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ASSESSMENT OF PADDY DAMAGE DUE TO FEEDING BY *OEBALUS* SPP. – A COMPARISON OF TWO METHODS

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ABSTRACT

In Guyana, rice (Oryza sativa) is grown on more than 92,000 hectares twice per year, ideally from mid-May to September and mid-November to March. Each season, paddy bugs (Oebalus spp.) plague the rice crop and due to feeding, they cause severe damage to the grains. It was assumed that paddy graded at rice mills, using the Quality Control paddy bug damage grading method, do not reflect the true damage caused by paddy bugs in rice fields because grains with reduced weight are blown away by the combine harvester. This grading method was compared with exposing the grains to a heat treatment with Sodium Hydroxide (NaOH), which captures those damaged grains with reduced weight. The results showed that the two methods of analyzing paddy bug damage were significantly different from each other at T-Table (0.05) level of significance. It proved that paddy bug damage at field level is much higher than what is usually recorded at the rice mills. The comparison revealed that rice farmers need to do a lot more in managing paddy bugs during the susceptible growth stages of the crop to limit the paddy bugs from feeding on the grains, especially since the damage was evident at the onset of grain development.

***KEYWORDS**: Paddy, Rice, Oebalus Spp., Paddy Bug Damage, Stinkbug.*

Article History

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INTRODUCTION

In Guyana, rice (*Oryza sativa*) is grown on more than 92,000 hectares twice per year, ideally from mid-May to September and mid-November to March. Paddy production in 2023 was over one million tons with an average of 6.3 tons per hectare (Guyana Rice Development Board [GRDB], 2024).Each season, paddy bugs (*Oebalus* spp.) plague the rice crop from the vegetative stage through to maturity. The bugs invade as early as thirty days after sowing to feed and nest on alternate hosts, particularly the *Echinochloa* spp. (**Plate 1**), then move into rice fields when the heading/flowering stage begins (**Plate 2**).

Paddy bugs are also called stinkbugs, rice bugs, ghundi bugs or bush bugs. They cause damage to the paddy by feeding on the developing grains from heading/flowering through to maturity. When the bugs feed during

heading/flowering, the grains become sterile; while feeding during the milk or dough stages cause the grains to be half-filled, deformed and partially or completely discolored. Often, these grains are blown out by the combine harvester at the time of harvesting. However, feeding that take place during the ripening stage causes the grains to have specks, which are also called 'pecky' grains (**Plate 3**).This damage associated with paddy bug feeding attracts a heavy monetary penalty when the farmers take the paddy to the mills.

Once the paddy reaches the mills, a Quality Control analysis is done in order to apply a grade to the quality of paddy that the farmer brought to be sold to the mill. Any paddy that is damaged beyond 4.5%, among other factors, is graded as sample grade, which is the lowest grade that can be awarded. The other grades are A, B or C (GRDB, 2011).

According to the nature of damage that can be associated with paddy bug feeding and the process through which the grains are harvested with a combine harvester, it can be assumed that the damage caused by paddy bugs in the field is much greater than the damage grade that is awarded at the mills. The assumption was based on the fact that the grains that were fed on by the bug during the flowering or milk stages are blown out by the combine harvester and do not form part of the grading analysis. In order to capture these grains and award a damage grade, the method of exposing them to a heat treatment with Sodium Hydroxide (NaOH) was used, which was then compared with the Quality Control paddy bug damage grading method. As such, this study was done to assess paddy damage due to feeding by paddy bugs (*Oebalus* spp) and compare the two grading methods.

METHODOLOGY

Paddy was harvested with a grass knife from thirty (30) rice fields in Region 5, Mahaica-Berbice, Guyana during both crops in 2021.Three samples were taken from different parts of each field. Each sample was threshed, labeled and brought to the Entomology laboratory at the Rice Research Station in Burma, Mahaicony.

