INNSPUB

International Journal of Agronomy and Agricultural Research (IJAAR)
ISSN: 2223-7054 (Print) 2225-3610 (Online)
http://www.innspub.net
Vol. 10, No. 1, p. 60-64, 2017

RESEARCH PAPER OPEN ACCESS

Effectiveness of practiced management option to control rice stem borer

Most. Surovi Sultana[1], Md. Giush Uddin Ahmed[*1], Tamanna Yeasmin[1], Mst. Nasrin Khanam[1], Ferdous Akter[1], S. M. Zillur Rahman[2], Mr. Sukleash George Costa[2], Mr. Augustin Baroi[2], Md. Taibur Rahman[2], Md. Abul Bashar Mollah[2], M. Ekramul Hoque[2]

[1]*Department of Agronomy & Agricultural Extension, University of Rajshahi, Rajshahi, Bangladesh*

[2]*Caritas Rajshahi Region, Mohishbathan, Rajshahi, Bangladesh*

Article published on January 31, 2017

Key words: Rice, Stem borer, Gonabum, Neem Cake.

Abstract

The rice stem borer infestation was a serious problem for rice cultivation in Bangladesh. It caused damage of rice yield. The objectives of this study were to evaluate the performance of two organic pesticides to control rice yellow stem borer. Two organic pesticides, Gonabum and Decomposed Neem Cake was tested to reduce rice stem borer at three locations (Paba, Baraigram, and Patnitala) in kharif season. Among three locations stem borer infestation of BINA Dhan-7 was highest at Patnitala location using Gonabum and lowest was at Baraigram location using Decomposed Neem Cake. Between two pesticides, Decomposed Neem Cake was performed better than Gonabum at Baraigram location. Decomposed Neem cake applied plot was sowed lowest number of affected tiller hill^{-1} and the lowest number of affected panicle hill^{-1} and highest yield at Baraigram location. Finally it was observed that rice yield increased with the decreased of insect infestation. Neem cake was suitable practiced management option to control rice yellow stem borer.

* **Corresponding Author:** Md. Giush Uddin Ahmed ✉ ahmedmgu@ru.ac.bd

Introduction

Rice stem borers are important and serious pests of rice. Usually six species of stem borer attack rice. The yellow stem borer is a pest of deep water rice. It is found in aquatic environments where there is continuous flooding. Second instar larvae enclose themselves in body leaf wrappings to make tubes and detach themselves from the leaf and falls onto the water surface. They attach themselves to the tiller and bore into the stem (Rice Knowledge Bank).

After hatching, early instars bore into the leaf sheath and causing longitudinal yellowish-white patches as a result of feeding. Then it invades stem of rice plant and stay in the pith to feed on the inner surface of the stem wall. But these are not externally visual as symptoms. Severe feeding cause a deep circular cut through the parenchyma tissue showing dead hearts at the vegetative stages and whiteheads at the reproductive stages (Chandramohan *et al.,* 2010).

Due to heavy damage to rice throughout the world, many controlling measures underway always. Chemical controls, physical control, biological controls and many traditional methods are used to control the pest at any stage of its lifecycle. Numerous pest resistant paddy varieties have been genetically modified and introduced in to the fields by the local governments.

Two organic pesticides (Gonabum and Decomposed neem Cake) were used to control rice stem borer. Gonabum is an organic pesticide, used as growth disruptor of yellow rice stem borer. Decomposed Neem Cake is effective in the management of rice stem borer. Neem cake is a potential source of organic pesticide. The bitter principles of soil and cake have been reported to some important activities. Such as antifeedant, attractant, repellent, as well as growth disruptor. Improvement of soil fertility is another advantage of neem cake application. Neem cake is an excellent source of insecticide. (Prasad *et al*., 2004). The present investigation was therefore, to identify sustainable management options for rice stem borer, to justify the efficacy of the two organic pesticides on rice stem borer and to reduce rice stem borer severity and improve grain yield.

Material and methods

Rice stem borer management

Field experiments were conducted with cultivated variety BINA dhan-7 during kharif season belong to the "Caritas Bangladesh" Rajshahi zone at three locations (Paba, Baraigram, Patnitala) in 2015. Two organic pesticides, Gonabum (1.0 kg of digestive system of poultry, 1.0 kg molasses and 5.0 L H_2O decomposed solution) and Decomposed Neem Cake were tested to control rice stem borer of BINA Dhan-7 at three locations. Gonabum was used 1:10 ratio with fresh water for spray and Decomposed Neem cake solution was sprayed with 7 days' intervals according to insect infestation.

