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Screening of Some Local Upland Rice Cultivars against Major Insect Pests of Rice in Nagaland

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ABSTRACT

The present investigation entitled "Screening of some local upland rice cultivars against major insect pests of rice in Nagaland" was carried out 2018. Twenty rice cultivars were screened against gundhi bug, grasshopper and termites infesting rice. The cultivar Khulaghi was found to be better cultivar against gundhi bug with percent mean damage of 5.27%, Kungrei and Joha against rice grasshopper with percent mean damage of 18.70 and 19.30%, Logha and Phamul against termites with percent mean damage of 19.05 and 19.12% respectively. None of the cultivars was found to be free from the infestation of gundhi bug, rice grasshopper and termites.

Keywords Cultivars, Screening, Gundhi bug, Termites, Grasshopper.

INTRODUCTION

Rice, *Oryza sativa* L. (Poaceae) belongs to genus *Oryza* of Gramineae family and the genus includes 24 species. More than 60% of the world's population as well as of most of the people of South-Eastern Asia consume mostly rice and rice is a staple food. About 90% of all rice grown in the world is produced by and consumed in the Asian region. In India, the total area under rice cultivation is 42.8 million hectares with annual production of 105.24 million tonnes and productivity 2.46 tonnes/ha. Among various constraints of rice production, insect-pests, which attack the crop right from germination to harvesting, are estimated to cause huge yield losses to the tune of 30-40%. More than 100 species of insect infest and damage the rice plant of these 15 species of insect-pests are major significance and are generally of regular occurrence. The stem borers, leaf hoppers, plant hoppers, grasshoppers, gundhi bug, rice leaf folder, rice hispa, termites, cut worms and army worms are most destructive (Pathak and Dyck 1973). When genetically improved varieties were introduced in the 1960s, chemical insecticides have played a big role as part of the technological packages of the green revolution. It has also been observed that with the increase in the use of improved varieties, the use of chemicals also increased. The insecticides misuse caused the extreme destruction of parasitoids and predators which resulted in resurgence of several rice pests including brown plant hopper (BPH), *Nilaparvata lugens* Stal (Heinrichs and Mochida 1984) and rice stem borers (Lim *et al*. 1980). At present, the management practices include cultural methods, resistant rice cultivars/varieties and Chemical control. Increasingly, there are evidences and reports that pesticide applications done by farmers are inappropri-

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ately unnecessary which even facilitate pest outbreaks (Wang *et al.* 2010). Injudicious use of insecticides drastically reduces the populations of natural enemies of rice pests and leads to pest outbreak (Jahn 1992). In 1993, the IRRI revealed that 87.5% reduction in pesticide use can lead to an overall drop in pest numbers (Hamilton 2008). Some synthetic chemicals, such as the Imidacloprid can induce changes in the gene expression of the rice which causes the plant to become more susceptible to some certain pests (Cheng *et al.* 2012). The first and foremost thing to be considered to enhance management practices with respect to yield losses, due to insect pest infestation, is to cultivate resistant varieties. Resistant varieties are desirably economic friendly, cheap, non-toxic and cause no harm to environment as well as other organisms. Host-plant resistant is a desirable trait for pest management in rice varieties (Cheng *et al.* 2008). Considering all these views, to identify the potential resistant cultivars against major pests, the present studies entitled, "Screening of some local upland rice cultivars for resistance against major insect pests," was undertaken.

MATERIALS AND METHODS

To study the response of some promising rice cultivars against major insect pests of rice a field experiment was conducted at the Experimental farm, Department of Entomology, School of Agricultural Sciences and Rural Development (SASRD), Nagaland University, Medziphema campus during 2018. For this experiment twenty rice varieties/cultivars were used which were obtained from different Districts of Nagaland and Mizoram. The experiment was laid out in Randomized Block Design (RBD) with two replications. Seeds of twenty cultivars, namely, Joha, Logha, Khulaghi, Ranjit, Lekhomopuka, Kathaghi, Kuki, Phamul, Chongleimon, Nagaland Special, Khalamaghi, Seminye, Mezierie, Shefüghi, Lokhomo, Changman, IURON-514, Kungrei, Lekhomokala, Neithomo/Buhpui were sown in the last week of May by maintaining the recommended definite row to row spacing (20 cm). The allotted field was terrace with two rows and each row contains one replication of 20 cultivars. The cultivars were randomly distributed within the plots of each row.

