Prevalence of insects influenced by tree litter and N-fertilizer on BR11

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Abstract: A field experiment was conducted at the Agroforestry Farm, Bangladesh Agricultural University, Mymensingh in 2005 to find out the effect of tree litter and N-fertilizer combinations on the prevalence of different insects and their interaction on BR-11 rice. Rice was grown in 4 levels of tree litter (L_0=control, L_1=2 ton ipil-ipil ha^{-1}, L_2= 4 ton ipil-ipil ha^{-1}, L_3=6 ton ipil-ipil ha^{-1}) and 4 levels of N fertilizer (N_0= control, N_1= 86.7 Kg. Nitrogen ha^{-1} N_2 =86.7 Kg. Nitrogen ha^{-1}, N_3=86.7 Kg. Nitrogen ha^{-1}). The result revealed that the prevalence of insects viz. grasshopper, brown plant hopper, rice bug and rice hispa were significantly affected by the application of tree litter and N-fertilizer. The highest prevalence of insect viz. grasshopper (45.67), brown plant hopper (8.98), rice bug (4.00) and rice hispa (43.32) and % white head (0.08) was found in L_3N_3 treatment combination and lowest prevalence of grasshopper (24.46) brown plant hopper (2.33), rice bug (1.33) and rice hispa (26.67) and white head (0.02) was found in the L_0N_0 combination.

Key words: Insect prevalence, tree litter, N-Fertilizer, BR-11.

Introduction

Rice is the staple food and thus it is the number one crop for the people of Bangladesh. Total rice growing area in Bangladesh is about 10.2 million hectors which was 75% of total cropped area. Shortage of food each year in Bangladesh is 1.5 million tons. So it is an outmost need to produce more food in order to feed growing people.

Leaf litter is an important source of organic matter for improvement of soil fertility. The decomposition of leaf litter influences the amount of N availability for plant uptake. Leaf litter supplies the carbon, nitrogen, phosphorus and other

nutrients in the soil that are further considered as important indicator of soil productivity and ecosystem. So, leaf litter can be used as a substitution to N-fertilizer. Nitrogen input increases plant productivity but on the other way it also increases the number of insect individuals of different insect species (Prestidge, 1982).

About 175 insect species have been recorded as rice pest (BRRI, 1985) and of them 20-30 species are economically important (Miah and Karim, 1984). Stem borer, rice bug, grass hopper and plant hopper are generally considered as major pest. They cause about 13% yield losses to Boro crops (BRRI, 1985). Due to attack of pests and diseases 1.5 to 2.0 millions tons of rice production reduced annually. The average loss due to insect pest damage in Bangladesh is about 18% of expected rice yield per year (Alam *et al.*, 1983). The study was undertaken to find out the influence of tree litter and N-fertilizer on the prevalence of insect pests in rice field.

Materials and Methods

The experiment was conducted in two factor Randomized Complete Block Design (RCBD) with three replications. Tree litter combined with different levels of nitrogenous fertilizer was considered as treatments in the study. The plot size was 4x2.5 m^2.

The following two factors were used in this experiment:

Factor (A): Tree litters

i) L_0 (control)
ii) L_1 (2 ton ipil-ipil ha^{-1})
iii) L_2 (4 ton ipil-ipil ha^{-1})
iv) L_3 (6 ton ipil-ipil ha^{-1})

Factor (B): Different level of N-fertilizer

i) N_0 (Control)
ii) N_1 (86.7 kg nitrogen ha^{-1})
iii) N_2 (130 kg nitrogen ha^{-1})
iv) N_4 (173.4 kg nitrogen ha^{-1})

Five major insect species namely, stem borer, brown plant hopper, rice hispa, grass hopper and rice bug were taken into consideration and their prevalence was measured as follows-

Sweeping was done from the plant canopy level including inter space between plants as well as close to the basal region of the plants. In each field, 10 sweeps was made in cross-section. The collected sample was stored in a jar and counted in the laboratory. To asses the prevalence of rice bug early morning was chosen because the insects are not active at that time. By selecting $1m^2$ area at 4 different sites in each plot the number of bugs were recorded. The same procedure also followed for rice hispa. The prevalence of stem borer was determined based on the percentage of white head. Twenty hills were recorded. The damage is assessed using the following formula-

$$\% \text{ White head} = \frac{\text{No. of white heads}}{\text{Total no.of Panicles obs.}} \times \frac{\text{No. of infested hills}}{\text{Total. no. of hill observed.}}$$

The data collected throughout the experiment were computed and analyzed. DMRT were done in order to show the significant differences between the treatment means. The percent data were transformed by Arc Sin or Square- Root transformation depending on range of percent data. The Data ranging from 0-30% and 70-100% were transformed by Square Root transformation and that of 30-70% by Arc Sin (Gomez and Gomez, 1984).

