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Evaluation and Selection of Promising Rice (*Oryza sativa* L.) Genotypes under Augmented Block Design in Aerobic System

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ABSTRACT

Field experiment was conducted for evaluation and selection of rice genotypes under aerobic system of cultivation during Kharif 2015-16. In this experiment sufficient amount of variability was observed for grain yield per plant and its components among 125 genotypes evaluated under augmented randomized block design II in aerobic condition. The analysis of variance for grain yield and its attributing characters among blocks, treatments, checks and checks vs varieties revealed presence of significant variation in the genotypes studied. However, with respect to checks and checks vs varieties non-significant differences were recorded for panicle length and plant height. In these results indicated that, among the 125 rice genotypes only 50 rice genotypes expressed higher yield and its attributing characters with significant genotypic effect in comparison with five checks in aerobic system of cultivation. Among these 50, the genotypes viz., KMP-128, MTU-1075, NLR-3349, KNM-604, RNR-21245, CSR-27 and KMP-175 were the top ranking genotypes.

Key words: *Aerobic rice, Sugmented block design II, Genotypic effect, Block effect*

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important food crop of India ranking first in world's total area and second in production. Rice contributes to 43 per cent of total food grain production and 46 per cent of total cereal production in India. Rice is a profligate user of water, consuming half of all developed fresh water resources. Unlike other cereal crops like wheat, maize, sorghum *etc.*, rice requires more water per unit grain production. Traditional lowland rice cultivation with continuous flooding involves relatively higher water usage. But the increasing scarcity of water threatens the sustainability of the irrigated rice production system, food security and livelihood of rice producers and consumers. In view of increasing water scarcity, there is a need to develop alternate systems of rice culture that require less water. IRRI expand recently coined the term "Aerobic rice" is a new concept of growing rice.

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It is a production system in which specially developed, high input response rice varieties with "aerobic adaptation" are grown in well-drained, non-puddled and without ponded water. It holds promise for farmers in water-scarce irrigated environments or where water is too expensive to grow flooded low land rice. To make aerobic rice more profitable, new varieties in the high yield potential and high input use efficiency and corresponding better management practices need to be developed.

MATERIAL AND METHODS

One hundred and twenty five lines were sown directly adopting augmented block design in five blocks with five checks at the Rice Research Center, ARI, Rajendranagar. The checks were replicated five times. The crop (evaluation) was cultivated purely as aerobic rice, which does not require any flooding and puddling. The soil condition (moistures status) was maintained at below saturation level and throughout the period it was maintained as irrigated dry crop. After thorough land preparation and application of FYM + basal recommended fertilizer doses (NPK), three to four seeds were dibbled per hill in dry soil and then irrigated. Two rows of 2m length for each entry with a spacing of 20 x 15 cm were maintained and later thinning was done retaining one seedling per hill after one week. The data were recorded on yield and its components viz., days to 50 per cent flowering, plant height, panicle length, number of productive tillers/hill, total number of grains per panicle, 1000-seed weight. The means were subjected to analysis as per augmented randomized block design (Table 1). The genotypes which showed significant performance for yield and component traits upon the best checks were selected. While selecting, the correlation (significant 'r' value) of the yield components with yield was also taken into consideration, the genotypes which expressed good performance for at least one of the yield components which had significant correlation with yield were also selected.

RESULTS AND DISCUSSION

The analysis of variance for grain yield and its attributing characters among blocks, treatments, checks and checks *vs* varieties revealed presence of significant variation in the genotypes studied. However, with respect to checks and checks *vs* varieties non-significant differences were recorded for panicle length and plant height (Table 1).

Earliness is always desirable, as the genotypes that mature early under rainfed would escape from the drought. The examination of data on the days to 50 percent flowering revealed presence of good variation between the lines. Maximum number of days were recorded in case of in RNR-20809 (108), GSR-34 (107) followed by MTU-1001, MTU-1075, RNR-21225, RNR-21252 (106) while minimum number of days were taken by KMP-175, NDR-356 (87). Sathya, the check flowered very early (74 days) (Table 3).

Early maturing varieties like KMP-175, NDR356, SG 26-120 *etc.* were identified as desirable types for aerobic cultivation from the point of water scarcity and yield as was reported by [1 & 12].

