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Interaction of Some Semi-Deep and Deep Water Rice Accessions with Yellow Stem Borer *Scirpophaga incertulas* (Wlk.) under Two Water Regimes

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Abstract

The findings in relation to the interaction of semi-deep and deep water rice accessions revealed that the percent DH, WEH, adult emergence was more in deep water situation than that of the shallow water situation. The percent increase in tillers was higher in shallow water condition and semi-deep water rice accessions than those of the deep water rice accessions and deep water rice condition indicating compensatory ability were more pronounced in semi-deep water accessions and under semi-deep water condition.
Key words : Yellow stem borer (YSB), IPM, Host plant resistance (HPR), Interaction, Adult emergence.

Yellow stem borer is the dominant and most prevalent stem borer species of rice which attacks the rice plants from seedling to maturity almost in all ecosystems (1) causing yield loss of about 10—60% . It is most abundant and destructive in semi-deep and deep water rice eco-system of South and South East Asia causing more than 40% damaged stem at harvest and heavy yield loss (2). Host plant resistance is the major component of IPM system in this eco-system because it involves no cost, environment friendly, compatible with other pest management practices and amenable to fit in IPM system (3). With a view to use the YSB resistant/moderately resistant donors in developing improved varieties, experiments were conducted in *Kharif* season of 2004-05 to evaluate and measure of tolerance level of some semi-deep and deep water rice accessions under two year regimes in protected condition.

Methods

Reaction of selected deep water cultivated accessions like NDGR-398, Jalanidhi, LPR-85, LPR-8, NDGR-421, CN-579-363-3-1, IET-10084 and Kariawa with susceptible check Jalapriya and semi-deep water cultivated accessions like RP-2344-OR-47-3, Matangini, Kalashree, Amulya and Seema with susceptible check Tulasi were studied in two water regimes of 30—50 cm and 50—100 cm in micro-ponds of suitable depth in *Kharif* seasons of 2004-05. Each treatment was replicated five times. Each test entry was infested with four freshly hatched YSB larvae by a camel hair brush. The micro-plots were covered with nylon mesh to prevent further infestation from other sources. Total biomass of the test cultures was taken by uprooting the whole plant along with roots, drying in the oven and recording the dry weight.

Results and Discussion

The results on the interaction of some semi-deep and deep water rice cultivated accessions indicated that percent dead heart (DH) in semi-deep water accessions varied from (3.9—5.8%) and (4.1—5.9%) in shallow water (SW) and deep water (DW) situations, respectively whereas the percent DH of deep water accessions varied from (4.4—7.9%) and (4.5—8.2%) in SW and DW situation (Table 1). The percent increase of tillers 25 days after infestation (FDI) of semi-deep water accessions varied from (32.1 — 36.7%) and (24.9—32.1%) as compared to the corresponding 7.1 and 6.9% in susceptible check Tulasi in SW and DW situations, respectively whereas in deep water accessions it varied from (30.1—34.9%) and (21—26.7%) as compared with 8.7 and 6.8% in susceptible check in SW and DW situations. The per cent WEH in semi-deep water accessions varied from (3.3—8.2%) and (3.4—10.4%) as compared with (4.2—

Table 1. Measure of compensatory abilities of the test entries vis-á-vis fitness of YSB under two water regimes. SW - Shallow water, DW- Deepwater, Total plant biomass-Averaged of three plants. Figures in parentheses are the Arcsin values.