Experimental design

The experiment was laid out in a randomized complete block design (RCBD). Each plot was $4m^2$ in size. Pre-germinated seeds were sown in the wet nursery bed on 1st july. One days old healthy seedlings were transplanted at as spacing of Plant to plant distance was 15 cm and line to line distance was 20 cm in the experimental plots on 20 july 2015.

Land preparation and intercultural operations

Urea: 180 kg/ha i.e. 728g/decimal. Was applied in 3 equal splits (1st split 10 days after transplanting (DAT) + 2nd split 25 days DAT and 3rd split at the panicle initiation stage. TSP: 75 kg/ha i. e. 303g/decimal. Application was done before final land preparation. MOP: 90-112.3 Kg/ha i.e. 454g-495g/decimal (½ at the basal + ½ with the 2nd top dress of urea). Weeding was done manually. The first weeding was done at 15 DAT, the second and third weeding were done at 30 and 45 DAT, respectively. Experimental plots were irrigated as and when necessary. The crop was harvested at full maturity. Five hills (excluding border hills) were randomly selected from each plot and tagged for recording necessary data.

Data analysis

The collected data was analyzed statistically by using two applications, SPSS Statistics V22 and Microsoft office Excel 2010.

Results and discussion

Affected tiller hill-1

Affected tiller hill-1 was significantly influenced by three locations. Among three locations significantly highest (2.00) affected tiller hill-1 was observed at Patnitala and the lowest (0.50) at Baraigram location (Table 1). In case of affected tiller hill-1 there is no significance difference between Baraigram and Paba, and Patnitala and Paba. But Baraigram and Patnitala were significantly different. Influence of organic pesticide on number of affected tiller hill-1 and their interaction with location are presented in Fig. 1. The result showed that highest affected tiller hill-1 was recorded at Patnitala location using Gonabum and the lowest at Baraigram location using Decomposed Neem Cake. Between the two organic pesticides Decomposed Neem Cake was better than Gonabum to reduce affected tiller hill-1.

Table 1. Effect of three locations on affected tiller hill-1 of BINA Dhan -7 using Gonabum and Deomposed Neem cake.

Location	Mean±Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
Paba	1.167±0.272 ab*	0.574	1.760
Baraigram	0.500±0.272 b	0.093	1.093
Patnitala	2.000±0.272 a	1.407	2.593

* In a columm, data are the mean values with standard error having different letters among three locations differ significantly as per DMRT.

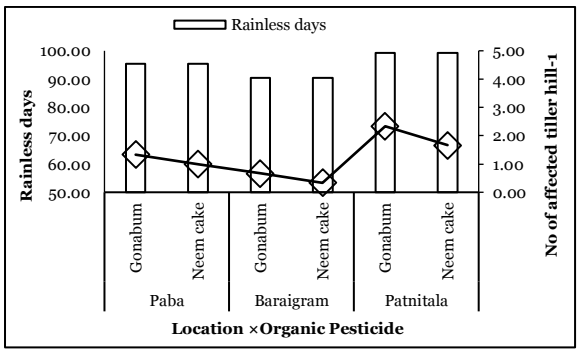

Fig. 1. Relation between rainless days and affected tiller hill-1 of BINA Dhan -7 in three locations using Gonabum and Decomposed Neem Cake.

Maximum rainless days was recorded at Patnitala location and minimum rainless days was recorded at Baraigram. Maximum affected tiller hill-1 was found at Patnitala location and minimum affected tiller hill-1 was found at Baraigram location. Between two organic pesticides, Decomposed Neem Cake was better than Gonabum. Decomposed Neem Cake reduced the affected tiller hill-1 at all locations. Affected tiller hill-1 increased with the increased of days of rainless at all locations.

