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Field evaluation of improved rice genotypes against yellow stem borer

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ABSTRACT

Forty four rice cultivars were evaluated against yellow stem borer under field condition under two level of nitrogen i.e. at zero and 180 kg ha^{-1}. It was revealed that at high nitrogen level ADT 43 recorded 35% DH, 30%WEH, Saket 4 50%DH, 16% WEH, Annada 44% DH, 17% WEH where as at zero nitrogen level ADT 43 recorded 15%DH, 20% WEH, Saket 4 11%, DH, 3% WEH and Annada 14%DH, 7%WEH, respectively and were found susceptible to yellow stem borer. At high nitrogen level Surendra recorded 7%DH, 3%WEH, MTU 1071 6%DH, 2%WEH and PR 111 6%DH, 4%WEH whereas, at their zero level of nitrogen Surendra recorded 2%DH, 4% WEH, MTU 1071 6%DH, 4%WEH and PR 111 4%DH, 3% WEH, respectively. Under high N level invariably there was high incidence of DH and WEH in most of the genotypes than the zero N level.

Key words: *rice cultivars, field evaluation, yellow stem borer, nitrogen level*

One of the major constraints of rice production in India is the occurance of insect pests at various stages of crop growth. Mostly six species of rice stem borers occur in India (Rao and Rao, 1979). The yellow stem borer (YSB) (*Scirpophaga incertulas* Walker) is the most predominant in rice growing tracts of India, Bangladesh and South East Asian countries causing serious damage (Islam, 1996). This pest constitutes more than 90% of stem borer population as observed from the stem dissection of the rice crop and stubbles (Senapati and Samalo, 1990; Padhi and Mishra, 2000). It attacks the rice plants from seedling to maturity in almost all ecosystems and in boro rice also (Misra et al, 2005).The grain yield loss due to this pest varies between 3-95% in India in different varieties grown under different situations (Mathur 1983). There are various tolerant varieties identified from the different studies but the reaction of the varieties at low and high nitrogen level are scanty and therefore this study was undertaken to know the varietal reaction to yellow stem borer at low and high nitrogen level.

Forty four rice cultivars including susceptible check variety TN 1 were evaluated against yellow stem borer under field condition during dry season, 2008 and 2009 at Central Rice Research Institute, Cuttack under two level of nitrogen i.e. at zero and 180 kg ha^{-1}. These cultivars were seeded on 15th Dec,2007 and transplanted one month old seedling in a plot of 3.5 m length with 4 rows for each variety with susceptible check TN 1.The spacing maintained were 15 x 15 cm^2 and the treatment were replicated twice. Incidence of yellow stem borer was monitored from the light trap catch as well as by teasing damaged plant tissue. At maximum incidence stage, *i.e.* at 50 days after transplanting % of dead heart (DH) observations were recorded from each variety at both the level of nitrogen and % white ear head (WEH) observations were recorded at harvest.

Light trap catch indicated YSB as the predominant species accounting for 98% of the stem borer population. Similarly, larvae recovered from the plant tissue indicated YSB as the dominant pest. The results indicated that the lowest incidence of stem borers was in the treatment where no nitrogen was applied. The results further show that the pest incidence increases with the high dose of nitrogen fertilizer application. The highest mean damage (40.5%) of stem borers was recorded in high nitrogen application treatments. These findings are in accordance with Singh *et al* (1990) who reported that NPK in the ratio of 120-60-60 Kg ha^{-1} increased the susceptibility of rice crop

to rice stem borers. Saha and Saharia (1970) also reported the incidence of stem borers from 8.36% in plots without nitrogen fertilizer to 20.12% in those treated with 100 Kg ha^{-1}.

The observations revealed that at high nitrogen level ADT 43 recorded 35%DH, 30%WEH, followed by Saket 4 50%DH, 16% WEH, Annada 44% DH, 17% WEH and the susceptible check TN 1 had 45% DH and 25% WEH where as at zero nitrogen level ADT 43 recorded 15%DH, 20% WEH, Saket 4 11%, DH, 3% WEH and Annada 14%DH, 7%WEH, respectively and were found susceptible to yellow stem borer. At high nitrogen level cultivar Surendra recorded 7%DH, 3%WEH, MTU 10716%DH, 2%WEH and PR 1116%DH, 4%WEH whereas, at their zero level of nitrogen Surendra recorded 2%DH, 4% WEH, MTU 1071 6%DH, 4%WEH and PR 1114%DH, 3% WEH respectively. This is observed that cultivars Surendra, MTU 1071 and PR 111 showed tolerant reaction to the pest and this reaction was indifferent to the applied nitrogen levels.

