GROUPING OF RICE GENOTYPES BASED ON VIGOR INDEX AND SPEED OF GERMINATION FOR SALT TOLERANCE AT GERMINATION STAGE

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Abstract

Salinity induced changes in vigor index and speed of germination were examined to screen out salt tolerant rice genotypes. A total of 127 rice genotypes including mostly traditional, cultivated in the coastal regions of Bangladesh and some improved genotypes were used in the study. The study was conducted in petridish with 0and 15 dS m^{-1} salinity. Salinity stress reduced the vigor index and speed of germination of rice genotypes. But the extent of vigor index and speed of germination, varied with genotypes and levels of salinity. Generally in control condition vigor index and speed of germination was found higher and it gradually decreased with the increase of salt concentration. Based on decrease of vigor index at 15 dS m^{-1}salinity, the genotypes Pengek, BRRI dhan40, BRRI dhan47, Sada Mota Bashpai, Bashful Balam, Patnai, Rajshahi Balam, Khok Shail, Jamai Naru, Talmugur, Nonabokra, BR23, Talmuri, Khesrail, BRRI dhan41 and Pokkali scored 1 (highly tolerant), and the genotypes Lambo, Chenga, Bhute Shalot, Gigoj scored 9 (highly susceptible) to salinity. Regarding speed of germination, the genotypes Bola Balam, Swarnadhan, PBRC-30, Swarnalata, Sadamota, DepaKolom, Kesa, Ghunshi-2, Koicha Binni, Nunia and Talmuri scored 1(highly tolerant), and the genotypesTilekKuchi, Orgoja, Khejure Chori, Mondeshor Chenga, Mohime, Nona Kochi scored 9 (highly susceptible).

Key Words: Salinity, Rice, Vigor index, Speed of germination.

Introduction

Soil degradation due to salinity is a serious environmental problem. In Bangladesh, there are approximately 2.85 million ha of coastal land which occurs in the southern parts of the Ganges Tidal Floodplain (AEZ 13), in the Young Meghna Estuarine Floodplain (AEZ 18) and in the tidal areas of the Chittagong coastal plain and offshore islands. About one million ha land of these coastal and offshore areas are affected by varying degrees of soil salinity. These coastal saline soils are distributed unevenly in 64 thanas of 13 coastal districts covering 8 agroecological zones (AEZ) of the country. The common trend is an increase in salinity during November to December and March to April, until the onset of the monsoon rains. The electrical conductivity (EC) of the soils and water are the lowest in July-August and the highest in March-April at all sites. Soil salinity, at any time, is maximum in the surface layers (0-15 cm), the salinity gradient being vertically downwards. The underground water within 1-2 meters below the soil surface at all locations is moderately to strongly saline in the dry season.

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Saline soils can be managed by large-scale irrigation and drainage schemes and by chemical treatment of soil, but the scale of problem makes these solutions too costly. Agricultural land use in these areas is very poor, which is much lower than country's average cropping intensity. Salinity causes unfavorable environment and hydrological situation that restrict the normal crop production throughout the year. Development of salt tolerant rice genotypes could be an effective solution. Development of salt tolerant varieties has been considered as one of the strategies to increase rice production in saline prone coastal areas.

Selection of salt tolerant genotypes has been carried out for over 3 decades (Flowers, 2004) and various screening methodologies used (Qadar, 1988; Kuchanur*et al.*, 2006) to screen out tolerant varieties. But progress of developing salt tolerant varieties has been hampered due to several factors viz., limited knowledge on the genetics of salt tolerance, lack of understanding on the mechanism of salt tolerance, low selection efficiency, inadequate screening techniques, and poor understanding of the interactions of salinity and environments. The present study was therefore designed to screen out a wide range of rice genotypes based on their tolerance to different levels of salinity.