Results and Discussion

Prevalence of major insect pests influenced by different levels of tree litter and N fertilizer

The prevalence of all insect species studied varied due to application of tree litter (Table 1). The highest prevalence was recorded in L_3 treatment and the lowest prevalence was found in L_0 (control) treatment. The mean number of insect species was grass hopper: 36.78 vs. 26.02, brown plant hopper: 6.70 vs. 4.02, rice bug: 3.36 vs. 2.37, rice hispa: 37.09 vs. 28.2 and the percent white head infestation was: 0.06 vs. 0.035.

N fertilizer also had significant effect on the prevalence of all the insect species studied (Table2). The highest prevalence was recorded in N_3 treatment and the lowest prevalence was found in N_0 (control) treatment.

The mean numbers of insect species were grass hopper: 36.7 vs. 25.12, brown plant hopper: 6.97vs 3.22, rice bug: 3.41vs 2.03, rice hispa: 36.46 vs. 27.38 and the percent white head infestation was 0.06 vs. 0.02.

Table 1. Effect of tree litter on insect pest prevalence in rice cv. BR-11

Treatment	Grasshopper	Brown plant hopper	Rice bug	Rice hispa	% white head
L_0	26.02d	4.02d	2.37c	28.02d	0.035d
L_1	29.03c	5.41c	2.78b	29.86c	0.047c
L_2	31.59b	5.86b	3.07ab	33.25b	0.055b
L_3	36.78a	6.70a	3.36a	37.09a	0.064a
Level of significance	**	**	**	**	**
CV (%)	5.49	7.59	12.87	4.62	3.54

** Indicate significant at 1% level of probability

Table 2. Effect of N- fertilizer on insect pest prevalence in rice cv. BR-11

Treatment	Grasshopper	Brown plant hopper	Rice bug	Rice hispa	% white head
N_0	25.12d	3.22d	2.03c	27.38d	0.02d
N_1	29.89c	5.74c	2.97b	31.38c	0.05c
N_2	31.70b	6.08b	3.18ab	33.18b	0.05
N_3	36.70a	6.97a	3.41a	36.46a	0.06
Level of significance	**	**	**	**	**
CV (%)	5.49	7.59	12.87	4.62	3.54

** Indicate significant at 1% level of probability

Table 3. Effect of tree litter and N-fertilizer combination on insect pest prevalence in rice cv. BR-11.

Treatment	Grasshopper	Brown plant hopper	Rice bug	Rice hispa	% white head
L_0N_0	24.46h	2.33j	1.33g	26.67g	0.02o
L_0N_1	25.92gh	4.41gh	2.65def	28.50fg	0.03i
L_0N_2	26.30fgh	4.50fg	2.72cdef	28.70fg	0.03k
L_0N_3	27.41efgh	5.10f	2.80cdef	28.96fg	0.04j
L_1N_0	25.00gh	3.15i	2.15f	27.52fg	0.02no
L_1N_1	28.20efg	5.85e	2.85cdef	29.41fg	0.04i
L_1N_2	30.50d	6.15de	3.00cde	3.30ef	0.05g
L_1N_3	32.41d	6.50cde	3.15bcd	32.24de	0.06f
L_2N_0	25.35gh	3.50hi	2.30ef	27.45fg	0.03mn
L_2N_1	29.20ef	5.96de	2.97cde	30.00ef	0.05h
L_2N_2	30.50de	6.70bcd	3.32abcd	34.23d	0.06e
L_2N_3	41.32b	7.30b	3.70ab	41.32ab	0.07b
L_3N_0	25.70gh	3.92gh	2.35ef	27.91fg	0.03m
L_3N_1	36.27c	6.92bc	3.41abc	37.62c	0.07d
L_3N_2	39.50b	7.00bc	3.70ab	39.51bc	0.07d
L_3N_3	45.67a	8.98a	4.00	43.32a	0.08 d
Level of significance	**	**	**	**	**
CV(%)	5.49	7.59	12.87	4.62	3.54

** Indicate significant at 1% level of probability

The prevalence of all insect species also varied significantly due to combine effect of tree litter and N-fertilizer (Table 3). The highest prevalence was recorded in L_3N_3 treatment and the lowest

prevalence was found in L_0N_0 treatment. The above results also supported by (Hurd *et al*. 1971; Hurd and Wolf, 1974; Prestidge, 1982). They conducted an experiment and proposed that nitrogen inputs increase plant productivity, which also increase the availability of insect resources and also the number of insect individuals and possibly the number of insect species.

Both the N-fertilizer, tree litter alone and in combination had significant influence on the abundance of various insect species like grass hopper, brown plant hopper, rice bug, and rice hispa on BR-11 rice. So for the proper management of these pests careful decision should be taken during the use of these tree litter and N-fertilizer in the rice field.

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