The other cultivars showed high incidence of stem borer damage at high nitrogen in comparison to the zero level of nitrogen. These findings are in accordance with Ramzan *et al* 2007 and Zhong-xian et al 2007. At high level of Nitrogen cultivar ADT-43, Nagarjuna, Annada, Khitish, Birupa, Ananga, Saket-4 & IR-36 showed high susceptible reaction to YSB with more than 20% damage. Cultivar Vijeta, Tapaswini, Konark, Lalat, Ratna, Dubaraj, Shaktiman, Indira, Jajati, IR-50 and Prasad were moderately susceptible with 10-20% damage at high Nitrogen level. The variety Lalat was reported to be susceptible to stem borer by earlier worker (Subudhi and Padhi, 2008).No other cultivar except susceptible check TN 1 was highly susceptible at N_0 level (25% DH and 27% WEH). At zero level of Nitrogen the damage was invariably low i.e. up to 10% in most of the cultivars except ADT 43(17.5%), Khitish (14%), Ratna (12%), Radhi (11%), CR 2340-3(10.5%) and Annada (10.5%). At low level of nitrogen the incidence of YSB was invariably low i.e. up to 10% with few exceptions like ADT 43, Annada, Konark, Khitish, Ratana, Radhi and TN 1. Cultivar Surendra, MTU-1071 and PR 111 had moderate level of resistance with less than 10% damage at both the levels of Nitrogen application. These cultivars i.e.

Table 1. Field reaction of improved rice genotypes to yellow stem borer in dry season, 2008

Sl. No.	Varieties	180 kg N ha^{-1}			0 kg N ha^{-1}		
		%DH	%WEH	Grain yield t ha^{-1}	%DH	%WEH	Grain yield t ha^{-1}
1	ADT 43	35	30	5.8	15	20	3.2
2	Vijetha	5	20	6.2	8	3	2.8
3	Nagarjuna	45	10	4.9	9	9	2.4
4	IR 8	9	13	7.4	3	3	2.9
5	Annada	44	17	5.15	14	7	2.4
6	Tapaswini	15	14	7	4	7	3.6
7	Bhabani	8	7	4.6	5	8	2
8	Konark	24	10	5.3	8	14	3.5
9	Khitish	32‘	10	4.5	14	14	1.8
10	Divya	10	9	6.5	3	4	2.9
11	Bhoi	27	16	4.3	5	6	2.4
12	Birupa	26	22	7.3	8	5	3.2
13	Ananga	27	23	4.6	12	7	1.8
14	Saket 4	50	16	5	11	8	2.4
15	CR 2463-25	17	14	5.5	2	5	2.3
16	Lalat	16	7	5.6	8	10	2.4
17	Pusa 44	8	6	6.8	4	3	3.2
18	Ratna	19	11	4.8	12	12	1.8
19	Surendra	7	3	7.6	2	4	3.8
20	Naveen	9	7	6	3	3	3.7
21	Shaktiman	18	21	4.5	5	5	2.2
22	IR 72	10	7	5.8	3	6	2.8
23	Indira	14	8	6.5	3	8	3.1
24	IR 64	8	7	7	4	6	3.2
25	Jajati	22	14	5.8	4	5	2.4
26	IR 50	18	6	4.6	9	10	2.1
27	CR2340-1	11	5	5.5	3	10	2.7
28	Satabdhi	12	14	4.6	4	15	2.8
29	Gouri	7	4	6.4	3	2	3
30	Surakshya	10	4	6	5	4	3.1
31	IR 36	35	9	5.6	10	5	2.8
32	Prasad	20	3	6.45	4	4	3.1
33	CR 2464-8	10	4	5.1	5	4	2.1
34	Kharavela	18	3	5.9	6	4	2.8
35	Kshira	13	3	6.2	2	5	2.9
36	CR2340-3	19	14	5.4	15	6	2.6
37	Radhi	22	12	6.5	12	10	3.8
38	CR2461-9	11	5	5.1	4	3	2.5
39	Sravani	10	2	6.5	3	4	3.3
40	Vikramarya	13	2	6.2	2	4	3.15
41	Gajapati	12	4	6	4	5	3.1
42	MTU 1071	6	2	5.2	3	6	2.7
43	PR 111	6	4	5.1	4	3	2.8
44	TN 1	45	36	2.4	25	27	1.1
	CD(P=0.05)	-	-	1.403	-	-	0.60

Table 2. Reaction of improved rice cultivars to yellow stem borer in dry season, 2009

Variety	180 kg N ha^{-1}		0 kg N ha^{-1}	
	%DH	%WEH	%DH	%WEH
Surendra	4.7	4.5	3.2	1.4
MTU 1071	4.9	4.7	3.1	2.3
PR 111	4.8	4.4	4.1	2.5
TN 1	46.3	34.1	33.7	27.1

Surendra, MTU 1071 and PR 111 were again screened during dry season, 2009 and the result was confirmed showing resistant reaction. Thus the varieties identified having field resistance may be popularized in stem borer endemic areas and used as donors in resistance breeding programme.

The results reveal that the plots without nitrogen application produced the lowest yield (1.1 t ha^{-1}) in TN 1. The highest grain yield (7.6 t ha^{-1}) was produced by the variety Surendra at high nitrogen level. There was significant increase in yield with the increase of nitrogen application of 180 Kg ha^{-1}. (Table1). These results are in accordance with Ramzan *et al.,* 2007.

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