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Scientific Note

PREVALENCE AND ABUNDANCE OF INSECT PESTS IN TRANSPLANTED AMAN RICE ECOSYSTEM

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Rice is the staple food of Bangladesh grown in Aus, Aman and Boro seasons. Most of the cultivable lands are occupied by rice in Aman season. Insect pests are the major concern of rice cultivation. Different species of insects are found in rice field based on growing seasons and localities. The study was conducted in T. Aman season around Patuakhali Science and Technology University (PSTU) to know the prevalence and abundance of insect pests in T. Aman rice ecosystem. Sweeping net was used to collect the insect samples. The prevailing insect pests were rice bug (*Leptocorisa acuta* Thun.), green leafhopper (*Nephotettix virescens* Dis.), brown planthopper (*Nilaparvata lugens* Stal), short horned grasshopper (*Hieroglyphus daganensis* Krauss), long horned grasshopper (*Tettigonia viridissima* Krauss), leaf roller caterpillar (*Cnaphalocrocis medinalis* Guenee), green horned caterpillar (*Melanitis leda* Lin.), yellow stem borer (*Scirpophaga incertulas* Walker), rice caseworm (*Parapoynx stagnalis* Zeller), rice pollen beetle (*Chiloloba acuta* Wied.) and rice skipper (*Pelopidas mathias* Fab.). Among these pests, green leafhopper (51.96% relative abundance) and brown planthopper (21.79% relative abundance) were the most abundant while rice pollen beetle was the least abundant (0.565%). These insect pests belong to 9 different families under the orders of Hemiptera, Orthoptera, Lepidoptera and Coleoptera.

Keywords: Rice, Aman season, Insect pests, Prevalence, Relative abundance

Rice (*Oryza sativa*) is the staple food of the peoples of Bangladesh and many other countries in the East and South Asia, the Middle East, West Indies and Latin America (Sharif *et al*. 2014). Rice is nutritionally rich containing significant amount of protein, polyphenol, sugar, amino acids and many others (Khatun and Mollah 2021). Different bioactive compounds present in rice also have antioxidant and anti-inflammatory activity (Khatun and Mollah 2024). In Bangladesh, rice is cultivated in more than 11.6 million hectares area producing 34 million tons of milled rice

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in 2012 (IRRI 2014). It occupies 75% of the total cropped areas (Ganesh Kumar *et al*. 2012) providing about 75% of the calories and 55% of the proteins necessary in the average daily diet of Bangladeshis (Bhuiyan *et al*. 2004). Globally, people get more than one-fifth of total calories from rice consumption (Sogawa 2015). Rice-feeding insect pests are the major constraint for successful production of rice which have been serious threat to food security as well. In Bangladesh, more than two hundred insect species are known to occur in rice ecosystems (Islam and Catling 2012, Ali *et al.* 2017) of which 20-33 species can cause economic yield losses if large numbers are present (Ali *et al.* 2021). Insect pests hampering growth and yield of rice includes brown plant hopper (*Nilaparvata lugens*), small brown planthopper (*Laodelphax striatellus* Fallen), rice leaf folder (*Cnaphalocrocis medinalis* Guenee), rice hispa (*Dicladispa armigera* Oliver), yellow stem borer (*Scirpophaga incertulas* L.), white-backed planthopper (*Sogatella furcifera* Horvath), rice bug (*Leptocorisa acuta* Thun.), ear cutting caterpillar (*Mythimna separata* Walker), rice gall midge (*Orseolia oryzae* Wood-Mason), etc. (Sogawa 2015, Liu *et al.* 2016**;** Ali *et al.* 2021). Among the insect pests, green leafhopper, brown plant hopper, white backed planthopper and yellow stem borer are most prevalent and abundant in all rice growing seasons (Afrin *et al.* 2019). The planthoppers (Hemiptera: Delphacidae) cause direct damage to plants by sucking the cell sap from the base of the plants (Ali *et al.* 2012) and indirectly they transmit rice ragged stunt (RRSV) and rice grassy stunt (RGSV) viruses (Hibino 1996). Outbreak of planthopper results drastic yield loss of rice and their control become less effective (BRRI 2009, Heong *et al.* 2015). Yellow stem borer attacks the rice plant at both vegetative and reproductive stage causing dead-heart and white head symptoms, respectively. This pest usually causes grain yield losses of 3-95% (Heinrichs *et al.* 1985).