Materials and Methods

The experiment was conducted at the laboratory of the Department of Biochemistry and Molecular Biology, Bangladesh Agricultural University, Mymensingh during April 2011. There were 127 rice genotypes comprising 120 traditional genotypes cultivated in the coastal region of Bangladesh and 7improved varieties where used as check varieties for selection of salt tolerance. Among the genotypes 6 were previously released as moderately salt tolerant rice variety (Binadhan 8, BR23, BRRI dhan40, BRRI dhan41, BRRI dhan47 and BRRI dhan53) and 1 was salt susceptible rice variety (Binadhan 7).

Two salinity levels such as 0, and 15 dS m^{-1} were maintained in the experiment. The salinity level was obtained by dissolving crude salt (collected from seashore) in distilled water. During dissolving salt with distilled water, the EC value was frequently measured with EC meter so that pre-fixed salinity level could be maintained. The control (0 dS m^{-1}) was maintained using distilled water only.

The study was carried out in petri dishes having 15 cm diameter using two layers of filter paper. Twenty five seeds were placed on filter paper and 10ml of treatment solutions of different salinity levels were poured in each petri dish to immerse the seeds partially for ensuring proper aeration. The petri dishes were placed on a table in the laboratory. The seeds were allowed to germinate at room temperature (25±2°C). Distilled water was added to each Petri dish every day as required. The young seedlings were up-rooted 8 days after sowing (DAS). Ten randomly selected plants of each genotype from each treatment were used for data recording.

The number of seeds germinated was recorded after 5 days of sowing and the results were converted into percentage.

The young seedlings were up-rooted 8 days after sowing (DAS). Ten randomly selected plants of each genotype from each treatment were used for data recording. Root length was measured from the base to the top of radicles whereas shoot length was measured from the base to the tip of the longest leaf of the plumule.

Vigor index (VI) was worked out according to the formula.

VI= Germination% × (Root length in cm + Shoot length in cm)

Speed of germination (SG) was calculated by the following formula, as given by Ellis and Roberts (1981).

$$SG = \frac{Number\ of\ germinated\ seeds}{Days\ of\ first\ count} + \cdots + \frac{Number\ of\ germinated\ seeds}{Days\ of\ final\ count}$$

Interpretation of results

The range of percent decrease was determined and divided into five equal groups in ascending order. The groups were chronologically scored as 1, 3, 5, 7 and 9 which represent very tolerant, tolerant, moderately tolerant, susceptible and very susceptible genotypes to salt stress, respectively. Thus, lower decrease indicates lower score value and higher decrease indicates higher score value. The grouping of rice genotypes into five distinct categories were done according to IRRI (1996).

Percent decrease of both parameters due to salinity stress was calculated using the following formula**:**

$$\%\,decrease = \frac{Traits\ of\ control\ treatment - Traits\ of\ salinized\ treatment}{Traits\ of\ control\ treatment} \times 100$$

Results and Discussion

Vigor index was calculated after 8 days of incubation. The calculated vigor index of individual genotype at 15dSm^{-1} was compared with that of respective control (non-saline) and expressed as percent decrease. Under non-saline condition vigor index ranged from 764 - 1969 and at 15 dS m^{-1} salinity, it varied from 30 – 1075(Table1). Across the genotypes, the mean values of vigor index were 1328 and 525 at 0 and 15 dS m^{-1} salinity, respectively. Salt stress reduced the vigor index by 27.1 - 97.8 %, with a mean of 60.5%.Among the 127 rice genotypes under test, 16 scored 1 (highly tolerant), 32 scored 3 (tolerant), 48 scored 5 (moderately tolerant), 27 scored 7 (susceptible) and 4 scored 9 (highly susceptible) to salinity. Based on the score, the genotypes Pengek, BRRI dhan40, BRRI dhan47, SadaMotaBashpai, Bashful Balam, Patnai, RajshahiBalam, KhokShail, JamaiNaru, Talmugur, Nonabokra, BR23, Talmuri, Khesrail, BRRI dhan41 and Pokkali appeared as highly tolerant.Based on vigor index thirty two rice genotypes including Binadhan 7, Vushiara, Ghunshi-1, RangaHogla, Lal 40, Hogla, ERI, Jota Balam, Swarnadhan, ShahebKachi, PBRC-30, Kongaj, KathiGoccha, Mala goti, MaitChal, BekiBalam, ArmanSardar, JoisriGhunshi, Sadamota, AsamiHajir, JolPaira, HuglaPata, Rani Shalot, DepaKolom, KutePatnai, Ghunshi-2, LalTupi, Pajam, , Pankhiraj, Minikit, PatnaiBalam and Kajal Sail were tolerant to salt stress (scored 3). The genotypes Lambo, Chenga, BhuteShalot, Gigoj scored 9 and were considered highly susceptible to salinity based on this parameter.