Test entry	Dead heart (%) SW	Dead heart (%) DW	Increase of tiller (%) SW	Increase of tiller (%) DW	White ear head (%) SW	White ear head (%) DW	Adult emergence · (%) SW	Adult emergence · (%) DW	Total biomass (g) SW	Total biomass (g) DW	Grain yield (kg/ha) In-fested	Grain yield (kg/ha) No infest-ation
RP-2344 -OR-47-3	4.1 (11.68)	4.3 (11.97)	36.7 (37.29)	28.3 (32.14)	4.2 (11.83)	4.5 (12.25)	22.1 (28.04)	32.2 (34.57)	76.7	137.2	3252	4073
Matan-gini	4.3 (11.97)	4.7 (12.52)	33.3 (35.24)	29.9 (33.15)	3.3 (10.47)	3.4 (11.0)	22.9 (28.59)	33.1 (35.12)	76.0	141.8	4033	4793
Kalashree	3.9 (11.39)	4.1 (11.68)	33.4 (35.30)	32.1 (34.51)	6.5 (14.77)	10.4 (18.81)	22.5 (28.32)	30.9 (33.77)	78.9	140.7	2220	2852
Seema	5.8 (13.94)	5.9 (14.06)	33.1 (35.12)	28.5 (32.27)	8.2 (16.64)	9.5 (17.95)	21.8 (27.83)	33.0 (35.06)	75.7	137.3	2368	2888
Amulya	5.6 (13.69)	5.7 (13.81)	32.1 (34.51)	24.9 (29.93)	4.4 (12.11)	5.0 (12.92)	36.2 (36.99)	42.5 (40.69)	88.5	142	2793	3967
Tulsi (Susc check)	74.0 (59.34)	78.0 (62.03)	7.1 (15.45)	6.9 (15.23)	20.5 (26.92)	33.3 (35.24)	61.3 (51.53)	67.1 (55.00)	27.1	47.9	1022	1736
NDGR 398	3.7 (11.09)	3.8 (11.24)	30.2 (33.34)	25.9 (30.59)	4.5 (12.25)	6.2 (14.42)	20.8 (27.13)	31.8 (34.33)	77.1	151.4	2238	3368
Jalanidhi	3.4 (10.63)	3.6 (10.94)	32.1 (34.51)	24.4 (29.60)	6.6 (14.89)	8.2 (16.64)	19.3 (26.06)	30.4 (33.46)	73.6	146.8	1925	2872
LPR 85	3.4 (10.63)	3.5 (10.78)	32.9 (35.00)	26.7 (31.11)	7.1 (15.45)	7.5 (15.89)	19.0 (25.84)	29.3 (32.77)	73.0	142.6	1333	2682
LPR-8	4.5 (12.25)	4.8 (12.66)	31.9 (34.39)	23.8 (29.20)	4.2 (11.83)	5.3 (13.31)	28.9 (32.52)	44.1 (41.61)	75.1	143.8	1713	2655
Kariwa	6.9 (15.23)	7.1 (15.45)	30.1 (33.27)	24.5 (29.67)	4.2 (11.83)	4.5 (12.25)	34.1 (35.73)	48.6 (44.20)	79.0	146.1	1504	1944
NDGR-421	7.7 (16.11)	7.8 (16.22)	30.7 (33.65)	22.1 (28.04)	5.3 (13.31)	5.8 (13.94)	34.4 (35.91)	49.0 (44.43)	79.6	145.9	1954	2605
CN-579-363-3-1	6.8 (15.12)	7.4 (15.79)	34.9 (36.21)	23.0 (28.66)	5.6 (13.69)	6.2 (14.42)	24.3 (29.53)	32.6 (34.82)	89.4	138.6	1545	1688
IET-10084	7.9 (16.32)	8.2 (16.64)	31.3 (34.02)	21.0 (27.27)	4.5 (12.25)	5.5 (13.56)	25.4 (30.26)	33.1 (35.12)	94.2	142.2	1835	2055
Jalpriya (Susc check)	75.0 (60.00)	79.0 (62.73)	8.7 (17.15)	6.8 (15.12)	19.5 (26.21)	38.2 (38.17)	59.0 (50.18)	63.8 (53.01)	31.1	48.1	1445	2084
SE ±	0.327	0.351	0.202	0.222	0.345	0.356	0.195	0.167				
LSD at 5%	0.924	0.992	0.569	0.628	0.973	1.00	0.550	0.472				

9.2%) and (4.5—10.5%) in SW and DW situations, respectively (Table 1). Total biomass of the semi-deep water accessions ranged from (75.7—88.5) and (138.6—151.4 g) and those of the deep water rice accessions ranged from (73—94.2) and (137.3—147.8 g) in semi-deep and deep water situations, respectively. The percent adult emergence in semi-deep water accessions ranged from 21.8 to 36.2 and 30.9 to 42.5% in semi-deep and deep water situations whereas it ranged from 22.0 to 38.4 and 29.3 to 49.0% in semi-deep and deep water conditions respectively in deep water rice accessions. The grain yield varied from 2,220 to 4,033 kg/ha and 2852 to 4593 kg/ha in infested and non-infested condition respectively in semi-deep water accessions, whereas in deep water rice accessions it ranged from 1,504 to 2,238 kg/ha and 1,688 to 3,368 kg/ha under infested and non-infested conditions, respectively (Table 1).

The results also revealed that the percent DH, WEH and adult emergence were more in deep water situation than that of the shallow water situation in semi-deep water and deep water rice accessions including the respective susceptible checks. In this connection Yasumatsu (4) and Catling (5) reported that YSB preferred swampy and poorly drained rice ecosystem and it has great affinity to aquatic environment. The present investigation corroborates the findings made by earlier workers like Catling (6) and Gupta et al. (7) who reported that the borer population increased with level and duration of water. It was presumably due to the short height of the stems in semi-deep and growth habit of the stems in the two water regimes and the adaptive characteristics and affinity of YSB to deep water rice eco-system than that of the semi-deep water ecosystem. On the contrary the per cent increase of tillers was higher in shallow water situations than that of the deep water situation in both the semi-deep and deep water rice accessions. Also the per cent increase of tillers was higher in semi-deep water rice accessions than those of the deep water rice accessions. In this connection Rubia et al. (8) explained that tolerance mechanism included increased tillering. Kumhof (9) also reported that plants were able to tolerate infestation of YSB by producing more compensatory tillers. Dale (10) also observed similar observations that rice plants could compensate for the YSB damage during early growth stages due to production of new tillers. The percent of DH and WEH was less in semi-deep water rice accessions than those of the deep water rice accessions which happened to be due to production of more number of tillers in semi-deep water accessions than those of the deep water rice accessions, thus indicating that compensatory ability was more pronounced in semi-deep water rice accessions and under semi-deep water condition.

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