Insect pests in rice field are specific to seasons and localities although some are available throughout the country irrespective of seasons. It was reported that prevalence of insect pests in Rangpur are green leafhopper, white leafhopper, grasshopper, yellow stem borer, white stem borer, rice leafroller, rice hispa, rice bug, long horned cricket, short- horned grasshopper, and long-horned grasshopper while at Barishal are yellow stem borer, rice leaf roller, rice hispa, long-horned cricket, long-horned grasshopper, short-horned grasshopper and green leafhopper indicating more at Rangpur than Barishal (Ali *et al.* 2017). The present study aimed at investigating the prevalence and abundance of insect pests in rice ecosystem at T. Aman season around Patuakhali Science and Technology University.

Study site: The study was conducted adjacent to Patuakhali Science and Technology University (PSTU), Dumki, Patuakhali, Bangladesh. The specific study sites included Muradia, Sreerampur and Angaria unions of Dumki upazila (sub-district). This area belongs to 22.46424°N 90.38252°E with an elevation of 1.0 m from the sea level (Hasan *et al.* 2014).

Soil type and land preparation: The study area is located under Active Ganges Floodplain (AEZ 10) Agro-Ecological Zone possessing calcareous, alluvium, and calcareous brown floodplain soils containing low organic matter and alkalinity. The fertility level was medium with N deficiency, soil pH ranged from 5.8 to 6.5, and cation exchange capacity (CEC) was 25.58 with silty clay loam textured soil (Khatun and Mollah 2023). The climate was characterized by alternate hot and cold seasons. The soil was prepared by repeated tillage and fertilized properly for successful crop production. Fertilization, transplanting and weeding were conducted following Khatun *et al.* (2020).

Sampling insect pests and their identification: Insects were sampled in all locations at the maximum tillering stage of rice. A sweep net (40-cm diameter) was used to collect insect pests in all plots. Ten complete sweeps were made randomly at the canopy level of the plants. The collected insect samples were kept in labelled bags and transported to the laboratory for sorting, identification and counting. The collected specimens after sorting out to family level were stored in 30 ml vials containing 70% (v/v) ethanol with few drops of glycerine and preserved in insect storage boxes for identification up to species level. These samples were identified with the help of a compound microscope, matching with the pictures and discussion with the experts.

Data processing and presentation: All the collected data were entered into Microsoft Excel to calculate relative abundance of any specific insect pests following the formula described by Mollah and Rahman (2012)**:**

$$\text{Relative abundance (\%)} = \frac{\text{Number of specific insect}}{\text{Total number of all insects}} \times 100$$

Graphical data were prepared using Sigma Plot 12.5 software (https://sigmaplot.software.informer.com/12.5/)

Prevalence of insect pests in rice field: In transplanted Aman rice field, ten insect pests were observed at Dumki of Patuakhali district. The prevalent insect pests were rice bug, green leafhopper, brown planthopper, short-horned grasshopper, long-horned grasshopper, leaf roller caterpillar, green horned caterpillar, yellow stem borer, rice caseworm, rice pollen beetle and rice skipper (Table 1, Fig. 1). Among the three different locations, rice bug, green leafhopper, brown planthopper, short-horned grasshopper, long-horned grasshopper and leafroller caterpillar was found in all locations. Rice pollen beetle and yellow stem borer was not found in location 2. Rice caseworm was found in location 1 and 2. Rice skipper was found in location 2 and 3. Therefore, the maximum insect was found in location 3. Ali *et al*. (2017) reported that yellow stem borer, rice leafroller, rice hispa, long-horned cricket, long-horned grasshopper, short-horned grasshopper and green leafhopper were prevalent in Barishal. However, in Sylhet green leafhopper, white leafhopper, rice hispa, long-horned grasshopper, short-horned grasshopper, rice bug, and caseworm were more abundant in Aman rice (Suhel *et al*. 2017).

