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# Effectiveness of practiced management options to control rice bug

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## Abstract

The rice bug 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 and inorganic pesticide to control rice bug of BRRI Dhan-57. Two pest management systems, Amritapani and Snail+Melathion was tested to reduce rice bug at three locations (Paba, Baraigram, and Patnitala) in kharif season in Rajshahi Zone. Among three locations rice bug infestation of BRRI dhan-57 was highest at Paba and Patnitala location using Amritapani and lowest was at Paba location using Snail+Melathion. Between two pesticides Snail+Melathion was performed better than Amritapani at Paba location. Snail+Melathion applied plot was sowed lowest number of affected panicle and the lowest number of affected grain at Paba and Patnitala location and highest yield at Paba location. Finally it was observed that rice yield get back with the decreased of insect infestation.

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**Introduction**

Rice bug (*Leptocorisa oratorius*) damage rice by sucking out the contents of developing grains from pre-flowering spikelet to soft dough stage, therefore causing unfilled or empty grains and discoloration. Immature and adult rice bugs both feed on rice grains. High rice bug populations are brought about by factors such as nearby woodlands, extensive weedy areas near rice fields, wild grasses near canals, and staggered rice planting. The insect also becomes active when the monsoonal rains begin. Warm weather, overcast skies, and frequent drizzles favor its population buildup.

The population of the rice bug increases at the end of the rainy season. Rice bugs are found in all rice environments. They are more common in rainfed and upland rice and prefer the flowering to milky stages of the rice crop. Rice bugs are usually seen feeding on the foliage and flowers of leguminous and graminaceous crops. *L. oratorius* can be found on many crop plants in the family Poaceae (grasses), especially rice, and is a reported pest of economic significance in rice-producing countries like India, Australia, and China (Schaefer and Panizzi, 2000).

Both the adults and nymphs feed on grains at the milking stage. They can be serious pests of rice and sometimes reduce yield by as much as 30%.Rice bugs feed by inserting their needlelike mouthparts into new leaves, tender stems and developing grains. Consequently, the plant reacts to repair the tissue and seal the wound. When injuries accumulate, the plant becomes stressed, which can lead to growth retardation of the grains and some grain and plant deformation. Excessive feeding can cause yellow spots on the leaves. This reduces photosynthesis and, in extreme cases, can damage the vascular system of the plant. Puncture holes also serve as points of entry for several plant pathogens, such as the fungus that causes sheath rot disease. The most economically important damage is caused when the adults and nymphs feed on the developing grains. Such damage causes discoloration of the grains, which reduces market quality.

The organic materials cow dung, cow urine, pulse beson, molases mix then fermented it for a week, and this mixture is called amritapani. Its widely use in India to accumulate the growth of soil microorganism. Usually rotten apple snails use attract the rice bug to come closes to malathion. Rotten snail does not kills the rice bug directly, only Malathion kills the insect. Malathion is an organophosphate insecticide of relatively low human toxicity. In the former USSR, it was known as carbophos, in New Zealand and Australia as maldison and in South Africa as mercaptothion.

Considering the above facts the present research work is designed to manage the rice bug eco-friendly by using pesticides. To attain this aim the present study was carried out to identify sustainable management options for rice bug, justification of the efficacy between two management systems of rice bug and comparison the performance of inorganic and organic pesticides.

**Material and methods**

Field experiments were conducted with cultivated variety BRRI dhan-57 during kharif seasons belong to the Rajshahi zone at three locations (Paba, Baraigram, Patnitala) in 2015. Two organic and inorganic pesticides; Amritapani and Snail+ Melathion were tested to control rice bug at three locations. The experiment was laid out in a randomized complete block design (RCBD). Each plot was 4m$^2$ in size. Healthy and vigorous seeds were collected from BADC Rajshahi. Pre-germinated seeds were sown in the wet nursery bed on 1$^{st}$ 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. Integrated organic, inorganic and chemical fertilizers were used as describes below:

Urea: 22 kg/bigha was applied in 2 equal splits (1$^{st}$ split 10 days after transplanting (DAT) + 2$^{nd}$ split 20-25 days. TSP: 12 kg/bigha. Application was done before final land preparation. MOP:7.5 Kg/bigha (½ at the basal + ½ with the 2$^{nd}$ 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.