Observations followed

The grains damaged by the gundhi bug and total number of grains in five panicles were recorded on 90 DAS, 105 DAS, 120 DAS and 135 DAS to screen the resistance of each cultivar against the pest. The per cent grain damage were calculated as follows.

$$\text{Per cent grain damage} = \frac{\text{Number of ear head bug damaged grains}}{\text{Total number of grains}} \times 100$$

The damaged leaves and total number of leaves from five randomly selected hills were observed in each plot to study the resistance of each cultivar against rice grasshopper. The percentage of leaf damage were calculated as follows.

$$\text{Per cent incidence} = \frac{\text{Number of damaged leaves}}{\text{Total number of leaves}} \times 100$$

Standard Evaluation System (SES) for grain damage developed by IRRI, 2002 was followed for estimating relative resistance/susceptibility against rice gundhi bug and rice grasshopper.

At each plot, damaged rice plants were counted and recorded in three phenological stages, i.e., tillering (40 DAS), heading (60 DAS) and maturation (90 DAS) in one-meter square quadrate to evaluate the resistance of each cultivar against termites. The percentage of damaged plants were calculated as follows.

$$\text{Per cent incidence} = \frac{\text{Number of damaged plants}}{\text{Total number of plants}} \times 100$$

Standard Evaluation System (SES) for grain damage developed by (Sharma *et al.* 2004) was followed for estimating relative resistance/susceptibility against termites.

RESULTS AND DISCUSSIONS

For the present study, twenty cultivars of rice viz., Joha, Logha, Khulaghi, Ranjit, Lekhomopuka, Kathaghi, Kuki, Phamul, Chongleimon, Nagaland Special, Khalamaghi, Seminye, Mezierie, Shefüghi,

Table 1. Response of various local rice cultivars against Rice gundhi bug, *Leptocorisa acuta*. HS- Highly susceptible; S- Susceptible ; MS- Moderately susceptible; MR- Moderately Resistant.

Cultivars	Damage percentage				Mean damage %	Scale	Status
	90 DAS	105 DAS	120 DAS	135 DAS			
Joha	0	15.74	21.15	15.74	13.15	5	MS
Logha	16.47	12.48	16.74	26.03	17.93	7	S
Khulaghi	0	5.23	7.00	8.87	5.27	3	MR
Ranjit	18.35	18.45	20.11	30.39	21.83	7	S
Lekhomopuka	10.47	18.59	42.09	48.92	30.02	9	HS
Kathaghi	39.05	13.45	20.79	23.14	24.11	7	S
Kuki	39.08	46.94	59.63	67.43	53.27	9	HS
Phamul	62.79	58.49	71.71	85.12	69.53	9	HS
Chongleimon	0	24.46	26.14	24.46	18.77	7	S
Nagaland Special	59.28	48.26	65.02	48.26	55.20	9	HS
Khalamaghi	0	15.27	13.42	17.74	11.61	5	MS
Seminye	0	14.09	22.00	14.09	12.54	5	MS
Mezierie	63.54	54.40	68.52	73.59	65.01	9	HS
Sefüghi	40.34	16.57	14.90	28.16	24.99	7	S
Lokhoma	0	10.88	7.88	26.46	11.30	5	MS
Changman	21.58	17.18	26.27	23.62	22.16	7	S
IURON-514	71.21	54.21	69.62	34.74	57.45	9	HS
Kungrei	0	6.57	34.92	14.36	13.96	5	MS
Lokhomo kala	30.35	17.09	20.89	27.47	23.95	7	S
Buhpui	26.32	25.91	43.22	22.21	29.41	9	HS
Sem±	0.42	0.51	1.03	0.67			
CD at 5%	1.23	1.52	3.04	1.98			

Lokhomo, Changman, IURON-514, Kungrei, Lekhomokala, Neithomo/Buhpui were selected for screening of rice against major pest of rice. The data on screening of cultivars against gundhi bug, termites and grasshopper infestation on number basis are presented in the table below. From the data, it could be seen that none of the cultivars was found to be free from the infestation of gundhi bug, termites and grasshopper. All the varieties recorded more than 5% infestation for rice gundhi bug, 15% infestation for rice grasshopper and termites respectively.