Paddy bug damage analyses were done for each sample using two methods *viz*. the Quality Control Paddy Bug Damage Analysis where only grains that were damaged because of paddy bug feeding were considered and the second method was done using the sodium hydroxide treatment. Details of each method are as follows:

Quality Control (Qc) Paddy Bug Damage Analysis

Clean paddy weighing 100g was dehulled, out of which, 35g was taken out from each sample. There were three replicates per sample. Each grain, either whole or broken, was separated as a good grain with no discoloration or speck or a paddy bug damaged grain that was specked or discolored (**Plate 3**).The weight of the damaged grains was taken and the percent damaged grains was calculated using the following formula:

$$\textbf{Damaged grain (\%)} = \frac{\text{Weight (g) of damaged grains}}{35\text{g}} \text{ X } 100$$

Sodium Hydroxide (Naoh) Treatment

Uncleaned paddy weighing 30g was taken from each sample. There were three replicates per sample. The total number of grains was recorded from each 30g replicate. The grains from each replicate were then placed in a conical flask and covered with distilled water. Five NaOH pellets were added to each conical flask, after which the flasks were placed in a pot containing enough water to prevent the flasks from floating. The sample was steamed for 20 mins, allowed to cool and rinsed thoroughly. The hull of the paddy was now transparent and the damage caused by paddy bug feeding was easily

identified. Each paddy bug damaged grain was separated and counted. The percent damage was calculated using the following formula:

$$\textbf{Damaged grain (\%)} = \frac{\text{Number of damaged grains}}{\text{Total number of grains}} \text{ X } 100$$

The mean damage recorded from each field for the two methods was subjected to the Paired T test statistical analysis and comparisons were drawn from the results.

RESULTS AND DISCUSSION

Paddy samples were harvested from thirty fields located in Region 5 during the First and Second Crop of 2021.There were three replicates from each field. Paddy bug damage analyses were done to compare the Quality Control paddy bug damage analysis method with the NaOH treatment method. The results are presented and discussed below:

Table 1: Comparison Between Two Methods of Paddy Bug Damage Analyses – Region 5

Field No.	MEAN PADDY BUG DAMAGE (%)			
	First Crop		Second Crop	
	NaOH Treatment	QC Analysis	NaOH Treatment	QC Analysis
1	24.08	12.62	1.22	0.50
2	69.01	6.37	3.35	0.27
3	26.08	11.27	6.32	0.82
4	65.01	23.53	4.76	0.30
5	15.58	26.04	6.02	0.67
6	94.78	49.82	3.81	0.72
7	42.57	16.00	6.09	0.10
8	10.05	2.51	4.14	1.04
9	14.58	3.04	3.49	0.21
10	4.93	0.67	1.13	0.17
11	3.03	0.47	4.71	0.60
12	3.92	0.58	4.68	0.56
13	2.48	0.30	8.74	0.63
14	3.47	0.98	1.16	0.25
15	3.11	1.11	6.99	0.21
16	2.98	0.30	11.36	0.36
17	9.81	1.42	3.16	0.18
18	13.30	3.21	12.89	13.66
19	22.82	5.03	3.59	0.76
20	7.90	1.32	12.63	0.11
21	11.17	0.92	3.83	0.63
22	13.11	9.62	6.38	0.10
23	4.27	0.24	6.75	0.24
24	11.90	2.86	7.90	0.69
25	16.98	4.30	14.64	0.43
26	9.79	1.72	2.28	0.24
27	9.62	1.30	2.89	0.27
28	8.50	1.57	29.83	13.89
29	4.19	1.11	4.86	0.12
30	9.11	0.82	20.29	0.72
SD	21.97	10.62	6.131	3.397
T- Statistic	**4.322**		**6.596**	
T - Table (0.05)	**2.045**		**2.045**	

The results showed that the two methods of analyzing paddy bug damage were significantly different from each other at T-Table (0.05) level of significance. It is clear that damage at the field level, before harvesting with a combine harvester, is much greater than the damage that is recorded at the mills. This is probably because the method using NaOH treatment allows for grains that were damaged during the flowering and milk stages to be counted, which would otherwise be blown out by the combine harvester. Consequently, damage in the field is significantly greater than the damage awarded to farmers at the time the produce is sold to the mills.

CONCLUSION

The results proved that the two methods used to assess paddy bug damaged grains were significantly different. This difference can be mainly because the grains that were subjected to the NaOH heat treatment were not cleaned and contained all the light grains that the bugs fed on, whereas as the Quality Control paddy bug damage method includes separating the hull during which all the light damaged grains get separated as well.

The comparison revealed that farmers need to do a lot more in managing paddy bugs during the susceptible growth stages of the crop to limit the paddy bugs from feeding on the grains, especially since the damage was evident at the onset of grain development.

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PLATES

Plate 1: Paddy Bugs on Alternate Host, Birdseed Grass (EchinochloaSp.)

Plate 2: Paddy Bugs in Rice Field at the Onset of Heading/Flowering.

Plate 3: Discoloration and Specks on Paddy Bug Damaged Grains