Table 1. Prevalence of insect pests in Aman rice field at Dumki, Patuakhali

Sl.	Name of the insect pests identified		
	Location 1	*Location 2*	*Location 3*
1	Rice bug	Rice bug	Rice bug
2	Green leafhopper	Green leafhopper	Green leafhopper
3	Brown plant hopper	Brown planthopper	Brown planthopper
4	Short-horned grasshopper	Short-horned grasshopper	Short-horned grasshopper
5	Long-horned grasshopper	Long-horned grasshopper	Long-horned grasshopper
6	Leafroller caterpillar	Leaf roller caterpillar	Leafroller caterpillar
7	Green horned caterpillar	Green horned caterpillar	Not found
8	Rice yellow stem borer	Not found	Rice yellow stem borer
9	Rice caseworm	Rice caseworm	Not found
10	Rice pollen beetle	Not found	Not found
11	Not found	Rice skipper	Rice skipper

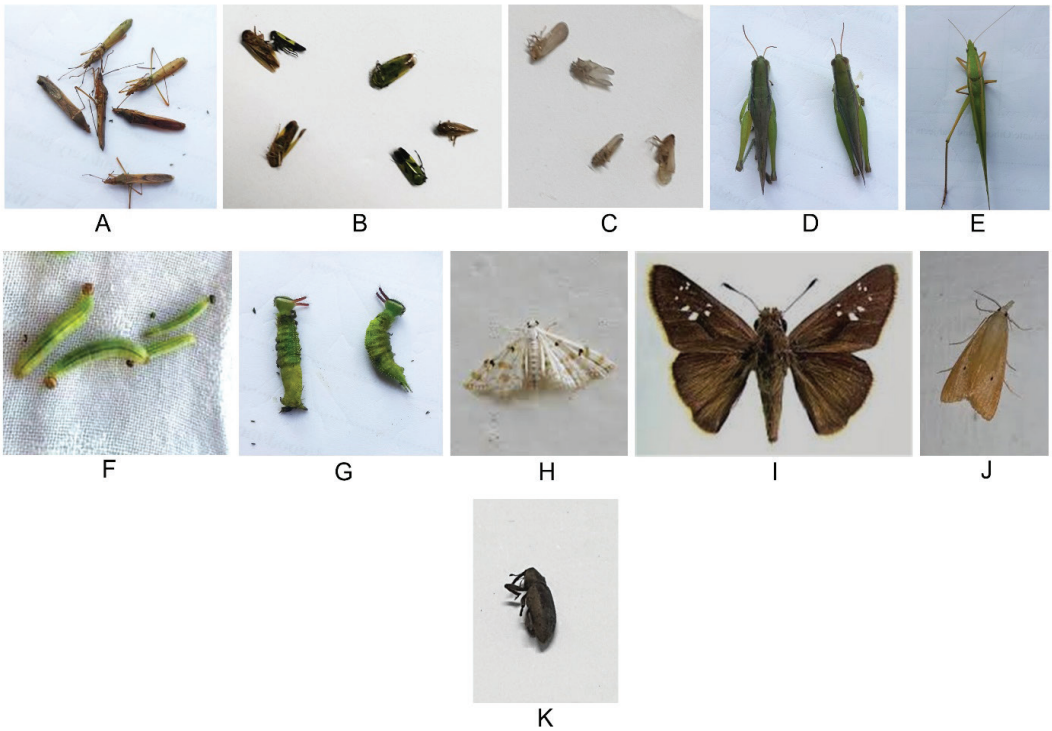


Fig. 1. The prevalent insect pests in rice field**. A.** Rice bug **B.** Green leafhopper **C.** Brown planthopper **D.** Short horn grasshopper **E.** Long horn grasshopper **F.** Leaf roller caterpillar **G.** Green horned caterpillar **H.** Rice caseworm **I.** Rice skipper **J.** Yellow stem borer **K.** Rice pollen beetle.