In this study, the other early maturing genotypes with high yield were KMP-175, SVHR-3005, IURON-6 and HRR10-34. Also [9, 13 & 2] found that early maturing cultivars were more adapted to aerobic conditions than late maturing ones and suggested earliness as a suitable criterion for selection of improved varieties.

Good amount of variability was registered for plant height also, RNR-20763 (138.32), RNR-20774 (120.57), SG26-120 (119.57) and RNR-20770 (116.82) were tall, while AAGP9777 (44.47), HRR08-29 (48.47) were too dwarf. Many were in the range of 70cm to 100cm height.

In the present investigation, high yield was associated with medium to tall stature genotypes *viz.*, KMP-175, KMP-128, IURON-6, KNM-604, SG 26-120. Similar results were reported by [4 & 21] earlier. Over all observations tells that there was reduction in height compared to irrigated. Also[19] reported that plant height was slightly lower in aerobic condition than the irrigated low land conditions, as in the case of present study. Usefulness of lines, SV-315-081R, RNR-21280 which recorded less plant height of 56.47cm and 57.45cm cannot be ruled out in view of specific desirable trait, non lodging nature.

In this study, the cultivars NH12-103R, KMP-128, SG26-120, IURON-6 and JGL-20171 also had longer panicles with more number of grains per panicle which resulted in high yield. Reported [3 & 17] high variability for this trait in aerobic rice in evaluation trails.

Number of effective tillers produced by each plant constitutes an important morpho-physiological trait for grain yield in rice[18]. In present study, significant differences were observed for number of productive tillers per plant among rice cultivars. It varied from 5.64 to 14.04.

In addition CSR-27, L-493, NDR3308, HRR 10-34 also had good number of effective tillers and higher test weight which resulted better yield. And[20] & [1]stated selection for increased productive tillers might be a promising avenue for increasing aerobic rice grain yield[4].

In this study, KMP-175, KMP-128, SVHR-3005, L-493, NP-9807, RNR-19397, NLR-3349 and KNM-604 cultivars had significant number of grains per panicle coupled with higher weight and higher number of effective tillers per plant resulting higher yielders. Among those components, grain yield was significantly increased by the number of grains per panicle as was reported by[10]. Next to this, higher number of panicles and test weight contributed to higher grain yield [12].

Rice crop grown under aerobic conditions, showed spectrum of variability for grain number and test weight and reported reduced number of grains per panicle and test weight compared to continuous flooding[11 & 8].

In this study, SVHR-3005, IURON-6, KNM-604, NP-9807, NDR3308, CSR-27 and HKR 10-34 cultivars exhibited higher test weight followed by grain yield.

Grain yield is the ultimate manifestation of a plant's ability to survive, grow and produce more yield under water limited situation regardless of the tolerance mechanisms involved. Grain yield of rice under aerobic culture differed significantly among rice genotypes under aerobic culture (Table 2). Perusal of the yield data revealed that good genotypic variability exhibited among the genotypes with a range of 11.15 to 29.76g.

Among the rice genotypes evaluated OR (T) 26 recorded highest seed yield of 29.76g followed by NP-9807 (28.08g), KMP-175 (27.41g). Other entries RNR-19397, RNR-21245, SVHR-3005, NH-12-103R, IURON-6 and KNM-604 registered moderate seed yields. Lowest seed yield was observed with RNR-20819 (11.15g) and RNR-20715 (12.10g). The checks, MAS-946 and CRdhan-201 gave 24.67 and 22.13 grams per plant respectively. Genotypic differences for grain yield under aerobic condition were reported by[5, 11 & 6].Variations in the grain yield were in accordance with differences its components as reported by [7 & 3]. Such genotypic variability among rice genotypes for yields under aerobic method of cultivation also reported by [11, 15 & 14].

Under aerobic rice cultivation drought tolerant genotypes which could maintain sufficient tissue water, at reproductive stage can maintain higher physiological efficiency, spikelet fertility and seed yield. In the present study, KMP-128, KMP-175, SVHR-3005, NH12-103R, NP9807, IURON-6, NDR-3308, RNR-21268, L-493, NLR-3349 and RNR-19397 recorded higher significant yield also exhibited better performance for test weight, number of grain per panicle, effective tillers compared to other entries and checks.

