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Screening of different rice genotypes against major diseases under old alluvial zone of West Bengal

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Abstract
A field experiment to assess the varietal susceptibility or resistance against the diseases was conducted under natural condition with seven treatments and three replications during Kharif 2015 and 2016. Per cent disease incidence and disease severity was recorded from the experimental plot based on different symptoms produced by different pathogens. It was found that sheath blight incidence (52.60%) and severity (24.19%) was highest in MTU-7029. Swarna Sub-1 (80.32%) recorded the highest blast incidence but the severity was highest in MTU-1079 (2.54%). Except all varieties under trial incidence (5.90%) and severity (1.04%) of false smut was recorded in BPT-5204.

Keywords: rice, incidence, severity, sheath blight, blast, false smut, varieties

Introduction
Rice (*Oryza sativa* L.) is one of the most important cereal crops in the world, serving as staple food for (Deepti *et al.*, 2013) [13] about 90% of rice in the world is grown and consumed by the population of Asian countries. In India, rice crop is grown under wide range of agro-climatic conditions and is being cultivated over an area of 44.40 m hectares with total production of 104.32 m tonnes during 2011-12 (Anonymous 2013) [2].

West Bengal being the largest rice producing state in India covers more than 90% of the crop during Kharif season with high yielding variety (HYV) where as in boro season all the cultivated lands are covered with HYV. Rice occupied almost 53% of the of the total agricultural crop areas of the state of West Bengal during 2007-08. The area and production under food grain during 2007-08 were 63.70 lakh hectare and 160.61 lakh metric tonnes respectively (Anonymous, 2010) [2].

Rice suffers from many diseases caused by fungi, bacteria and viruses. Among the fungal diseases, sheath blight, sheath rot, bacterial blight, brown spot, blast and false smut are the most prevalent ones. To ensure the global food security for increasing population growth, it is vital to control the various insect pests and diseases that damage rice (Normile, 2008) [7]. The resistant varieties reduce the cost of production by reducing the investment on pesticide (Chouhan *et al.*, 2000) [3]. Keeping in the view its economic importance, the present investigation was undertaken to find out the resistant /tolerant cultivars against sheath blight, brown spot and false smut under natural condition in rice.

Material and Methods
The present experiment was conducted at Research Station (OAZ), UBKV, Majhian, Dakshin Dinajpur West Bengal 2015-16 taking seven rice varieties viz., MTU-7029, MTU-1075, MTU-1064, Swarna Sub-1, Pratiksha, BPT-5204 to assess the varietal incidence and severity against the major diseases in Randomized Block Design (RBD) with seven treatments and three replications using. The seeds of all varieties were sown in small beds for raising nursery and 25 days old seedlings were transplanted into the field with 20 cm inter and 15 cm intra row spacing in plots measuring 5.0 m x 5.0 m. Recommended package of practices was followed for sowing the crop. Data on disease incidence and severity were taking into consideration 10 plants from each plotsbased on visual scoring on different symptoms produced by different pathogensfollowing standard SES scale (IRRI 1996) [6]. Disease severity and Disease incidence were calculated by using the following formulas given by Wheeler (1969) [10] and Hajano *et al.*, (2011) [5] as below.

$$\text{PDI for severity} = \frac{\text{Sum of numerical values}}{\text{Number of plants or leaves observed}} \times \frac{100}{\text{Maximum disease rating value}}$$

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$$\text{PDI for incidence} = \frac{\text{Number of infected plants with disease}}{\text{Total number of plants studied}} \times 100$$

Results and Discussion

The leaf blast and sheath blight diseases were observed in the early stages of the crop growth and false smut was observed at the time of flowering stage.

Data on Percent disease incidence and disease severityof sheath blighthas been presented on Table 1. Among all the variety highest incidence was recorded on MTU-7029 (52.60%) followed by MTU-1064 (50.04%), MTU-1075 (17.66%), Pratiksha (14.87%) and Swarna Sub-1(2. 34%) also the highest severity was found on MTU-7029 (24.19%) followed by MTU-1064 (22.48%), MTU-1075 (14.71%), Pratiksha (7.89%) and Swarna Sub-1(0.25%). The variety Naveen and BPT 5204 showed 0% of incidence and severity to the disease. Based on the results on reaction of 7 varietiesof rice against sheath blight (Table 2) three varieties (Naveen, Swarna Sub 1 & BPT 5204) were found to be resistant, two (MTU-1075 & Pratiksha) moderately resistant and two (MTU-7029 & MTU-1064) were observed susceptible towardssheath blight disease.

The data on incidence and severity of blast disease (Table 3) shows that highest incidence was recorded in Swarna Sub-1 (80.32%) followed by MTU-7029 (71.17%), BPT-5204 (52.55%), MTU-1064(47.68%), Pratiksha (46.94%), MTU-1075(33.31%) and Naveen (1.14%). But the disease severity was found highest in MTU-1079 (2.54%) followed by Swarna Sub-1(2.34%), BPT-5204(2.17%), Pratiksha (2.05%), MTU-1064(1.67%), MTU-1075(1.05%) and Naveen (0.001%). Based on the disease reaction against blast disease Naveen, BPT-5204 & Swarna Sub-1 were found to be resistant, Pratiksha & MTU-1075 as moderately resistant and MTU-7029 & MTU-1064 as susceptible varieties.