*Rice Bug Management*
*Amritapani Materials*
(i) 2 Kg Ghee
(ii) 2 Kg Honey
(iii) 1.5 Kg *Vitex negundo* leaves
(iv) 1.5 Kg Neem leaves
(v) 1 L Cow urine

*Amritapani Preparation*
(i) Mixed the ghee and honey gently. (ii) Crushed roughly the neem and *Vitex negundo* leaves and mixed with 2 L of water. (iii) Kept cow urine in a separate pot. (iv). Mixed the suspension thoroughly and kept it for two days, (v) Third day, mixed all suspension into one bowl and mixed thoroughly. (vi) Set aside for another two days. (vii) On fifth day, filter the suspension and the filtrate is ready for spraying (3% solution) and as a soil drench (5% solution).

*Snail with Melathion*
Malathion is an organophosphate insecticide of relatively low human toxicity. In the former USSR, it was known as carbophos, in New Zealand and Australia as maldison and in South Africa as mercaptothion. Apple snails are collected from local lakes and removed the testa and soft fleshy portion was collected. Those flashey snails were kept it to rot at lest 7 days in a cloth rag. The cloth rag with snail was soaked in malathion solution and attached the cloth rag with a stink rod. Two or three cloth rag were placed per 10 square meter.

The collected data was analyzed statistically by using the computer package SPSS Statistics V22 and Microsoft office Excel 2010.

## Results and discussion

*Affected panicle and rainless days*
Influence of rainless days on affected panicle using two pesticide (Amritapani and Snail+Melathion) in three locations were shown in Fig 1.

Maximum rainless day was found at Patnitala location and minimum rainless day was observed at Baraigram location. Duo to high temperature, soil conditions and other environmental factor was responsible for maximum rainless days at Patnitala. Maximum affected panicle was found at Paba location and minimum affected panicle was found at Baraigram location. Between two management systems, Snail+Melathion was better than Amritapani to control the rice bug. Removal of Amritapani reduces the affected panicle at all locations. The affected panicle increases with the increase of days of rainless at all locations.

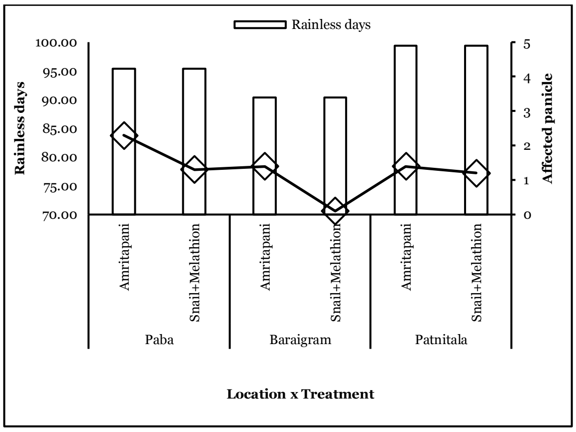


**Fig. 1.** Relation between rainless days and affected panicle of BRRI Dhan-57 in three locations using Amritapani and Snail+Melathion.

*Affected Panicle and Grain*
Affected panicle was significantly influenced by three locations (Table 1). Among the three locations, significantly highest affected panicle (11.400) was found at Patnitala using Amritapani and the lowest affected panicle (1.350) was observed at Baraigram location. There was no significance difference between Paba and Baraigram location but Patnitala location was significantly differ with other two locations. Influence of pesticide on affected grains and their interaction with location presented in Fig 2. Maximum number of affected grains was recorded at Patnitala location using Amritapani and the lowest affected grain (0.2) was observed Baraigram location using Snail+Melathion. Between two pesticides Snail+Melathion was better than Amritapani to reduce affected grains for all locations.

**Table 1.** Effect of three locations on affected panicle of BRRI dhan-57 using Amritapani and Snail+ Melathion.

| Location | Mean±Std. Error | 95% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| Paba | 3.100±0.812 b | 1.463 | 4.737 |
| Baraigram | 1.350±0.812 b | 0.287 | 2.987 |
| Patnitala | 5.200±1.149 a | 6.085 | 4.715 |

