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MONITORING POPULATIONS OF THE BROWN PLANTHOPPER, *NILAPARVATA LUGENS* (STAL), THE GREEN LEAFHOPPER, *NEPHOTETTIX VIRESCENS* (DISTANT) AND SPIDERS IN RICE AT MAQUIAPO, GUAGUA, PAMPANGA[1]

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ABSTRACT

The relative abundance of the brown planthopper (BPH), *Nilaparvata lugens* (Stal), the green leafhopper (GLH), *Nephotettix virescens* (Distant) and spiders was monitored on three rice varieties at Maqiuapo, Guagua, Pampanga. The efficiencies of the sampling devices, viz., sweep net, yellow gallon trap and trapezoidal steel cage were compared.

Weekly catches from three rice varieties, IR-22, IR-36 and IR-50 were counted fourteen days after transplanting up to the booting stages.

GLH mean count from sweep net was significantly higher than mean count from trapezoidal steel cage and yellow gallon trap.

BPH catches for yellow gallon trap and sweep net were statistically the same while trapezoidal visual count was statistically lower. The yellow gallon trap was expected to have the highest catch because of its color.

The combined spider mean counts for the three rice varieties were not statistically different. As to the sampling devices the sweep net gave significantly higher mean count compared to the yellow gallon trap and trapezoidal steel cage.

Key words: *Nilaparvata lugens* (Stal.), *Nephotettix virescens* (Distant), spiders, rice, monitoring, Pampanga.

INTRODUCTION

Satisfactory control of insect pests in rice is often difficult to achieve. For a long time farmers have tried to forecast pest problems to enable them to apply control measures in an effective and at the most efficient time. However, our ability to forecast insect densities and damages is still very limited (Dyck, 1978).

The green leafhopper, *Nephotettix virescens* (Distant) and the brown planthopper, *Nilaparvata lugens* (Stal) cause considerable yield loss in rice due to their ability to transmit virus diseases. With the resurgence phenomenon attributed to insecticides (Heinrichs et al. 1982) the role of natural enemies is in focus.

Present studies emphasize the importance of predators in the natural control of rice planthoppers and leafhoppers (Kenmore, 1980). The spiders predominate

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among predators in wetland rice (Okuma, 1968).

The key factor to a successful pest management system is the monitoring of fields on a regular basis (Heinrichs, 1978).

Monitoring is a major requirement for forecasting or to any supervised pest control.

Of the different monitoring devices used for insect pests of rice, both FARMCOP and D-VAC were found to be effective and precise. However, not all rice farmers can afford these equipment because of prohibitive cost (Barrion and Litsinger, 1984). Thus, it is necessary to find cheaper and effective monitoring devices.

Good sampling in monitoring is very important in determining population levels of both pests and beneficial species. Such information will serve as guide for establishing economic threshold and for decision making in pest control activities (Gabriel, 1982).

This study tested the performance of three monitoring devices. It also aimed to study the relative abundance of the rice green leafhopper, the brown planthopper and spiders on three rice varieties.

MATERIALS AND METHODS

Collecting Site

The rice green leafhopper (GLH), the brown planthopper (BPH) and spiders were monitored weekly from June to October, 1982 in the farm of Mr. Agapito Miranda at Barangay Maquiapo, Guagua, Pampanga.

Experimental Plots and Lay-out

The plots were laid-out in a randomized complete block design with sub-sampling replicated three times. Three varieties- IR-22, IR-36 and IR-50 were the treatments while three insect sampling devices (trapezoidal steel cage, yellow pantrap and sweep net) were the sub-samples. Total land area was 270 sq.m.

Planting and Land Preparation

A Ford tractor and a carabao were used in preparing the field. The experimental plots were 5 m x 6 m. Fifteen days old dapog seedlings of IR-22, IR-36, and IR-50 were transplanted at 25 x 25 cm. distance with 2-3 seedlings per hill. Complete fertilizer (14-14-14) was applied basally and the remaining nitrogen fertilizer, UREA (45-0-0), was top dressed at panicle initiation. Other cultural practices were done in all plots following the Masagana 99 package of technology except insecticide application.

Data Collection

Weekly data collection was started two weeks after planting up to the booting stage.