The result presented in Table 1 revealed that the percentage of rice plant damaged by rice gundhi bug ranged from 5.27 (Khulaghi) to 69.53 (Phamul). Seven cultivars viz., Lekhomopuka, Kuki, Phamul,Nagaland Special, Mezierie, IURON-514 and Buhpui were categorized as highly susceptible to gundhi bug on the basis of damage percentage. Five cultivars viz., Joha, Khalamaghi, Seminye, Lokhoma and Kungrei were found to be moderately susceptible to gundhi bug infestation with a percent damage of 13.15%, 11.61%, 12.54%, 11.30% and 13.96%, respectively. Seven cultivar viz., Logha, Ranjit, Kathaghi, Chongleimon, Sefüghi, Changman and Lokhomo kala were categorized as susceptible to gundhi bug. One cultivar viz., Khulaghi was found to be moderately resistant (5.27%) as shown in Table 1.

The result presented in Table 2 revealed that the percentage of rice plant damaged by rice grasshopper ranged from 18.70 (Kungrei) to 52.15 (Nagaland Special). Eight cultivars viz., Logha, Khulaghi, Lekhomopuka, Kathaghi, Chonglei-mon, Changman, IURON-514 and Lokhomo kala were categorized as susceptible to rice grasshopper on the basis of damage percentage. Nine cultivars viz., Ranjit, Kuki, Phamul, Khalamaghi, Seminye, Mezierie, Sefüghi, Lokhoma and Buhpui were found to bemoderately susceptible to rice grasshopper infestation. One cultivar viz., Nagaland Special was categorized as highly susceptible to rice grasshopper with a percent damage of 52.15. Two cultivars viz., Joha (19.30%)

Table 2. Field reaction of various rice cultivars against Rice grasshopper, Hieroglyphus banian.

	Damage percentage							Mean		
Cultivars	45 DAS	60 DAS	75 DAS	90 DAS	105 DAS	120 DAS	135 DAS	damage %	Scale	Status
Joha	13.33	22.22	22.12	15.83	22.92	18.97	19.70	19.30	3	MR
Logha	30.33	37.72	32.77	40.67	42.45	36.49	35.78	36.60	7	S
Khulaghi	43.53	48.66	43.08	42.41	56.22	35.42	52.65	46.00	7	S
Ranjit	20.34	39.53	32.08	28.75	31.32	31.44	27.85	30.19	5	MS
Lekhomo-puka	30.71	42.04	33.98	34.47	45.74	33.33	31.97	36.04	7	S
Kathaghi	25.90	45.56	47.07	31.03	38.39	32.48	32.30	36.10	7	S
Kuki	19.80	22.26	40.71	41.67	42.45	33.97	40.68	34.51	5	MS
Phamul	30.82	34.85	31.53	35.32	41.67	35.17	34.52	34.84	5	MS
Chonglei-mon	53.06	62.78	46.92	42.06	40.95	34.11	40.59	45.78	7	S
Nagaland Special	50.19	54.36	57.14	51.45	49.09	50.58	52.27	52.15	9	HS
Khalamaghi	17.49	21.88	27.59	29.85	29.81	29.00	26.99	26.09	5	MS
Seminye	29.31	36.07	45.45	30.68	37.82	34.60	36.75	35.81	5	MS
Mezierie	33.04	36.19	25.92	24.42	41.80	31.86	28.67	31.70	5	MS
Sefüghi	21.64	29.30	29.81	42.08	25.11	25.59	22.42	27.99	5	MS
Lokhoma	26.14	33.33	30.83	24.33	22.97	28.03	21.75	26.77	5	MS
Changman	39.90	52.73	37.55	34.33	44.12	35.82	46.43	41.56	7	S
IURON-514	46.02	48.91	42.98	46.55	42.57	36.64	43.02	43.81	7	S
Kungrei	15.56	16.67	20.20	18.07	20.15	18.65	21.57	18.70	3	MR
Lokhomo kala	31.01	48.81	44.23	51.47	49.57	44.11	45.00	44.89	7	S
Buhpui	24.12	27.72	32.69	30.38	36.21	28.10	28.94	29.74	5	MS
Sem±	0.25	0.18	0.23	0.25	0.20	0.18	0.20			
CD at 5%	0.75	0.53	0.67	0.73	0.61	0.54	0.59			

and Kungrei (18.70) were found to be moderately resistant as shown in Table 2.