Speed of germination is often considered as a valid measurement for the salt tolerant capability of rice genotypes. In the experiment speed of gerimination of each genotype was calculated at 0 and 15 dS m^{-1}salinity. Under control condition (non-saline), it ranged from 31.5 - 50.0 with a mean of 43.1 and at 15 dS m^{-1}salinity, it varied from 14.4 - 45.0 with a mean of 28.4 (Table2). Salinity stress decreased the speed of germination by 10.0 - 65.6% where mean value was 34.2%. Although salt stress reduced the speed of germination in all genotypes; few genotypes under salt stress retained the speed near to that of control whereas susceptible genotypes had lost that ability. Keeping this phenomenon in mind the genotypes were categorized into 5 groups and score values (1, 3, 5, 7 and 9) were assigned accordingly. Table 2, indicated that among the 127 rice genotypes, 11 scored 1, 42 scored 3, 48 scored 5, 17 scored 7 and 9 scored 9. The genotypes scoring 1 were Bola Balam, Swarnadhan, PBRC-30, Swarnalata, Sadamota, Depa Kolom, Kesa, Ghunshi-2, Koicha Binni, Nunia and Talmuri. Rice genotypes scored 3 (tolerant) on germination speed were Machranga, Dud sail, Ghunshi-1, Shorna Mushuri, Lal 40, BRRI dhan47, Jota Balam, Jiradhan, Kathi Goccha, Mala goti, Lutori, Durga Bhog, 44 dhan, Beki Balam, Kalmilata, Bashful Balam, Gota, BazraMuri, AsamiHajir, IRRI-1010, Hugla Pata, Khok Shail, Ghocca, Lalbanamuri, Khainol, KutePatnai, HatiBajore, JamaiNaru, LalTupi, Tor Balam, Pairjat, Talmugur, Kaliboro, Kakuabinni, Pajam, Rati Sail, Khesrail, Binadhan 8, BRRI dhan41, KutiPatnai, Dorkumur and Pokkali. The genotypes TilekKuchi, Orgoja, Khejure Chori, Mondeshor Chenga, Mohime and Nona Kochi scored9 (highly susceptible).

Salinity stress reduced the Vigor index and speed of germination of the rice genotypes. But the extent of reduction varied with genotypes and levels of salinity. Generally in control condition vigor index and speed of germination was found higher and it was gradually decreased with the increase of salt concentration. Under 15 dS/m salinity, the reduction of vigor index ranged from 30 to 1075% where the mean value was 525.8% and speed of germination reduced by 14.4 to 45.0%, with an average of 28.4%. Finally based on the both growth biomarkers (vigor index and speed of germination) the genotype Talmuri appeared as highly tolerant. Regarding the vigor index and speed of germination, the genotype Chenga was highly succeptible under 15 dS/m saline stressed condition. Generally growth biomarkers (vigor index and speed of germination) may be used as effective approach to select highly tolerant and highly succeptible rice genotype exposed to salt stress.

