Plant Archives Vol. 14 No. 1, 2014 pp. 185-187 *ISSN 0972-5210*

EVALUATION OF BIOINTENSIVE PEST MANAGEMENT (BIPM) PACKAGE IN RICE VARIETIES AS AN EFFECTIVE MEANS TO TACKLE STEM BORER

G. Anitha* and K. Parimala[1]

All India Coordinated Research Project on Biological Control, A.R.I. Campus, Rajendranagar – 500 030, Hyderabad (Andhra Pradesh), India.

[1]Seed Research and Technology Centre, Rajendranagar – 500 030, Hyderabad (Andhra Pradesh), India.

Abstract

Biointensive IPM incorporates ecological and economic factors into agricultural system design and decision making and addresses public concerns about environmental quality and food safety. Its benefits include reduced chemical input costs, reduced on-farm and off-farm environmental impacts and more effective and sustainable pest management (Dufour, 2001). A field study was undertaken in *kharif* seasons of 2009-10 and 2010-11 in A.R.I. Farm, Rajendranagar, Hyderabad (A.P.), India to know the comparative reaction of four rice varieties *viz*., to stem borer infestation when cultivated under BIPM and farmers' practices. Analysis of two-year results showed that BIPM treated plots recorded significantly lesser dead hearts and white ears in all the four varieties compared to the plots grown using farmers' practices. Among the different varieties in BIPM and Farmers' module, there was no significant difference among the different varieties with respect to dead hearts, white ears and yield. Study of the extent of parasitisation of stem borer egg masses collected from the fields revealed that higher number (88.6%) of completely parasitized egg masses were recorded in BIPM plots compared to FP plots (55.45%). *Tetrastichus*, *Telenomus* and *Trichogramma* were found to be the dominating species. *Tetrastichus* was the single dominant species in 89.1% of the completely parasitized egg masses, *Telenomus* to an extent of 7.2% and *Trichogramma* upto 3.7%.

Key words : Biointensive pest management, stem borer, rice.

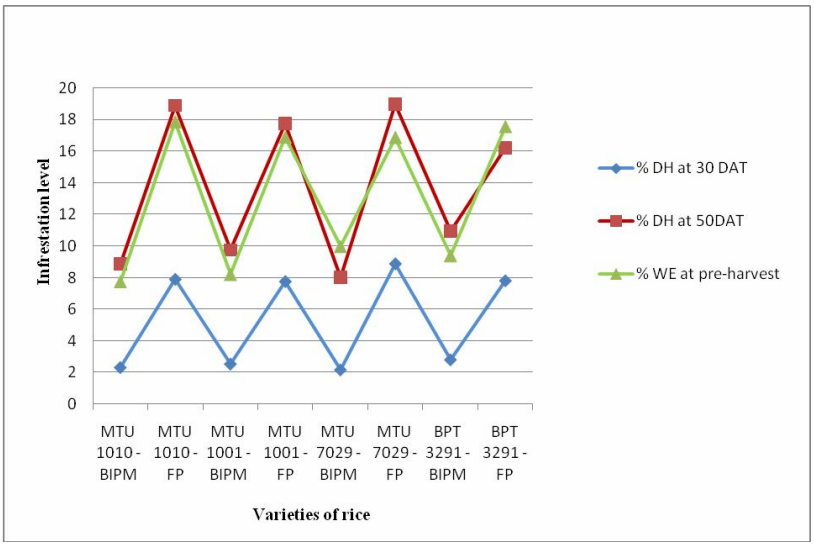
Introduction

India has the largest area under rice in the world and ranks second among the rice producers, accounting for above 20 per cent of global rice exports. But, it is attacked by a number of pests, the stem borer being the major one, which cause losses upto 90% if not managed timely. Its damage symptoms appear as dead hearts, as the central leaf of the culm dries up in vegetative stage. When the infestation occurs in the panicle bearing stage then unfilled grains appear causing white ears. It causes severe economic losses to the farmer. Biointensive pest management (BIPM) techniques, *viz*. pheromone traps and bio-agents are environment friendly, reduce pest pressure and earn profitable incomes for the farmers. Pheromone and bioagents are species-specific, have no adverse effect on the non-targets and hence would be fully compatible with other management approaches to control yellow stem borer and leaf folder (Katti *et al*., 2001; Garg *et al*., 2002; Kaur *et al*., 2003; Ignacimuthu, 2005; Mahal *et al*., 2006). BIPM package for rice certainly seems to be an effective alternative for managing the stem borer. Hence, a field study was undertaken to know the impact of BIPM practices on stem borer infestation on four popular varieties of rice in comparison with farmers' practices (FP).