Abundance of insect pests in Amon rice field: Among the prevailing insect pests, green leafhopper was most abundant (93.00) which was followed by brown planthopper (39.00), and short-horned grasshopper (11.00) while rice pollen beetle was least abundant (1.00) (Table 2). However, the rice bug (6.00), long horned grasshopper (6.00), rice leaf roller caterpillar (6.00), green horned caterpillar (5.00), yellow stem borer (3.00), rice caseworm (4.00) and rice skipper (5.00) were moderately abundant in the field (Table 2). The number of green leafhopper was 31.00, 40.00 and 22.00 in location 1, 2 and 3, respectively (Table 2). Brown planthopper was also another prevalent insect in the rice field and the number was 19.00, 12.00 and 8.00 in location 1, 2 and 3, respectively (Table 2). The relative abundance of

these insect pests, green leafhopper (GLH, 51.96%) was highly abundant which was followed by brown planthopper (BPH, 21.79%) and short horned grasshopper (SHG, 6.15%) while rice pollen beetle (RPB, 0.56%) was least abundant which was followed by rice bug (RB, 3.35%), long horned grasshopper (LHG, 3.35%), rice skipper (RS, 2.79%), leaf roller caterpillar (LRC, 3.35%), rice caseworm (RC, 2.23%) and yellow stem borer (YSB, 1.68%) (Fig. 2). Afrin *et al.* (2019) reported that yellow stem borer and green leafhopper were most abundant in Barishal. On the other hand, in Sylhet green leafhopper was more abundant which was followed by white leafhopper, short-horned grasshopper, rice hispa, rice bug and others (Suhel *et al*. 2017). However, intercropping or mixed cropping contribute to increase the abundance and prevalence of insect pests in the field (Mala *et al*. 2020a). Another, strategy named push-pull also effective to increase prevalence and abundance of both pests and beneficial insects (Mala *et al*. 2020b).

Table 2. Abundance of insect pests in rice field at Dumki, Patuakhali

Sl.	Name of the insect pests collected and identified	Number of insects from 10 sweeps			Total number
		Location 1	*Location 2*	*Location 3*	
1	Rice bug	2.00	2.00	2.00	6.00
2	Green leafhopper	31.00	40.00	22.00	93.00
3	Brown plant hopper	19.00	12.00	8.00	39.00
4	Short-horned grasshopper	3.00	5.00	3.00	11.00
5	Long-horned grasshopper	2.00	2.00	2.00	6.00
6	Leafroller caterpillar	2.00	1.00	3.00	6.00
7	Green horned caterpillar	2.00	3.00	0.00	5.00
8	Yellow stem borer	2.00	0.00	1.00	3.00
9	Rice caseworm	2.00	2.00	0.00	4.00
10	Rice pollen beetle	1.00	0.00	0.00	1.00
11	Rice skipper	0.00	3.00	2.00	5.00

