Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(4): 943-946

Received: 22-05-2020
Accepted: 24-06-2020

Jharna Chaturvedani
Department of Entomology, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Jayalaxmi Ganguli
Department of Entomology, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Rashmi Gauraha
Department of Entomology, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Corresponding Author:
Jharna Chaturvedani
Department of Entomology, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Biointensive pest management against yellow stem borer, *Scirpophaga incertulus* Walker at Raipur, Chhattisgarh

Jharna Chaturvedani, Jayalaxmi Ganguli and Rashmi Gauraha

Abstract
A field experiment was conducted at IGKV, during kharif 2019 to test Biointensive Pest Management (BIPM) strategies against yellow stem borer, *Scirpophaga incertulus* in paddy var 'Swarna' along with farmer's practice and control. BIPM includes use of biopesticides and bio control agents without any chemical insecticides. Usually, farmers rely mostly on chemicals for the management of major pest of paddy at Chhattisgarh, the YSB, *S. incertulus*. The main objective was to see whether BIPM works to promote organic farming. Results showed that BIPM treated plots recorded significantly lesser dead hearts (DH) (8.50%) and white ear heads(WEH) (15.58%) as compared to the plots grown using farmer's practice with DH% (11.24), WEH% (18.01) and control DH% (12.20), WEH% (20.51). The average yield was also found significantly higher in BIPM plots (31.56 kg/ plot) as compared to farmer's practice i.e. (28.89 kg /plot) and control i.e. (25.25 kg/ plot) plots. Predators like coccinellids and spiders were found more abundant in BIPM plots than farmer's practice and control plots.

Keywords: BIPM, bio-pesticides, organic farming, predators, *Scirpophaga incertulus*

Introduction
Rice (*Oryza sativa* L.) is an essential source of food for more than three billion populations of the world and is among the most significant staple food. Chhattisgarh well known as the 'rice-bowl of the India', has been among country's five states ranked as major contributors of rice to the central pool occupying an area of 3760.50 lakh hactare with a production potential of 65.27 lakh tons [6].

More than 100 species of insects are known to attack rice crop, of which the yellow stem borer (YSB), *Scirpophaga incertulas* Walker (Lepidoptera: Pyralidae) is one of the most destructive monophagous pest of this crop and is widely distributed in the Indian subcontinent [4]. The pest attacks all stages of the crop. Larval damage to tillers during the vegetative stage results in 'dead heart' symptoms (drying up of central shoot) and damage during the panicle initiation stage results in 'white ear head' (chaffy, unfilled grains). Yield loss estimate across India varied from 11.2 to 40.1% due to dead heart and 27.6 to 71.7% due to white ear heads, respectively [1].

The excessive use of pesticides has resulted in reduction of biodiversity of natural enemies, development of pesticide induced resistance and outbreak of secondary pests. Side effects of insecticides on natural enemies and possibility of their integration in plant protection strategies have been well documented by [7]. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, as they are sprayed across the entire field [8]. These issues can be sorted out by adopting eco-friendly Bio intensive pest management strategies. Biointensive Pest Management (BIPM) is a systems approach that deals with management of pest based on understanding of pest ecology and where natural enemies of the crop pests, forms the core component. It includes environment friendly techniques viz. seed priming, use of seedling dip treatments using bio-pesticides, pheromone traps and bio-agents, helping in reducing pest burden and for the farmers to earn profitable income.

Materials and Method
The present experiment was laid out in kharif season of 2019 at the field behind Biocontrol laboratory Department of Entomology and Instructional Research farm of College of, Agriculture, IGKV, Raipur, Chhattisgarh with the variety 'Swarna' in Randomized Block

Design (RBD) with three package of practice (treatments) i.e. Bio intensive pest management (BIPM), Farmer's practice (FP) and control having eight replications in each package. Nursery sowings after due treatments as mentioned in (Table 1) were carried out in the third week of July and twenty five day-old seedlings were transplanted in August to the main field with a spacing of 20 × 15 cm^2 following all the recommended agronomic practices for growing the rice crop.

Table 1: Treatment details taken up under different packages

BIPM package	Farmer's practice package	Control
(i) Seed bio-priming with *Trichoderma harzianum* @ 15gm/kg of seeds.	(i) Seed treatment with Bavistin @ 2g/kg seed	Untreated
(ii) Seedling dip with *Pseudomonas fluorescence* 2% solution.	(ii) Use of Chlorocyper (Chloropyriphos 50% EC + Cypermethrin 5% EC) Insecticide spraying @ 2ml / lit water.	
(iii) Spray of *Azadiractin* 1500 ppm @ 3ml/lit. at 45 and 65 DAT against foliar pest.		
(iv) Erection of bird perches @ 20-30/ acre (uptill vegetative stage).Pheromone traps @15-20/ha.		
(v) Release of *Trichogramma japonicum* @ 10,000/ha (6 releases) at 10 days interval starting from 25 DAT for stem borer.		