Sampling Methods

Three sampling methods were employed to monitor the two insect pests and spiders. These were visually counting insects found on each sample hill enclosed by a trapezoidal steel cage, counting catches sampled by a sweep net and yellow gallon trap.

Trapezoidal Steel Cage

A trapezoidal steel cage measuring 30 cm wide at the top, 40 cm at the bottom and 60 cm high with plastic walls was used to enclose an area equivalent to one hill of transplanted rice. Each sample hill was tapped and all individuals of the two insect pests and spiders falling into the water were counted. A total of 30 hills were sampled for each rice variety.

Sweep Net

A standard sweep net 32 cms in diameter was used. Ten sweeps were taken per plot replicated three times per rice variety. Green leafhoppers, brown planthoppers and spiders caught were counted right in the field and released afterwards.

Yellow Gallon Trap

Traps used were yellow plastic ice cream containers of one gallon capacity filled with water and little amount of detergent. The water was changed regularly. One trap was placed at the middle of each 30 sq.m. plot. Three traps were placed in each rice variety. A total of nine traps were distributed in the field.

RESULTS AND DISCUSSION

Table 1 shows the population density of the GLH in three rice varieties using three monitoring methods. The aggregate mean catch of the three monitoring methods were as follows: IR-36, 1.93, IR-50, 2.11 and IR-22, 2.63. The three rice varieties were not significantly different in harboring the GLH. The result shows that the three rice varieties were equally attractive to GLH.

The GLH mean count per hill for the three monitoring methods were: visual count using trapezoidal steel cage, 0.52, yellow gallon trap, 0.88 and sweep net, 5.26. Statistically, the sweep net gave a higher mean count than the other two methods.

Table 2 shows the abundance of the BPH on the three rice varieties using the three monitoring devices. The combined means of the three monitoring devices were IR-22, 1.20, IR-36, 2.34 and IR-50, 2.89. The abundance of the BPH on IR-50 and IR-36 was the same but significantly different from that of IR-22. The outcome suggests that even in the presence of IR-22, a susceptible variety, other IR varieties, such as IR-36 and IR-50, can also be infested by a greater number of hoppers. This might be due to the changing physiologic response of insects to different varieties.

As for the individual monitoring devices, the yellow gallon trap and the sweep net were not statistically different (3.11 and 2.48 mean catches, respectively). The 0.84 mean catch using the trapezoidal steel cage for visual counting gave comparatively the lowest count. Statistically, it is the least efficient in sampling BPH.

Table 1. Green leafhopper (GLH) abundance on three rice varieties using three monitoring devices.[a]

VARIETY	TRAPEZOIDAL STEEL CAGE	SWEEP NET	YELLOW GALLON TRAP	MEAN
IR-22	1.35	7.00	0	2.63 a*
IR-36	0.37	4.60	0.83	1.93 a
IR-50	0.30	4.20	1.83	2.11 a
MEAN	0.52a	5.26 b	0.88 a	

[a]Data taken from the mean for six weekly sampling dates.
Visual Count = mean of ten (10) randomly selected hills per variety;
Sweep net = mean of ten sweeps replicated three (3) times per variety;
Yellow Pan Trap = mean of three (3) gallons per variety.

* In the row or column, means with the same letter are not significantly different at 5% level using DMRT. Data transformed to /x+.5

ANOVA table for Green Leafhopper using SORT (X + 5) transformed data values.

SOURCE	DF	SS	MS	F-RATIO
Total	53	34.92155		
Variety	2	0.29235	0.14618	0.45093[ns]
Method	2	16.67382	8.33691	25.71821ns**
INT	4	3.36801	0.84200	
Error	45	14.58736	0.32416	
C.V. (%)	38.99			

[ns] not significant
** significant at 1% level

Table 3 shows the abundance of spiders on three rice varieties. The mean counts were as follows: IR-22, 4.03, IR 36 , 4.74 and IR-50, 5.17. Although IR-50 harbored more spiders than IR-22 or IR-36, the differences were not significant.

The mean count for each monitoring method were 1.23 for trapezoidal steel cage, 1.88 for yellow gallon trap and 10.83 for sweep net. The sweep net caught significantly more spiders than the other two devices.