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

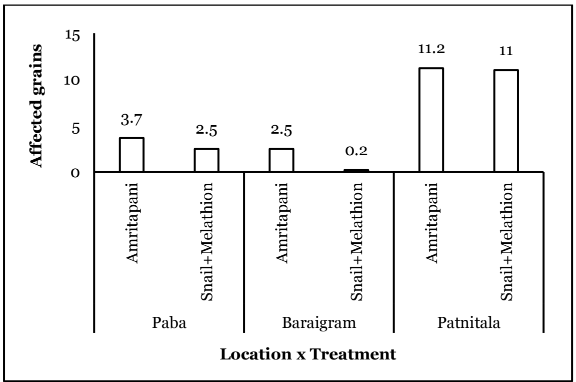


**Fig. 2.** Comparison of Amritapani and Snail+Melathion on affected grains of BRRI dhan-57 grown in three locations.

Environment condition of Patnitala was favorable for insect infestation as a result affected grains was increased in Patnitala location comparatively. Humidity of Patnitala was moderate and temperature was optimum. Rainless days was highest in Patnitala that was influenced affected grains infestation. Although the environmental condition of Paba and Patnitala was more favorable than Baraigram for producing maximum fertile tiller but in case of grain affection the environmental condition of Patnitala was effected grain. The environmental condition of Baraigram location was more effective to control rice bug.

*Yield*

Yield was significantly influenced by three locations. Among the three locations significantly highest yield (4.476) was found at Paba location and followed by Baraigram. The lowest Yield (4.038) was observed at Patnitala location. In case of rice yield there was no difference between Paba and Baraigram but Patnitala location was significantly lower than other two locations.

Pest management systems on yield and their interaction with location are presented in Fig 3. The result shown that highest (4.699) yield was recorded at Paba location using Snail+Melathion and lowest (4.01) at Patnitala location using Amritapani. Between two management systems, Snail+Melathion was better than Amritapani to gain optimum yield for all locations.

**Table 2.** Effect of three locations on Yield of BRRI dhan -57 using Amritapani and Snail+Melathion.

| Location | Mean±Std. Error | 95% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| Paba | 4.476±0.059 a | 4.357 | 4.594 |
| Baraigram | 4.335±0.059 a | 4.216 | 4.454 |
| Patnitala | 4.038±0.083 b | 3.870 | 4.206 |

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

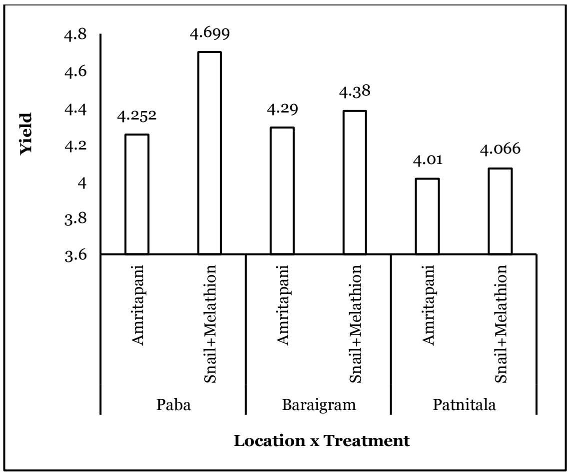


**Fig. 3.** Effect of Amritapani and Snail+Melathion on Yield of BRRI dhan -57 grown in three locations.

Environmental condition of Paba was favorable for rice production. Temperature and Rainfall was also optimum in Paba. Rainless days was lowest. Humidity was 70-80%, average temperature was 29ºc and rainfall was 180-200mm . Due to insect infestation yield was decreased in Patnitala and Baraigram location. In Paba insect infestation was less as result yield was highest in Paba location. Snail+Melathion performed as a better option to manage the rice bug and helpful to gain good rice yield.

Chemical control is still considered as the first line of defense in rice pest control. Application of various granular and sprayable insecticidal formulations gives effective control of rice pests. Various chemical insecticides have been recommended to control the rice bugs. In the present paper, the comparative effectiveness of some new insecticides evaluated in irrigated field condition against these two pests of transplanted rice has been reported. The Leptocorisa spp. (Hemiptera: Alydidae), commonly known as rice bugs, cause extensive loss in rainfed lowland or upland rice. Several species of rice bugs occur in the Philippines, but L. oratoriusis the most prevalent (Reissig *et al*., 1985; Litsinger *et al*., 1987). Nymphs and adults feed on developing grains resulting in partially or entirely empty grains and account for a yield reduction ranging from 10% (Pathak, 1968) to total crop failure depending on the degree of infestation. Control strategies in current use against the pest are largely based on chemical insecticides which are prohibitively expensive for most rice farmers.

In addition, intensive use of insecticides creates an ecological imbalance through destruction of non-target beneficial insects, and accumulation of toxic residues in the environment. There is, therefore, a need to develop a safer and integrated approach to pest management to promote a more sustainable and ecologically sound pest management strategy.

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