Thus, it was clearly noticed that vigor index was affected by salinity and the same result was also noticed at other levels of salt concentration. Anbumalarmathi and Mehta (2013) also reported that increasing salt stress resulted in gradual decrease in speed of germination. The reduction of speed of germination at high salt levels might be mainly due to osmotic stress (Heenan*et al.,* 1988). Kandil*et a*l (2012) showed that rice cultivars significantly varied in vigor index and speed of germination under salt stress condition. Ologundudu*et al*. (2014) classified salt tolerant rice varieties as tolerant (T), moderately tolerant (MT), moderately susceptible (MS) or susceptible (S). Salinity decreased germination percentage, speed of germination and germination energy and led to reduction in shoot and root length and dry weight in all varieties and the magnitude of reduction increased with increasing salinity stress. Among eight tested rice genotypes 'NERICA 1', 'IR 29', and 'IR 20' were selected as salt tolerant rice variety based on its better performance in germination stage and recommended for intensive study on growth processes and physiological consequences at advanced stage of growth. Mokhtar et al. (2015) obtained variable physiological and biochemical responses of the tested varieties vis-à-vis of the applied salinity levels at the early stages of plant growth. The Sahel 108 showed better germination response under salinity stress conditions. At four-leaf stage, Sahel 201 and IR28 showed the highest salt stress index values suggesting their susceptibility to salinity.

Table1. Variation in vigor index of rice genotypes at germination stage at 15 dS m^{-1} salinity

Sl. no	Rice genotypes	0 dSm^{-1}	15 dSm^{-1}	% Decrease over control	[a]Score
1	Binadhan 7	835	432	48.2	3
2	Ledrabinni	950	350	63.2	5
3	Machranga	1277	405	68.3	5
4	Vushiara	1200	568	52.7	3
5	Dud sail	1320	424	67.9	5
6	Ghunshi-1	1168	529	54.7	3
7	RangaHogla	994	543	45.3	3
8	ShornaMushuri	1434	361	74.9	7
9	Lal 40	1440	801	44.4	3
10	Gotamala	1410	540	61.7	5
11	Hogla	920	479	48.0	3
12	Bola Balam	1230	387	68.5	5
13	Pengek	1500	1075	28.3	1
14	ERI	913	450	50.7	3
15	BRRI dhan40	1050	587	44.1	1
16	BRRI dhan47	980	657	33.0	1
17	Jota Balam	1240	708	42.9	3
18	Jiradhan	1270	554	56.3	5
19	Patnai (FW)	1960	396	79.8	7
20	Sada Mota Bashpai	1220	810	33.6	1
21	Patnai (SW)	1480	437	70.5	7
22	SwarnaPajam	1360	322	76.3	7
23	SadaGotal	1181	401	66.1	5
24	Swarnadhan	1390	648	53.4	3
25	ShahebKachi	1104	598	45.8	3
26	PBRC-30	1300	691	46.8	3
27	Kongaj	1520	802	47.3	3
28	LalGotal	1220	334	72.6	7
29	KathiGoccha	1210	635	47.5	3

Sl. no	Rice genotypes	0 dSm^{-1}	15 dSm^{-1}	% Decrease over control	[a]Score
30	Mala goti	1168	680	41.8	3
31	Lutori	1518	590	61.2	5
32	MaitChal	1190	541	54.6	3
33	DurgaBhog	1300	405	68.9	5
34	Lambo	1360	30	97.8	9
35	Chap Shail	1083	272	74.8	7
36	44 dhan	1330	549	58.7	5
37	Swarnalata	1680	707	57.9	5
38	TilekKuchi	1814	288	84.1	7
39	DakhShail	1076	424	60.6	5
40	BekiBalam	1070	607	43.3	3
41	Kalmilata	1646	543	67.0	5
42	Basmati	1070	343	67.9	5
43	Bouari	1588	440	72.3	7
44	Bashful Balam	1205	767	36.3	1
45	Patnai	1250	844	32.5	1
46	Rajshahi Balam	970	598	38.4	1
47	Arman Sardar	1610	800	50.3	3
48	Orgoja	1159	419	63.9	5
49	Hamai	1590	690	56.6	5
50	Gota	1390	500	64.0	5
51	Joisri Ghunshi	1390	616	55.7	3
52	Kumra Ghor	1420	590	58.5	5
53	Sada Balam	1780	408	77.1	7
54	Ashful	1410	422	70.1	5
55	Chini Kanai	1294	344	73.4	7
56	Raja Shail	1400	558	60.1	5
57	Tikaram	1672	644	61.5	5
58	Motaaman	850	332	60.9	5
59	Sadamota	1270	640	49.6	3
60	BazraMuri	1104	422	61.7	5
61	Swarna	1310	463	64.7	5
62	AsamiHajir	1744	960	45.0	3
63	IRRI-1010	1580	568	64.1	5
64	JolPaira	1325	629	52.5	3
65	HuglaPata	1368	764	44.2	3
66	DudhKalam	1624	456	71.9	7
67	Rani Shalot	1620	725	55.2	3
68	Moghai Balam	1206	372	69.1	5