The result presented in Table 3 revealed that the percentage of rice plant damaged by termites ranged from 19.05 (Logha) to 43.81 (Kuki). Seventeen cultivars viz., Joha, Khulaghi, Ranjit, Lekhomopuka, Kathaghi, Kuki, Chonglei-mon, Nagaland Special, Khalamaghi, Seminye, Mezierie, Lokhoma, Changman , IURON-514, Kungrei, Lokhomo kala and Buhpui were categorized as very high against termite infestation on the basis of damage percentage. Three cultivars viz., Logha, Phamuland Sefüghi were found to be highagainst termite infestation with a percent damage of 19.05, 19.12 and 20.00 respectively as shown in Table 3.

The results obtained during the investigation-showed wide variation among different varieties for their resistance to gundhi bug, rice grasshopper and termites infesting rice. The result revealed that none of the cultivars were highly resistant. The result of the present study isin partial agreement to the findings of Malek (2010) who reported Aloron susceptible against rice grasshopper. Kakde and Patel (2018) also reported different varieties of rice under the category of 'Moderately resistant', 'Moderately sisceptible', 'Susceptible' and 'Highly susceptible' based the extent of per cent grain damage recorded during the crop period. Mukherjee and Khan (2017) has recorded maximum number of grasshopper (17.25) at early tillering stage of rice.Yadav *et al*. (2018) reported termites as the major insect pest occurred in the cultivars Tanr I and Tanr II in pure upland rice cultivation in the area of Jharkhand. Mishra *et al.* (1991) reported that RR-19-2 and RR50-3 were most resistant to attack by rice gundhi bug. Regmi *et al.* (2017) also reported the lowest population of rice grasshopper in the variety Radha-4 followed by Ramdhan.

Table 3. Response of various local upland rice cultivars against Termites, *Termete sobesi*. VH- Very High; H- High.

Cultivars	Damage percentage (%) 30 DAS (Vegetative)	60 DAS (Reproductive)	90 DAS (Maturation)	Mean damage %	Scale	Status
Joha	10.00	30.00	51.43	30.48	5	VH
Logha	10.00	20.00	27.14	19.05	3	H
Khulaghi	7.35	27.14	51.43	28.64	5	VH
Ranjit	13.89	35.71	54.29	34.63	5	VH
Lekhomopuka	10.00	31.43	62.86	34.76	5	VH
Kathaghi	11.43	34.29	62.86	36.19	5	VH
Kuki	18.57	37.14	75.71	43.81	5	VH
Phamul	7.35	17.14	32.86	19.12	3	H
Chongleimon	14.29	35.71	65.71	38.57	5	VH
Nagaland Special	10.00	32.86	58.57	33.81	5	VH
Khalamaghi	9.72	32.86	60.00	34.19	5	VH
Seminye	12.86	27.14	55.71	31.90	5	VH
Mezierie	12.86	31.43	58.57	34.29	5	VH
Sefüghi	8.57	24.29	27.14	20.00	3	H
Lokhoma	11.43	40.00	58.57	36.67	5	VH
Changman	17.14	38.57	71.43	42.38	5	VH
IURON-514	14.29	38.57	62.86	38.57	5	VH
Kungrei	8.57	34.29	61.43	34.76	5	VH
Lokhomo kala	8.57	28.57	61.43	32.86	5	VH
Buhpui	11.43	35.71	50.00	32.38	5	VH
Sem±	0.14	0.16	0.19			
CD at 5%	0.43	0.48	0.57			

CONCLUSION

During the present investigation twenty rice cultivars we were screened against gundhi bug, rice grasshoppers and termites. None of the cultivars was found to be free from the infestation of these insects. All the cultivars recorded more than 5% infestation for rice gundhi bug, 15% infestation for rice grasshopper and termites respectively. The cultivar Khulaghi was found to be better cultivar against gundhi bug, Kungrei and Joha against rice grasshopper, Logha and Phamul against termites respectively.

From the results obtained above, it is evident that the insect pests of rice appeared at different growth stages of the rice plant with variable infestation level depending upon the cultivars. The infestation may vary from year to year in the same cultivar which can be due to change in weather conditions and other abiotic factors. Hence, it is suggested that the cultivars should be tested for at least two to three year to confirm the present findings. Cultivars showing resistance against major insect pests can be identified and used for further breeding program for enhancing insect pests' management strategy and to develop various resistant and superior types of rice variety.

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