Observation and Analysis

The population counts of yellow stem borer (YSB), *S. incertulas*, were taken on the basis of the number of dead hearts /white ear heads and total number of tillers/panicle from ten randomly selected hills at weekly interval.

The percentage of dead heart, and white ear head were computed by using following formula:

$$\text{Dead heart (\%)} = \frac{\text{Number of dead hearts}}{\text{Total numbers of tillers}} = 100$$

$$\text{White Ear Head (\%)} = \frac{\text{Number of white ear heads}}{\text{Total number of panicles}} = 100$$

Yield was calculated at harvest. Data on dead hearts, white ear heads and yield were subjected to ANOVA after using appropriate transformations through [9].

Result and Discussions

Initiation of damage symptoms caused by rice YSB, *S. incertulas* as dead heart (DH) was first observed during 38th standard meteorological week (SMW) i.e. third week of September (8.61% DH) and the maximum number of dead heart was observed during 42st SMW i.e. third week of October (13.06%, DH). Thus, the major activity period of YSB was observed from September to October, there after the number of dead hearts declined. (Table 2)

White ear head (WEH) first appeared during 47th SMW i.e. 3rd week of November (16.37% WEH) and the maximum number of WEH were observed during 49th SMW i.e. 1st week of December (23.4% WEH). (Table 3).

Thus, from the data depicted in table 4, it is clear that the pre-treatment observations of dead heart infestation for all the treatments i.e. T1-BIPM, T2-Farmer's practice and T3-Control were non-significant and the damage percentage were 6.10, 7.40 and 8.61% respectively. The post treatment data revealed that, dead heart damage percentage extended from 8.50, 11.24 and 12.20% in BIPM, Farmer's practice and Control respectively whereas, for white ear head (WEH) it was 15.58, 18.01 and 20.51% in BIPM, Farmer's practice and Control, respectively. Thus, it is evident that among all the treatments BIPM was significantly superior with lowest (8.50% DH and 15.58% WEH) as compared to Farmer's practice (11.24% DH and 18.01% WEH) and Control (12.20% DH and 20.51% WEH).

Yield

As far as yield was concerned, the average yield was also found to be significantly higher in BIPM plots (31.56 kg/ plot) as compared to farmer's practice (28.89 kg /plot) and control (25.25 kg/ plot) plots. (Table no.4). This resulted in percentage increase of yield in BIPM (16.06) and in farmer's practice (14.40) over control.

Predators like coccinellids and spiders were found significantly more abundant in BIPM plots and lowest population was found in farmer's practice. This may be due to the fact that chemical treatment used in farmer's practice was harsh on bio-agents (Table no.5).