Baraigram was less favorable for insect infestation than Patnitala and Paba location. Although the environmental condition of Patnitala was favorable than Baraigram for producing maximum fertile tiller hill-1 but in case of tiller infestation the environmental condition of Paba and Patnitala location was shown negative effect on tiller infestation than Baraigram. The environmental condition of Baraigram location was more effective to control rice stem borer. Rainless days was highest in Baraigram location that was influenced tiller infestation. Application of Decomposed Neem Cake with proper interval schedule was maintained in Baraigram location than Paba and Patnitala location that was another important factor to reduce affected tiller hill-1 of BINA Dhan-7. Decomposed Neem Cake was an important organic pesticide to control rice stem borer. It was antifeedant for insect. Due to its antifeedant properties insect can not eat neem cake applied plant. As a result neen cake applied plant become less affected by insect. Antifeedant activity was observed by neem extract of (*Azadirachta indica*) on larvae *Sesamia nonagrioides* and shown similar result by Juan *et al.,* (2000).

Affected panicle hill-1

Affected panicle hill-1 was significantly influenced by three locations. Among three locations significantly highest (1.83) affected panicle hill-1was found at Patnitala and lowest (0.50) affected panicle hill-1 was observed at Baraigram location (Table 2). In case of affected panicle hill-1 there is no difference between Paba and Baraigram but significant different observed at the location between Baraigram and Patnitala location and Paba and Patnitala location.

Influence of organic pesticide on affected panicle hill-1 and their interaction with location are presented in Fig. 2.

The result showed that highest (2.00) number of affected panicle hill^{-1} was recorded at Patnitala location using Gonabum and the lowest (0.33) was found at Baraigram and Paba using Decomposed Neem Cake. Between the two organic pesticides, Decomposed Neem cake was better than Gonabum to reduce affected panicle hill^{-1}.

Table 2. Effect of three locations on affected panicle hill^{-1} of BINA Dhan -7 using Gonabum and Decomposed Neem Cake.

Location	Mean±Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
Paba	0.667±0.255 b	0.112	1.221
Baraigram	0.500±0.255 b	0.055	1.055
Patnitala	1.833±0.255 a	1.279	2.388

*In a colum, data are the mean values with standard error having different letters among three locations differ significantly as per DMRT.

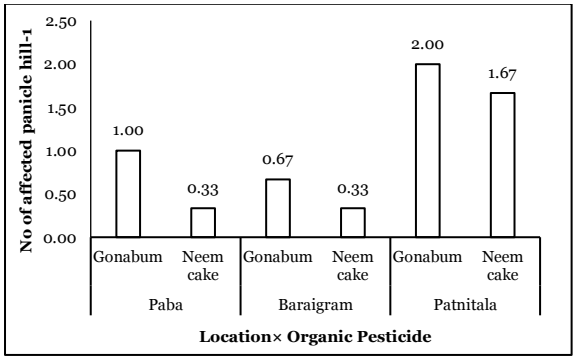

Fig. 2. Effect of Gonabum and Decomposed Neem Cake on affected panicle hill^{-1}of BINA Dhan -7 grown in three locations.

Yield (t/ha)

Yield (t/ha) influenced by three locations. Among the three locations highest (5.06 t/ha) yield was found at Baraigram and the lowest (4.75 t/ha)) at Patnitala location (Table 3). In case of yield (t/ha) there is no significance difference among three locations.

Influence of organic pesticide on yield (t/ha) and their interaction with location are presented in Fig. 3 The result showed that highest (5.18 t/ha) yield was found at Baraigram using Decomposed Neem Cake and lowest (4.63 t/ha) at Patnitala location using Gonabum.

Between the two organic pesticides Decomposed Neem Cake was better than Gonabum to increase yield (t/ha).

Table 3. Effect of three locations on yield (t/ha) of BINA Dhan -7 using Gonabum and Decomposed Neem Cake. Mean of three locations subsets.

Location	Mean±Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
Paba	4.768±0.119 a	4.510	5.027
Baraigram	5.067±0.119 a	4.808	5.325
Patnitala	4.750±0.119 a	4.492	5.008

*In a colum, data are the mean values with standard error having different letters among three locations differ significantly as per DMRT.