Sl. no	Rice genotypes	0 dSm^{-1}	15 dSm^{-1}	% Decrease over control	[a]Score
69	Khejure Chori	1526	337	77.9	7
70	Kuchra	1258	462	63.2	5
71	Depa Kolom	1594	840	47.3	3
72	Khok Shail	1400	997	28.8	1
73	Ashfuli	1550	519	66.5	5
74	Anda	1950	558	71.4	7
75	Ghocca	1580	461	70.8	7
76	Mondeshor	1560	306	80.4	7
77	Lalbanamuri	1632	340	79.2	7
78	Chenga	1580	152	90.4	9
79	DharShail	820	218	73.4	7
80	Khainol	1410	499	64.6	5
81	Rupessore	1392	373	73.2	7
82	BhuteShalot	1114	116	89.6	9
83	KutePatnai	1540	727	52.8	3
84	HatiBajore	1133	334	70.5	7
85	JamaiNaru	1133	690	39.1	1
86	HoldeGotal	1350	400	70.4	5
87	Kesa	1780	634	64.4	5
88	Ghunshi-2	1056	488	53.8	3
89	Mohime	1562	308	80.3	7
90	LalTupi	930	469	49.5	3
91	Tor Balam	1570	662	57.8	5
92	Nona Kochi	1468	325	77.9	7
93	Pairjat	1414	547	61.3	5
94	LalBiroi	1140	374	67.2	5
95	KoichaBinni	1200	407	66.1	5
96	Fulkandi	1076	389	63.9	5
97	Talmugur	1220	810	33.6	1
98	Kali boro	1632	528	67.6	5
99	Kakuabinni	778	204	73.7	7
100	Pajam	1448	754	47.9	3
101	Nonabokra	1110	720	35.1	1
102	Jolkumri	1150	346	69.9	5
103	Kasiabinni	1320	326	75.3	7
104	Gigoj	1718	232	86.5	9
105	Rati Sail	1522	597	60.8	5
106	SakalMukhi	1380	475	65.6	5
107	Golapi	1329	502	62.3	5

Sl. no	Rice genotypes	0 dSm^{-1}	15 dSm^{-1}	% Decrease over control	[a]Score
108	Malshira	1420	495	65.1	5
109	Pankhiraj	1670	775	53.6	3
110	Jongliboro	1360	568	58.2	5
111	Nunia	956	321	66.5	5
112	Nunia-1	1030	216	79.0	7
113	Minikit	1020	470	53.9	3
114	BR23	1310	804	38.6	1
115	Kalihytra	1969	330	83.2	7
116	KhatoKomro	1420	528	62.8	5
117	Talmuri	1160	681	41.3	1
118	Bekas	1198	320	73.3	7
119	PatnaiBalam	1420	810	43.0	3
120	Khesrail	1360	880	35.3	1
121	Kajal Sail	1250	650	48.0	3
122	Binadhan 8	764	304	60.2	5
123	BRRI dhan41	1317	960	27.1	1
124	KutiPatnai	1334	357	73.2	7
125	Dorkumur	1468	534	63.7	5
126	BRRI dhan53	955	400	58.2	5
127	Pokkali	1390	931	33.0	1
	Mean	**1328**	**525**	**60.5**	

[a]**Score:** 27-41%: 1; 42-56%: 3; 57-70%: 5; 71-84%: 7, 85-98%: 9

Table2. Variation in germination speed (% day^{-1}) of rice genotypes due to salinity