****Author for correspondence***- E-mail: anitha.gorthi@yahoo.com

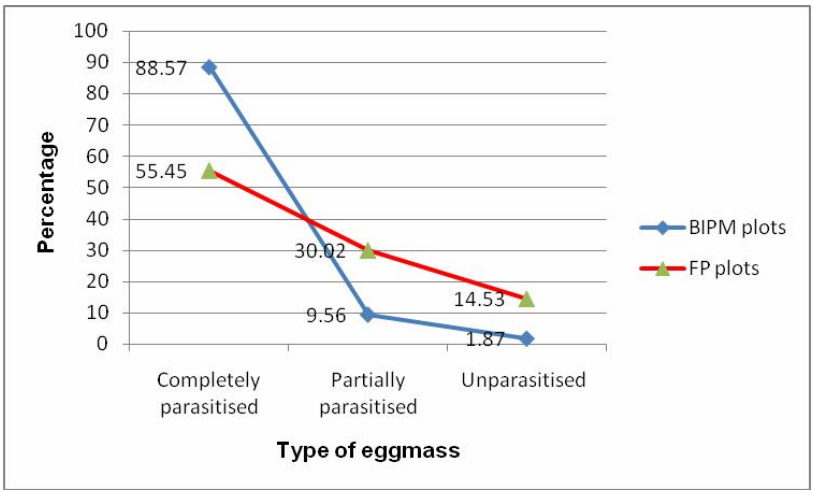
Materials and Methods

A field trial was laid out in *kharif* seasons of 2009-10 and 2010-11 in A.R.I. Farm, Rajendranagar, Hyderabad (A. P.), India; in a randomized block design with eight treatments and three replications. Four varieties of rice *viz*., MTU 1010, MTU 1001, MTU 7029 and BPT 3291 were cultivated each under BIPM and farmers' practices. Nursery sowings were carried out in the last week of June and twenty five day-old seedlings were transplanted in July. Plot size for each replication was 100 sq.m. Agronomic practices followed for all treatments were the same.



%DH = Per cent dead hearts **%WE** = Per cent white ears
BIPM = Biointensive Pest Management **FP** = Farmers' Practice

Fig. 1 : Infestation of stem borer in different varieties of rice under BIPM and FP packages.



BIPM = Biointensive Pest Management **FP** = Farmers' Practice

Fig. 2 : Comparative parasitisation levels of stem borer eggmassses by egg parasitoids in BIPM and FP plots.

Components of BIPM package

Growing green manure crop like Daincha; Pheromone traps for stem borer @ 4-5/acre; Erection of bird perches @ 10/ha; Release of *Trichogramma japonicum* @ 1,00,000/ha at 30 days after transplantation (DAT); Releases were repeated at weekly intervals till 60 DAT; Application of neem oil 3% at 15 DAT; Spraying Bt @ 2 Kg/ha at 30 DAT.

FP package

Recommended dosages of inorganic fertilizers in two splits 1-3rd week after transplantation and again between 2nd - 6th week after transplantation; Application of Carbofuran 3G granules in the nursery 1 week before pulling and again at 35 DAT; Spraying Cartap hydrochloride @ 2g/litre at 45 DAT and 60 DAT.

Observations on dead hearts were taken randomly from 200 hills/plot at 30 and 50 DAT and white ears were observed randomly from 200 hills/plot before harvest. Yield was calculated at harvest. Data on dead hearts, white ears and yield were subject to ANOVA after transformation.

Parasitization of egg masses

1000 egg masses of stem borer were collected from BIPM and FP plots each both the years and placed in small glass vials. They were observed for the emergence of parasitoids. Level of parasitisation for each egg mass was designated in terms of complete (100%) or partial based on the number of parasitoids and/or stem borer larvae emerged. Parasitoids were identified upto genus level and the dominant genus was arrived based on the number of egg masses completely parasitized by it.