The data given on Table 5 shows that the false smut incidence (5.90%) and severity (1.04%) was recorded only in BPT-5204. All the varieties were found to be resistant except for BPT-5204 as Moderately Susceptible based on disease reaction.

Different reports have been observed by different authors based on screening of the varieties. Based on artificial conditions screening of 23 entries Topo and Dubey (1997) [9] reported that none of the varieties were resistant towards sheath blight disease. Singh and Boral (2000) [8] also screened sixty local upland rice cultivars in Assam and reported that only one variety i.e. Chingdar was found to be resistant, seven moderately resistant and rest 52 were susceptible. Variation in the observations at various locations including present investigations may be due to variation in host genotypes, varying environmental conditions and variation in the inoculum load.

Table 1: Incidence and severity of rice varieties against sheath blight under field condition.

Sl. No.	Variety	Incidence (%)	Severity (%)	Reaction
1	MTU-7029	52.596(46.49)*	24.19(29.46)	Susceptible(S)
2	MTU-1075	17.66(24.85)	14.71(22.55)	Moderately Resistant (MR)
3	MTU-1064	50.04(45.02)	22.48(28.30)	Susceptible(S)
4	Swarna Sub-1	2.34(8.80)	0.25(2.87)	Resistant(R)
5	Pratiksha	14.87(22.68)	7.89(16.31)	Moderately Resistant (MR)
6	Naveen	0	0	Resistant(R)
7	BPT-5204	0	0	Resistant(R)
	SE(m)	1.161785	1.11039842	
	CD	3.52391	3.368045	
	C.V	9.527811	13.52721638	

*Figure in the parenthesis are angular transformed values

Table 2: Reaction of rice varieties against sheath blight under field condition.

Disease score	PDI range	Reaction	No.	Varieties/cultivars
0	0	Resistant	3	Naveen, BPT-5204 & Swarna Sub-1
1- 3	<20 to 30	Moderately Resistant	2	Pratiksha & MTU-1075
5	31-45	Moderately Susceptible	-	-
7	46-65	Susceptible	2	MTU-7029 & MTU-1064
9	66-100	Highly Susceptible		

Table 3: Incidence and severity of rice varieties against blast under field condition.

Sl. No.	Variety	Incidence (%)	Severity (%)	Reaction
1	MTU-7029	71.17(57.52)*	2.544(9.18)	Susceptible(S)
2	MTU-1075	33.31(35.25)	1.045(5.87)	Moderately Susceptible(MS)
3	MTU-1064	47.68(43.67)	1.665(7.41)	Moderately Susceptible(MS)
4	Swarna Sub-1	80.32(63.66)	2.34(8.80)	Highly Susceptible(HS)
5	Pratiksha	46.94(43.25)	2.045(8.22)	Moderately Susceptible(MS)
6	Naveen	1.135(6.12)	0.001(0.15)	Resistant (R)
7	BPT-5204	52.55(46.46)	2.17(8.47)	Susceptible (S)
	SE(m)	1.484259	0.97702	
	CD	4.502035	2.96349	
	C.V	6.122363	24.62339	

*Figure in the parenthesis are angular transformed values

Table 4: Reaction of rice varieties against blast under field condition.

Disease score	PDI range	Reaction	No.	Varieties/cultivars
0-3	0-1	Resistant (R)	1	Naveen
4-5	<2-10	Moderately Resistant(MR)	-	-
>5	>10-100	Susceptible(S)	6	MTU-7029, MTU-1075, MTU1064, Swarna Sub-1 ,Pratiksha & BPT-5204,

Table 5: Incidence and severity of rice varieties against false smut under field condition.

S. No.	Variety	Incidence (%)	Severity (%)	Reaction
1	MTU-7029	0	0	-
2	MTU-1075	0	0	-
3	MTU-1064	0	0	-
4	Swarna Sub-1	0	0	-
5	Pratiksha	0	0	-
6	Naveen	0	0	-
7	BPT-5204	5.90 (14.06)*	1.043 (5.86)	Moderately Susceptible(MS)
	SE(m)	0.276724	0.081689	
	CD	0.839356	0.247777	
	C.V	23.84578	16.89177	

*Figure in the parenthesis are angular transformed values

Table 6: Reaction of rice varieties against false smut under field condition.

Disease score	PDI range	Reaction	No.	Varieties/cultivars
0	0	Highly Resistant(HR)	6	MTU-7029,MTU-1075,MTU-1064,Swarna Sub-1,Pratiksha & Naveen
1	<1	Resistant (R)	-	-
3	1-5	Moderately Resistant(MR)	-	-
5	6-25	Moderately Susceptible (MS)	1	BPT-5204
7	26-50	Susceptible(S)	-	-
9	51-100	Highly Susceptible(HS)	-	-

Conclusion

From the above study it may be concluded that out of seven, five varieties except Naveen, Swarna Sub 1 & BPT 5204 showed more or less susceptibility to sheath blight. Also against blast except Naveen all varieties were found more or less susceptible to blast. BPT-5204 is the only variety that showed susceptibility towards false smut. Based on the result of disease incidence and severity it can be concluded that more emphasis needs to be given on screening tolerance/resistance genotypes with high yield potential and also more emphasis should be given on eco-friendly management practices taking into consideration the environment and the socio-economic upliftment of the farmers.

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