Table 2. Brown planthopper (BPH) abundance on three rice varieties using three monitoring devices.[a]

VARIETY	TRAPEZOIDAL STEEL CAGE	SWEEP NET	YELLOW GALLON TRAP	MEAN
IR-22	0.96	2.33	0.33	1.20 a*
IR-36	0.52	1.83	4.67	2.34 b
IR-50	1.05	3.30	4.33	2.89 b
MEAN	0.84 a	2.48 b	3.11 a	

[a]Data taken from the mean for six weekly sampling dates.
Visual Count = mean of ten (10) randomly selected hills per variety;
Sweep net = mean of ten sweeps replicated three (3) times per variety;
Yellow Pan Trap = mean of three (3) gallons per variety.

* In the row or column, means with the same letter are not significantly different at 5% level using DMRT.

ANOVA table for Brown planthopper (BPH) using SORT (X + .5) transformed data values.

SOURCE	DF	SS	MS	F-RATIO
Total	53	23.80025		
Variety	2	2.65229	1.32614	4.73635*
Method	2	3.73175	1.86588	6.66042**
Int	4	4.81655	1.20414	
Error	45	12.59967	0.27999	
C.V. (%)	35.28			

* significant at 5% level
** significant at 1% level

Comparison of the Population Density on the Three Rice Varieties

The results show that the population density of GLH and BPH was the same on the three rice varieties despite of the presence of IR-22 a known susceptible variety to hoppers (IRRI, 1984). In the case of spiders, their relative abundance in relation to the GLH or BPH on the three rice varieties can be explained by the fact that wetland fields impound water either from direct rainfall or from irrigation. The aquatic habitat enhances environmental diversity and is a source of additional aquatic species, notably chironomids (Yasumatsa, et al., 1979) as prey for spiders. The presence of more prey due to diverse environment leads to

Table 3. Abundance of spiders in three rice varieties using three monitoring devices[a].

VARIETY	TRAPEZOIDAL STEEL CAGE	SWEEP NET	YELLOW GALLON TRAP	MEAN
IR-22	1.30	10.80	0	4.03 a*
IR-36	1.20	10.70	2.33	4.74 a
IR-50	1.20	11.0	3.33	5.17 a
MEAN	1.23 a	10.83 b	1.88 a	

[a]Data taken from the mean for six weekly sampling dates.
Visual Count = mean of ten (10) randomly selected hills per variety;
Sweep net = mean of ten sweeps replicated three (3) gallons per variety;
Yellow Pan Trap = mean of three (3) gallons per variety.

* In the row or column, means with the same letter are not significantly different at 5% level using DMRT.

ANOVA table for spiders using SORT (X + 5) transformed data values.

SOURCE	DF	SS	MS	F-RATIO
Total	53	64.81233		
Variety	2	1.32254	0.66127	2.141422[ns]
Method	2	47.04217	23.52108	76.162400ns**
INT	4	2.55036	0.63759	
Error	45	13.89726	0.30883	
C.V. (%)	28.01			

[ns] not significant

** Highly significant at 1% level

the abundance of spiders. Moreover, the results showed that the GLH density was the same in all three rice varieties while BPH had statistically higher counts on IR-36 and IR-50 than on IR-22 which is known to be susceptible to hoppers.

Comparison of the Three Monitoring Devices

Of the three monitoring devices, the sweep net proved to be superior in monitoring green leafhoppers and spiders. Sweep net is one of the commonly utilized sampling devices. It is easy to adapt and fast to execute (Heinrichs et. al. 1979). However, workability of the sweep net method is limited. It is also not useful once booting stage is reached because the sweeping strokes can cause breakage of panicles thereby affecting yield.

The yellow gallon trap had the highest BPH catch. This device is being used at IRRI (IRRI, 1981), in Japan (Kisimoto, 1979) and other rice growing countries in establishing the time and density of immigration.

Visually counting insects trapped in a trapezoidal steel cage is the least effective. In approaching a sample hill, leafhoppers, planthoppers and other arthropods start to move away while the cage is not yet in place. Thus, the efficacy of count is reduced.

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