Results and Discussion

Stem borer infestation started at 15 DAT and continued till the end of the crop with peak infestation levels recorded in October (40-43 SWK). Analysis of two-year results showed that BIPM treatments recorded significantly lesser dead hearts and white ears in all the four varieties than the FP plots. 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 (fig. 1.). 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 P plots (3.1-3.3 t/ha). Stem borer damage and yield were on par in plots grown with BIPM package irrespective of the variety. The same held good for FP plots too. In field studies conducted by Suneel Kumar *et al.* (2007), maximum yield (86.7q/ha) was obtained from plots cultivated with biointensive pest management practices compared to four other package of IPM. In large scale evaluation of biointensive management in Basmati rice in Punjab against leaf folder and stem borer,

Ramandeep Kaur *et al.* (2007) found that the cost:benefit ratio of bio-intensive management practice was 1:4.01 and that for chemical control was 1:4.7. The mean % leaves folded (2.0), dead hearts (3.1), white ears (5.5) and yield (44 q/ha) in BPIM were on par with chemical control, mean % leaves folded (1.8), dead hearts (2.6), white ears (4.5) and yield (44.8 q/ha) and both the treatments were significantly better than control.

Parasitization of egg masses

Data on parasitization of egg masses of stem borer collected from BIPM and FP plots revealed that BIPM plots had higher percentage (88.57%) of completely parasitized egg masses compared to FP plots (55.45%), while the percentage of partially parasitized egg masses was higher in the FP plots (44.55%) compared to BIPM plots (11.43%) (fig. 2.). The predominant egg parasitoids were found to be *Tetrastichus* spp., *Telenomus* spp. and *Trichogramma* spp. *Tetrastichus* was found to be the single dominant species in 89.1% of the parasitized egg masses, *Telenomus* to the extent of 7.2% and *Trichogramma* upto 3.7%. In studies conducted by Jhansi Lakshmi *et al*. (2010), *Tetrastichus schoenobii* was the dominant species parasitizing 89% of egg masses followed by *Telenomus*, which parasitized 9% egg masses and 23% egg masses were parasitised by 2 or more of the parasitoids. BIPM practices elevated the incidence of natural enemies like *Ophionea indica*, *Paederus fuscipes*, Mirid bugs, *Cotesia*, *Charops* spp., Coccinellids and spiders like *Tetragnatha*, *Pardosa*, *Clubiona* thus enhancing chances of natural control. The present work highlights the importance of following eco-friendly pest management practices to safeguard the diversity of natural enemies in the crop ecosystem. The scope of natural control of stem borer has also been stressed upon so that the safety of management practices to the natural enemies would be considered while imposing them. Biodiversity conservation using ecologically safe products by way of adoption of BIPM package helps in maintaining the ecologically balance in nature besides being cost effective to the farmer in the long run.

References

Dufour, Rex (2001). Biointenisve Integrated Pest Management. http://www.attra.ncat.org/attra-pub/PDF/ipm.pdf

Garg, D. K., P. Kumar, R. N. Singh and M. Pathak (2002). Role of parasitoid *Trichogramma japonicum* in the management of yellow stem borer and leaf folder in Basmati Rice. *Indian J. Ent*., **64(2)** : 117-123.

Ignacimuthu, S. (2005). Biodiversity and insect pest management. *Curr Sci*., **88(10)** : 1543-1544.

Jhansi Lakshmi, V., V. Surekha and I. C. Pasalu (2010). Parasitization of rice yellow stem borer, *Scirpophaga incertulas* (Walker) egg masses. *Annals PIant Prot. Sci.*, **18** : 366-369.

Katti, G., I. C. Pasalu, N. R. G. Varma and N. Dhandapani (2001). Quantification of natural biological control in rice ecosystem for possible exploitation in rice IPM. *Indian J. Ent*., **63** : 439-448.

Kaur, S., K. S. Brar and M. Shenhmar (2003). Abundance of spiders in rice ecosystem in Punjab. *J. Insect Sci*., **16** : 90-91.

Kumar, Suneel, R. P. Maurya and M. A. Khan (2007). Impact of biointensive pest management strategies on yellow stem borer and leaf folder in rice and their effect on the economics of production. *J. of Entomol. Res*., **31(1)** : 11-13.

Mahal, M. S., V. K. Kajal, R. Kaur and R. Singh (2006). Integration of chemical and biocontrol approaches for the management of leaffolder, *Cnaphalocrocis medinalis* Guenee and stem borer, *Scirpophaga incertulas* Walker on basmati rice. *J. Bio. Cont.*, **20** : 1-6.

Ramandeep, Kaur, K. S. Brar, Jagmohan Singh and Maninder Shenhmar (2007). Large-scale evaluation of bio-intensive management for leaf folder and stem borer on basmati rice. *J. of Biol. Control.*, **21(2)** : 255-259.