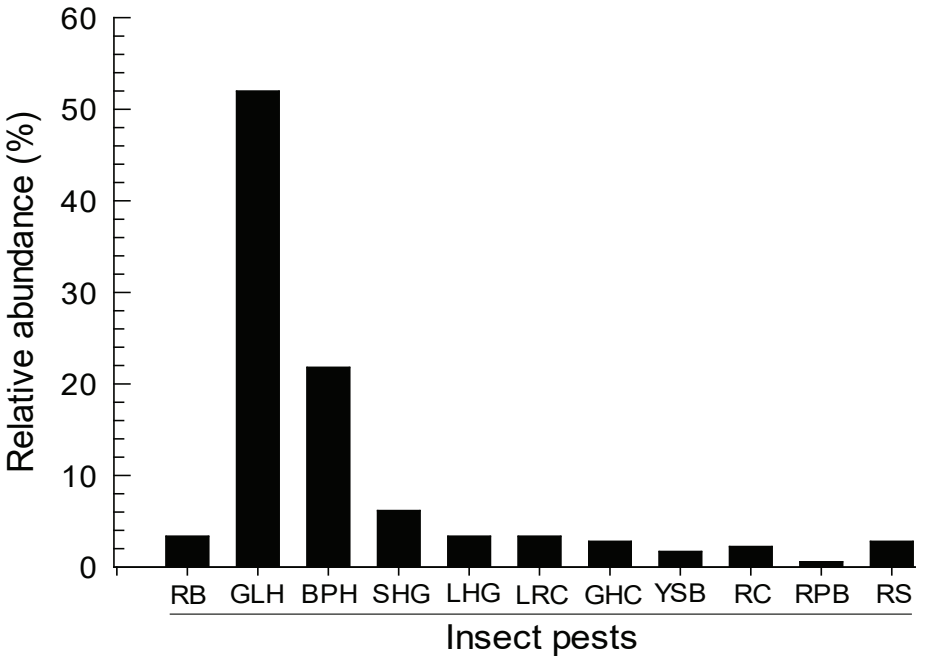


Fig. 2. Relative abundance (%) of insect pests in the rice field at Amon season. RB, rice bug; GLH, green leafhopper; BPH, brown planthopper; SHG, short horned grasshopper; LHG, long horned grasshopper; LRC, leaf roller caterpillar; GHC, green horned caterpillar; YSB, yellow stem borer; RC, rice caseworm; RPB, rice pollen beetle; RS, rice skipper.

Taxonomic status of prevalent insect pests: The prevalent insect pests belong to 9 different families of 4 different orders. Among the insect pests, rice bug (*Leptocorisa acuta* Thun.) belongs to Alydidae family, green leafhopper (*Nephotettix virescens* Dis.) belongs to Cicadellidae family, brown planthopper (*Nilaparvata lugens* Stal) belongs to Delphacidae, short horned grasshopper (*Hieroglyphus daganensis* Krauss) belongs to Acrididae family, long horned grasshopper (*Tettigonia viridissima* Krauss) belongs to Tettigoniidae family, Leaf roller caterpillar (*Cnaphalocrocis medinalis* Guenee), yellow stem borer (*Scirpophaga incertulas* Walker) and rice caseworm (*Parapoynx stagnalis* Zeller) belongs to Crambidae family, rice skipper (*Pelopidas mathias* Fab.) belongs to Hesperiidae family and rice pollen beetle (*Chiloloba acuta* Wied.) belongs to Cetonidae family (Table 3). From these family,

Alydidae, Cicadellidae and Delphacidae belongs to Hemiptera order, Acrididae and Tettigoniidae belongs to Orthoptera order, Crambidae and Hesperiidae belongs to Lepidoptera order and Cetonidae belongs to Coleoptera order (Table 3).

Table 3. Taxonomic identity of the insect pests in rice field at Dumki, Patuakhali

Common name	Scientific name	Family name	Order name
Rice bug	*Leptocorisa acuta* Thun.	Alydidae	Hemiptera
Green leafhopper	*Nephotettix virescens* Dis.	Cicadellidae	Hemiptera
Brown plant hopper	*Nilaparvata lugens* Stal	Delphacidae	Hemiptera
Short-horned grasshopper	*Hieroglyphus daganensis* Krauss	Acrididae	Orthoptera
Long-horned grasshopper	*Tettigonia viridissima* Krauss	Tettigoniidae	Orthoptera
Leafroller caterpillar	*Cnaphalocrocis medinalis* Guenee	Crambidae	Lepidoptera
Green horned caterpillar	*Melanitis leda* Lin.	Nymphalidae	Lepidoptera
Yellow stem borer	*Scirpophaga incertulas* Walker	Crambidae	Lepidoptera
Rice skipper	*Pelopidas mathias* Fabricius	Hesperiidae	Lepidoptera
Rice caseworm	*Parapoynx stagnalis* Zeller	Crambidae	Lepidoptera
Rice pollen beetle	*Chiloloba acuta* Wied.	Cetonidae	Coleoptera

In the transplanted Aman rice field, eleven insect pests were found. The prevailing insect pests were rice bug (Alydidae: Hemiptera), green leafhopper (Cicadellidae: Hemiptera), brown planthopper (Delphacidae: Hemiptera), short-horned grasshopper (Acrididae: Orthoptera), long-horned grasshopper (Tettigoniidae: Orthoptera), leafroller caterpillar (Crambidae: Lepidoptera), green horned caterpillar (Nymphalidae: Lepidoptera), yellow stem borer (Crambidae: Lepidoptera), rice caseworm (Crambidae: Lepidoptera), rice skipper (Hesperiidae: Lepidoptera) and rice pollen beetle (Cetonidae: Coleoptera). Green leafhopper (51.96% relative abundance) was most abundant, brown planthopper (21.79% relative abundance) was moderately abundant and rice pollen beetle was least abundant (0.565%) among the rice insect pests.

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