of green label pesticides Chlorantraniliprole 18.5% SC 150 ml/ha. The farmer's practices comprised the applications of chemical insecticides. The mean leaffolder damage was minimum (5.7 and 3.2 percent) in BIPM treatment than farmer's practices (16.9 and 20.6%) during 2016-17 and 2017-18 respectively. Significantly less dead heart incidence was observed in BIPM treatment (5.2% and 4.7%). Similarly, the mean incidence of white earheads was minimum in BIPM treatment (2.0 and 0.70 during 2016-17 and 2017-18). Highest grain yield was recorded in BIPM treatment (51.72 and 73.50 q/ha). The demonstration of BIPM module gave higher net return and B: C ratio of Rs. 49460/ ha and 1.97 during 2016-17 and of Rs.68337/ ha and 2.18 during 2017-18. Reduction in number of pesticide sprays (From 5- 2) scored highest adoption percentage (66.7%) in rice production technology followed by use of botanical insecticides neem oil/ NSKE 5 % (58.3%).

Keywords: *BIPM, Leaf folder, Pseudomonas, Stemborer, Trichogramma*

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Introduction

Rice is attacked by more than 100 insect pests, of which 20 are of economic importance. Among the rice pests, stem borer *Scirpophaga incertulus* (Walker), and leaf folder *Cnaphalocrocis medinalis* (Guen.), are the major ones. The leaf folder caterpillar feed on the leaf blade by scrapping the green matter resulting in reduced photosynthesis leading to reduced yield. The yield loss was from 30 to 80 percent due to leaf folder epidemic [1]. The yield loss due to rice stemborer varies from 30 to 60 percent. The progressive modernization of Indian agriculture involving the use of botanicals and microbial insecticides is gaining popularity in recent years due to their effectiveness in controlling pests and environment friendliness. Botanical and microbial insecticides are the best alternatives to manage the pests below the economic threshold level (ETL) and provide security to mankind from the residues of pesticides. Enhanced awareness about ecologically safe food has provided impetus to organic farming and area under organically grown crops is continuously rising in India [2]. Keeping in view the growing demand for organic food, an integrated pest management module was compared with farmers's practices.

Materials and Methods

The present study was carried out by Krishi Vigyan Kendra, Agricultural College and Research Institute, Madurai during *Rabi* season of 2016-2018. Ten farmers were selected in Thandalaiand Velliyankundram Villages of Madurai District. Altogether twenty front line demonstrations were laid out in one acre each for BIPM modules and Farmer's practice. The details are as follows

Treatments followed in different modules

Biointensive IPM

Seed treatment with *Pseudomonas flourescens* 10 g/ kg of seed
Bund crop with blackgram/ green gram/redgram
Use of light trap at a rate of 1/ ha
Use of biocontrol agents- *Trichogramma japonicum* and *T. chilonis*
Foliar spray with NSKE 5 %
Foliar spray with green label pesticides
Chlorantraniliprole 18.5% SC 150 ml/ha

Farmers practice

Blanket application of carbofuran
Foliar spray with Chlorpyriphos at 3ml/ l of water 2 sprays at an interval of 7 days.
Foliar spray with Lambda cyhalothrin at a rate of 3ml/ l - 2 sprays at an interval of 7 days.

Training programme was imparted to the beneficiaries related to Ecofriendly pest management measures as a part of demonstration. The data on yield was collected from farmers' field as well as from BIPM treatment plots. The observations on stem borer infestation (dead hearts, white ear) and leaf folder damaged leaves (at least 1/3 rd leaf area damaged) were recorded from 30 DAT at weekly intervals. White ears incidence by the stem borers were recorded one week before the harvest of the crop. The population of predators like spiders, recorded from 30 hills selected at random from each block during the entire crop season at weekly interval. The grain yield was recorded on whole plot basis. Cost of cultivation, gross return, net return and benefit cost ratio (B: C ratio) were computed and analysed. The percent increase over farmers practices, extension gap and BC ratio were calculated using the following formula as given by [3].

Percent increase over farmers' practices = Improved practices (IP)-Farmers practices (FP) / Farmers practices (FP) x 100

Extension gap = Demonstration yield -Yield under Farmers' Practices

B: C ratio = Net income (Rs. / ha) / Cost of cultivation (Rs. / ha)

Table-1 *Impact of different management practices on the incidence of major insect in rice*

Parameter with unit	2016-17			2017-18		
	BIPM module	Farmer's practice	% increase in reduction over FP	BIPM module	Farmer's practice	% increase in reduction over FP
Leaf Folder Infestation (%)	5.7	16.9	54.4	3.2	20.6	84.4
Dead heart (%)	5.2	12.5	58.4	4.7	15.1	68.8
White ear (%)	2.0	8.5	76.4	0.7	5.4	87.1
Spider Population (No./hil)	5.2	0.2	-	4.25	0.5	-

Table-2 *Impact of demonstrations on Yield*

Year	No of Demo	Yield q/ha		Percent increase in yield	Extension Gap	Cost: Benefit ratio	
		BIPM module	Farmer's practice			BIPM module	Farmer's practice
2016- 17	10	51.72	45.1	14.70	6.62	1.97	1.68
2017- 18	10	73.50	61.6	19.31	11.9	2.18	1.52