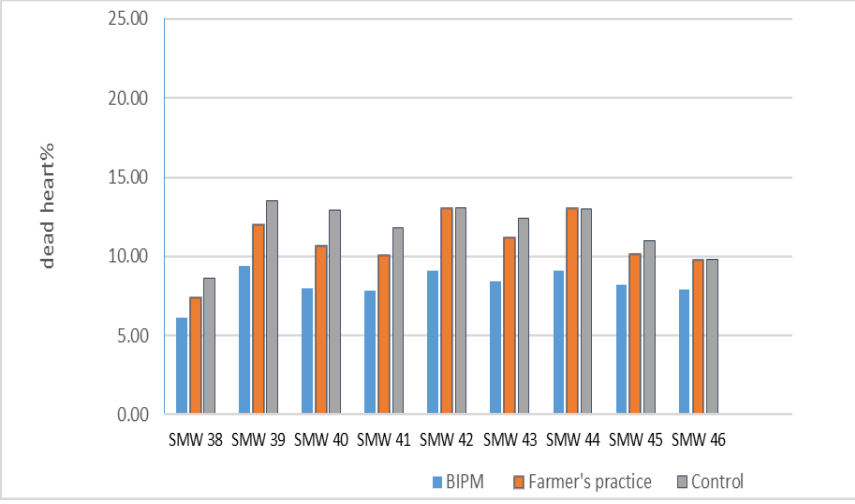

Fig 1: Percentage dead heart caused by YSB during kharif 2019

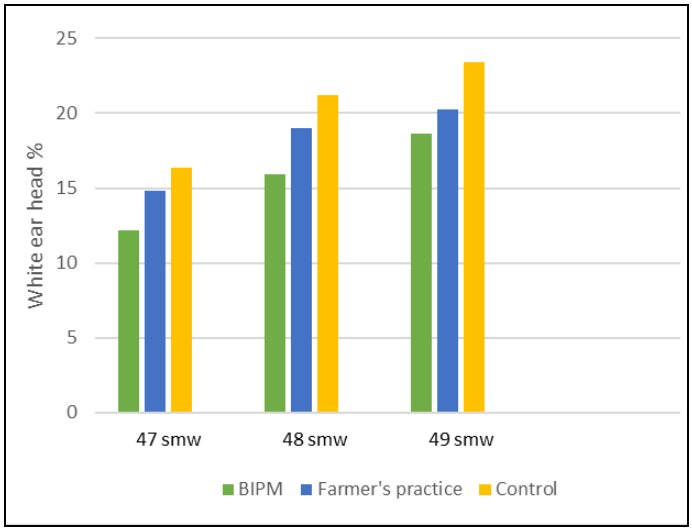

Fig 2: Percentage White ear head caused by YSB during kharif 2019

Table 2: Overall damage caused by YSB and mass grain yield during *kharif* 2019

Treatments	Pre-Treatment	Post -Treatment		Mean grain yield Kg /plot	Mean grain yield Kg/acre	Percent increase in yield over control
		Mean Dead heart % (DH)	Mean White ear head % (WEH)			
BIPM (T1)	6.10 (10.21)	8.50 (16.93)	15.58 (23.23)	31.56	1303.22	24.99
Farmer's practice (T2)	7.40 (12.57)	11.24 (19.57)	18.01 (25.09)	28.88	1284.63	14.40
Control (T3)	8.61 (13.59)	12.20 (20.40)	20.51 (26.91)	25.25	1122.87	
SEm±	N/A	0.943	0.522	3.054	136.652	
C.D.	1.549	0.308	0.171	1.00	64.471	

Table 3: Population percentage of spider and coccinelids in different treatments

Treatments	Pre-Treatment		Post-Treatment	
	Spider	Coccinelids	Spider	Coccinelids
BIPM (T1)	0.45 (1.203)	0.05 (1.02)	0.41 (1.188)	**0.57 (1.25)**
Farmer's practice (T2)	0.25 (1.118)	0.04 (1.01)	0.23 (1.108)	0.26 (1.12)
Control (T3)	0.28 (1.128)	0.03 (1.01)	0.25 (1.120)	0.43 (1.19)
SEm±	0.046	N/A	0.012	0.017
C.D.	0.015	0.012	0.004	0.006

Significant maximum grain yield/plot (31.56 kg) and per acre (1303.22) was obtained in BIPM treatment followed by farmer's practice (28.88 kg)/plot and (1284.63 Kg) and control (25.25 kg) and (1122.87 kg) per plot and per acre respectively.

More or less similar finding was reported by [2] stating that the incidence of dead hearts in BIPM plots at 30 DAT ranged from 2.2-2.8% while it was 7.8–8.9% in FP plots. At 50 DAT also the same trend continued with BIPM plots registering infestation level of 8.0–11.0% while FP plots recorded 16.2–19.0%. White ear damage in BIPM treatments was significantly less and ranged from 7.7– 10.0% and 16.9–17.9% in farmers' practices. Yield was significantly higher in BIPM plots (4.69-4.98 t/ha) compared to Farmer's practice plots (3.1-3.3 t/ha). Similarly, [5] also reported minimum percentage of dead heart (1.03%) and white ear head (2.00%) from the BIPM plots with significant differences between the all the treatments which is in accordance with the present results.

The present finding is in agreement with [3] who also mentioned that significantly lowest percentage of dead heart (8.02) and white ear head (15.68) in the BIPM treated plots with an average significant highest yield of 28.41Kg/plot followed by Farmer's practice and Control.

Conclusion

The present work substantiates the fact that Bio-intensive Pest Management (BIPM) strategies provide a sustainable system for the eco-friendly management of yellow stem borer in rice. Hence, this strategy can be taken in practice by farmers as it is an effective method (bio-pesticide and bio-control based) best suited for organic mode of farming to manage yellow stem borer in rice.

Acknowledgement

The authors are thankful to ICAR-NBAIR, for funding ACRIP on Bio-control at IGKV Raipur, Chhattisgarh.

References

1. Krishnaiah K, Varma NRG. Changing Insect Pest Scenario in the Rice Ecosystem –A National Perspective. Directorate of Rice Research Rajendranagar, Hyderabad, 2012, 2-8.
2. Anitha, Parimala. Evaluation of bio intensive pest management (BIPM) Package in rice varieties as an effective means to tackle stem borer. Plant Archives. 2014; 14(1):185-187.
3. Nagdev P. Monitoring and management of major insect pests of rice through Bio-intensive practice. Diss. Indira Gandhi Krishi Vishwavidyalaya, Raipur, 2019.
4. Atwal AS, Dhaliwal GS. Agriculture Pests of South India and Their Management, 2008.
5. Alam MZ, Haque Md M, Islam Md S, Hossain E, Hasan BS, Hossain Md S. Comparative study of integrated pest management and farmers practices on sustainable environment in the rice ecosystem. International Journal of Zoology. 2016; (2):1-12.
6. www.indiastat.com
7. El-Wakeil N, Gaafar N, Sallam A, Volkmar C. Side effects of insecticides on natural enemies and possibility of their integration in plant protection strategies. Insecticides: Development of Safer and More Effective Technologies Agricultural and Biological Sciences (S. Trdan, ed.). InTech Open Access Publisher, 2013, 1-56.
8. Miller GT. Sustaining the earth: An integrated approach. Thomson/ Books/ Cole, 211-216. ISBN 978-0-534-400 88-0.
9. http://www.202.141.47.5/opstat/index.asp