Sl. no	Rice genotypes	0 dS m^{-1}	15 dS m^{-1}	%Decrease over control	[a]Score
1	Binadhan 7	42.0	26.3	37.5	5
2	Ledrabinni	38.1	18.9	50.3	7
3	Machranga	49.2	33.8	31.4	3
4	Vushiara	34.2	22.8	33.3	5
5	Dud sail	37.5	26.7	28.9	3
6	Ghunshi-1	37.3	27.7	25.9	3
7	Ranga Hogla	34.6	20.7	40.1	5
8	Shorna Mushuri	47.0	34.7	26.2	3
9	Lal 40	50.0	36.3	27.5	3
10	Gotamala	46.7	28.3	39.3	5
11	Hogla	35.7	22.1	37.9	5
12	Bola Balam	43.3	35.1	19.0	1

Sl. no	Rice genotypes	0 dS m^{-1}	15 dS m^{-1}	%Decrease over control	[a]Score
13	Pengek	47.5	30.4	36.1	5
14	ERI	37.9	18.9	50.3	7
15	BRRI dhan40	46.1	28.5	38.3	5
16	BRRI dhan47	35.0	24.7	29.5	3
17	Jota Balam	44.7	32.0	28.4	3
18	Jiradhan	40.0	27.4	31.4	3
19	Patnai (FW)	37.8	21.4	43.4	7
20	Sada Mota Bashpai	40.0	26.3	34.3	5
21	Patnai (SW)	43.0	25.7	40.2	5
22	SwarnaPajam	41.7	25.6	38.6	5
23	SadaGotal	42.0	25.6	39.0	5
24	Swarnadhan	50.0	45.0	10.0	1
25	Shaheb Kachi	31.5	19.0	39.6	5
26	PBRC-30	50.0	40.3	19.3	1
27	Kongaj	50.0	31.3	37.4	5
28	LalGotal	32.9	19.5	40.9	5
29	Kathi Goccha	40.7	30.1	25.9	3
30	Mala goti	40.7	30.8	24.3	3
31	Lutori	37.3	27.7	25.9	3
32	MaitChal	33.3	19.8	40.5	5
33	DurgaBhog	47.0	33.3	29.1	3
34	Lambo	41.7	26.7	36.0	5
35	Chap Shail	30.4	14.5	52.4	7
36	44 dhan	50.0	38.7	22.7	3
37	Swarnalata	48.7	40.0	17.8	1
38	Tilek Kuchi	36.5	15.8	56.7	9
39	DakhShail	37.9	18.9	50.3	7
40	BekiBalam	50.0	36.3	27.3	3
41	Kalmilata	44.7	34.8	22.1	3
42	Basmati	44.1	28.7	35.0	5
43	Bouari	50.0	33.3	33.3	5
44	Bashful Balam	43.0	29.5	31.4	3
45	Patnai	46.7	28.3	39.3	5
46	Rajshahi Balam	50.0	35.3	29.3	5
47	Arman Sardar	46.7	25.7	45.0	7
48	Orgoja	40.0	17.6	56.0	9
49	Hamai	49.0	33.4	31.8	5
50	Gota	50.0	35.8	28.3	3
51	Joisri Ghunshi	38.0	24.1	36.7	5