Table-3 *Economic impact of the demonstration*

Year	Economics of demonstration (Rs./ha)				Economics of check (Rs./ha)			
	Gross Cost	Gross Return	Net Return	BCR (R/C)	Gross Cost	Gross Return	Net Return	BCR (R/C)
2016- 17	50900	100360	49460	1.97	52200	87490	35290	1.68
2017- 18	57875	126213	68337	2.18	69525	105800	36275	1.52

Table-4 *Percent adoption of various BIPM technologies by the farmers*

SN	Name of the technology	% adoption (n= 180)
1	Seed treatment with biocontrol agents	41.7
2	Pulses as bund crop	44.4
3	Use of light trap	11.1
4	Use of biocontrol agents (*Trichogramma japonicum* and *T. chilonis*)	30.5
5	Use of pheromone traps	36.1
6	T- shaped bird perches	50.0
7	Use of botanical insecticides neem oil/ NSKE 5 %	58.3
8	Use of green label pesticides	16.7
9	Reduction in number of pesticide sprays (From 5- 2)	66.7

Assessment of technology impact was made in addition to the yield and economic analysis for every individual using interview schedule. Random selection of farmers was made to a count of 90 numbers from each of the selected villages. In this way, a total of 180 farmers were taken as the respondents for this investigation.

Results

Insect pest

Significantly lower incidence of leaf folder was observed in BIPM treatment plot (5.7%and 3.2%) than in Farmer's practices (16.9 % and 20.6%) during 2016-17 and 2017-18 respectively. The percent reduction in leaf folder incidence over Farmer's practices was 54.4 and 84.4 percent respectively during 2016-17 and 2017-18. The mean dead heart incidence in BIPM treatment plot was lesser (5.2% and 4.7%) than Farmer's practices (12.5% and 15.1%). The highest incidence of white ears was recorded in farmers practices (8.5% and 5.4%). The mean percent reduction in white ear head incidence over farmers practice was 76.1% and 87.4% [Table-1]. The highest population of spider was observed in BIPM practice (5.2% and 4.25%) than farmers practice (0.2% and 0.5%). Farmers visualized the drastic reduction in pest population and increase in natural enemies' population due to the adoption of ecofriendly management technologies. Egg parasitoids belonging to number of genera play a significant role in the management of key insects of many crops and have been well documented in rice [4,5]. In the present study, the augmentative releases of Trichogrammatids helped in reducing stemborer and leaffolder incidence. In neem seed kernels, salanol, Salannolacetate, 3-deacetyl salanin, azadirachtin, 14-epoxyazadirodion, and deacetylnimbin showed high antifeedant activity [6]. The functional property of fatty acid in the NSKE plays an inhibitory role on feeding [7].

Yield

The average yield of rice under BIPM module-imposed field was 51.72 and 73.50 q/ha during 2016-17 and 2017-18 respectively. The yield was much higher compared to that of farmers' practices. The average percentage of increase in the yield over farmer's practices was 14.70 and 19.31during 2016-17 and 2017-18 respectively [Table-2]. The average extension gap in the improved practices was 6.6q q/ha during 2016-2017 and 11.9 q/ha during 2017-18.

This gap shows that there is need to educate the farming community about the integrated pest management techniques. There is also need to educate the farmers about all lowcost ecofriendly pest management measures. This will increase the yield per capita and overcome the extension gap [Table-2]. Crop production without residue and ecologically safe mean of insect control is provided by use of BIPM especially for resource poor farmers. Kumar, *et al*., (2007) [8] found BIPM treated paddy plots with maximum yield which is also reported in the present study. In Basmati rice use of BIPM for leaffolder and stemborer reduced the incidence which was statistically on par with measures of chemical control [9].

Economic return

The price of the inputs and produce prevailed during the study of demonstration were taken for calculating cost of cultivation, gross return, net return and benefit: cost ratio [Table-3]. The demonstration of BIPM module gave higher net return and B: C ratio of Rs. 49460/ ha and 1.97 during 2016-17 and of Rs.68337/ ha and 2.18 during 2017-18 which is in corroboration with [10].

Adoption of technologies

Reduction in number of pesticide sprays (From 5-2) scored highest adoption percentage(66.7%) in rice production technology followed by use of botanical insecticides neem oil/ NSKE 5 % (58.3%), T- shaped bird perches(50.0%), pulses as bund crop(44.4%), seed treatment with biocontrol agents(41.7%), use of pheromone traps(36.1%), use of biocontrol agents(*Trichogramma japonicum* and *T. chilonis*) (30.5%), use of green label pesticides(16.7%) and use of light trap(11.1%), respectively.

Conclusion

Minimum leaf folder incidence coupled with higher yield was obtained in the Biointensive IPM adopted farmers field. It is mainly due to reduction in number of pesticide sprays and use of botanical insecticides

Application of research: Study of different management practices on the incidence of major insect in rice

Research Category: Agriculture Economics

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Study area / Sample Collection: Thandalai and Velliyankundram Villages of Madurai

Cultivar / Variety / Breed name: Rice, Blackgram, Green gram, Redgram

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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