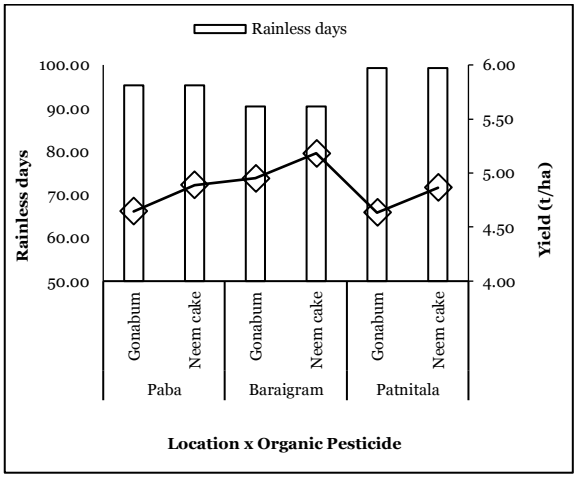

Fig. 3. Relation between rainless days and yield (t/ha) of BINA Dhan -7 in three locations using Gonabum and Decomposed Neem cake.

Influence of rainless days on yield (t/ha) using two organic pesticides Gonabum and Decomposed Neem Cake was grown in three locations were presented in (Fig. 3). Maximum rainless days was recorded at Patnitala location and minimum rainless days was recorded at Baraigram location. Maximum yield (t/ha) was found at Baraigram location and minimum yield (t/ha) was found at Patnitala location. In comparison of two pest management systems, Decomposed Neem Cake was more suitable than Gonabum. Neem cake increased the yield (t/ha) at all locations. Yield (t/ha) increased with the decreased of days of rainless at all locations.

Environmental condition of Baraigram was favorable for increasing highest yield (t/ha). Temperature and Rainfall was also optimum at Baraigram. Rainless days was lowest. Paba and Patnitala both the locations temperature and rainfall was not favorable to increase yield (t/ha). At Paba and Patnitala humidity was higher that was influenced insect infestation. Due to insect infestation yield (t/ha) was decreased at Paba and Baraigram location. At Baraigram insect infestation was less as result yield (t/ha) was highest at Baraigram location. Neem cake performed not only as an organic pesticide but also increase soil fertility that was helpful to increase yield (t/ha).

Therefore, the rice yield was attributed to affected tiller and not filled grain density. based on trial and error, farmers learned to manipulate planting dates, sowing rates, and other husbandry practices to minimize the effects of expected pest infestation on yield. Bangladeshi farmers would explain they changed their practices because they increased yield rather than because of decreased impact of insect pests. Our study centered on adjusting the rice stem borer management to determine whether yield compensation occurred. The data showed, in the three different locations where the study took place, high-yielding rice varieties' ability to reduce yield by insect pest damage.

An adequate water supply was one of the most important factors in rice production. In many parts in Bangladesh, rice plants suffer from deficit water because of irregular rainfall. Variability of rainfall affected rice crop at different times. If variability was associated with an untimely cessation at the reproductive or ripening stage of the rice crop, yield (t/ha) reduction was severe (Moomaw and Vergara, 1965). By using Decomposed Neem Cake, gain good rice yield. The highest yield obtained when number of affected tiller hill^{-1} and affected panicle hill^{-1} reduced.

References

Chandramohan C, Ingle SR, Murthy R. 2010. Yellow stem borer on paddy. Fact sheets for farmers. Plantwise.

Dhaliwal GS, Arora R. 1996. An estimate of yield losses due to insect pests in Indian Agriculture. Indian Journal of Ecology **23**, 70-73.

FAO. 2011. Food and agricultural commodities production. Food and Agriculture Organization of the United Nations.

Garris AJ, Tai TH, Coburn J, Kresovich S, Mccouch S. 2005. Genetic structure and diversity in *Oryza sativa* L. Genetics **169**, 1631-1638.

Huesing J, English L. 2004. The impact of *Bt* crops on the developing world. AgBioForum **7**, 84–95.

Juan A, Sans A, Riba M, 2000. Antifeedant activity of fruit and seed extracts of *Melia azedarach* and *Azadirachta indica* on larvae of *Sesamia nonagrioides*. Phytoparasitica **28**, 311-319.

Matteson PC. 2000. Insect pest management in tropical Asian Irrigated rice. Annual Review of Entomology **45**, 549- 574.

Moomaw JC, Vergara BS. 1965. The environment of tropical rice production. The mineral nutrition of the rice plant. Proc. of a Symposium at the International Rice Research Institute. The Johns Hopkins Press, Baltimore, Maryland. pp. 3-13.

Prasad SS, Gupta PK, Singh RB, Kanaujia BL. 2004. Evaluation of neem products against yellow stem borer, *Scirpophaga incertulas* on deep water rice. Ann. Pl. Protect. Sci **2**, 426-428.