Sl. no	Rice genotypes	0 dS m^{-1}	15 dS m^{-1}	%Decrease over control	[a]Score
52	Kumra Ghor	50.0	33.3	33.3	5
53	SadaBalam	41.7	25.8	38.0	5
54	Ashful	50.0	25.8	48.5	7
55	Chini Kanai	40.0	23.7	40.8	5
56	Raja Shail	46.7	29.6	36.6	5
57	Tikaram	50.0	33.4	33.2	5
58	Motaaman	43.7	29.2	33.1	5
59	Sadamota	46.7	41.7	10.7	1
60	BazraMuri	35.9	24.9	30.8	3
61	Swarna	44.1	28.7	35.0	5
62	Asami Hajir	50.0	38.3	23.3	3
63	IRRI-1010	50.0	38.0	24.0	3
64	JolPaira	40.7	19.4	52.3	7
65	HuglaPata	36.0	24.9	30.8	3
66	DudhKalam	49.0	28.6	41.6	5
67	Rani Shalot	40.0	20.1	49.8	7
68	Moghai Balam	38.1	18.9	50.3	7
69	Khejure Chori	36.0	15.2	57.8	9
70	Kuchra	39.3	26.7	32.2	5
71	DepaKolom	50.0	42.7	14.7	1
72	KhokShail	48.7	38.5	21.0	3
73	Ashfuli	44.1	28.7	35.0	5
74	Anda	50.0	33.3	33.3	5
75	Ghocca	49.3	38.0	23.0	3
76	Mondeshor	40.0	15.7	60.7	9
77	Lalbanamuri	46.7	36.7	21.4	3
78	Chenga	50.0	17.3	65.3	9
79	DharShail	43.0	25.7	40.2	5
80	Khainol	48.7	34.6	28.9	3
81	Rupessore	36.3	23.1	36.5	5
82	BhuteShalot	35.0	21.9	37.5	5
83	KutePatnai	50.0	36.7	26.7	3
84	HatiBajore	36.2	25.6	29.3	3
85	JamaiNaru	39.3	27.3	30.7	3
86	HoldeGotal	43.3	21.3	50.8	7
87	Kesa	50.0	43.3	13.3	1
88	Ghunshi-2	40.0	33.3	16.7	1
89	Mohime	32.5	14.4	55.6	9
90	LalTupi	36.7	26.3	28.2	3

Sl. no	Rice genotypes	0 dS m^{-1}	15 dS m^{-1}	%Decrease over control	[a]Score
91	Tor Balam	40.6	30.3	25.5	3
92	Nona Kochi	40.0	17.6	56.0	9
93	Pairjat	46.7	33.8	27.6	3
94	LalBiroi	49.3	30.8	37.6	5
95	Koicha Binni	46.0	39.0	15.2	1
96	Fulkandi	37.9	18.9	50.3	7
97	Talmugur	48.7	34.9	28.2	3
98	Kali boro	45.5	33.5	26.4	3
99	Kakuabinni	38.0	26.1	31.2	3
100	Pajam	50.0	37.3	25.3	3
101	Nonabokra	46.7	27.0	42.1	5
102	Jolkumri	44.3	25.4	42.6	7
103	Kasiabinni	41.8	28.1	32.9	5
104	Gigoj	38.7	26.1	32.6	5
105	Rati Sail	33.7	23.4	30.5	3
106	Sakal Mukhi	37.8	21.4	43.4	7
107	Golapi	38.1	18.9	50.3	7
108	Malshira	46.7	31.7	32.1	5
109	Pankhiraj	33.9	16.8	50.5	7
110	Jongliboro	44.1	28.7	35.0	5
111	Nunia	49.3	41.0	16.9	1
112	Nunia-1	40.0	18.1	54.7	9
113	Minikit	48.3	32.7	32.4	5
114	BR23	48.7	28.0	42.5	7
115	Kalihytra	46.7	18.0	61.4	9
116	Khato Komro	46.7	28.3	39.3	5
117	Talmuri	47.0	42.0	10.6	1
118	Bekas	41.3	24.5	40.8	5
119	Patnai Balam	50.0	31.7	36.7	5
120	Khesrail	42.5	30.0	29.4	3
121	Kajal Sail	50.0	31.7	36.7	5
122	Binadhan 8	35.6	25.1	29.6	3
123	BRRI dhan41	49.3	36.8	25.4	3
124	KutiPatnai	49.3	37.3	24.3	3
125	Dorkumur	38.3	26.6	30.5	3
126	BRRI dhan53	45.5	28.2	38.0	5
127	Pokkali	43.3	30.5	29.5	3
	Mean	**43.1**	**28.4**	**34.2**	

[a]**Score:** 10-20%: 1; 21-31%: 3; 32-42%: 5; 43-53%: 7, 54-65%: 9

Conclusion

Salinity stress reduced the vigor index and speed of germination of the rice genotypes. The extent of vigor index and speed of germination reduction varied with genotypes and levels of salinity.

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