In support of this data, reported [16] that rice genotypes having greater tolerance to water stress recorded more number of grains per panicle, test weight, grain yield and harvest index. Table 3, depicting the promising cultures among the 125 in this experiment.

Finally, among the 125 rice genotypes studied in aerobic system of cultivation with five checks in augmented randomized block design, 30 genotypes exhibited higher yield with high positive significant genotypic effect, 10 genotypes showed high effective tillers per plant with high positive significant genotypic effect only, 5 genotypes showed higher number of grains per panicle with high positive significant genotypic effect only and 5 genotypes showed high plant height with high positive significant genotypic effect only (Table 4).

In these results indicated that, among the 125 rice genotypes only 50 rice genotypes expressed higher yield and its attributing characters with significant genotypic effect in comparison with five checks in aerobic system of cultivation. Among these, 50 genotypes, CSR-27 (14), KMP-128 (12) for number of effective tillers, MTU-1075 (220), NLR-3349 (214), KNM-604 (210), RNR-21245 (208) for number of grains per panicle, CSR-27 (22.71), KNM-604 (22.55) for test weight and KMP-175 (27.41) for grain yield were top ranking genotypes.

Table 1: Augmented design II Analysis of variance for yield and its attributing characters

	DF	Days to 50% flowering	Plant height (cm)	Panicle length (cm)	Effective tillers/ plant	No. of Grains / Panicle	1000 seed weight (g)	Seed yield/plant (g)
Block (ignoring Treatments)	4	35.21 **	1699.91 **	42.34 **	12.12 **	3569.99 **	25.53**	63.86 **
Treatment (eliminating Blocks)	129	63.19 **	206.53 **	6.15 **	4.14 **	873.68 **	9.19**	15.39 **
Checks	4	817.74 **	286.12 **	4.33	5.94 **	489.56	15.47 **	36.42 **
Checks+Var vs. Var.	125	39.05 **	203.98**	6.20**	4.08 **	885.97**	8.99 **	14.73 **
ERROR	16	6.09	23.45	1.65	1.24	199.24	0.43	1.82
Block (eliminating Check+Var.)	4	8.65	100.60 *	4.60	2.24	36.96	0.86	2.23
Entries (ignoring Blocks)	129	64.02**	256.12 **	7.32**	4.44**	983.24**	9.96**	17.31**
Checks	4	817.74 **	286.12 **	4.33	5.94 **	489.56	15.47 **	36.42 **
Varieties	124	27.52 **	257.21 **	7.35**	4.37 **	998.16**	9.78 **	16.48 **
Checks vs. Varieties	1	1575.43 **	1.57	14.59 **	7.11 *	1106.56 *	9.87 **	43.66 **
ERROR	16	6.09	23.45	1.64	1.24	199.24	0.43	1.82
Ci – Cj	1	3.31	6.49	1.72	1.49	18.92	0.88	1.81
BiVi – BiVj	1	7.39	14.52	3.85	3.34	42.32	1.97	4.04
BiVi – BjVj	1	8.10	15.90	4.21	3.66	46.36	2.16	4.42
Ci - VI	1	6.28	12.32	3.26	2.83	35.91	1.67	3.43

*Significant at 5% level, ** Significant at 1% level, DF- degrees of freedom.

Table 2: Mean and genotypic effect of 125 rice genotypes and 5 checks cultivated in aerobic situation in augmented design

S. No.	Genotype	Days to 50% flowering		Panicle length (cm)		Plant height(cm)		Effective tillers		Total Grains per Panicles		1000 seed weight (g)		Seed yield (g)	
		Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Adjusted Mean	Genotypic effect	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect
1	RNR-21240	102.56	6.24	20.19	-1.63	111.52	15.82	-3.99	-1.76	111.52	-34.40	15.82	-3.99	20.25	0.16
2	RNR-11718	100.56	4.24	17.99	-3.83	156.52	16.06	-3.76	0.24	156.52	10.59	16.06	-3.76	23.19	3.09
3	RNR-21252	104.56	8.24	19.69	-2.13	186.52	15.03	-4.78	-1.76	186.52	40.59*	15.03	-4.78	21.60	1.51
4	RNR-17445	98.56	2.24	23.39	1.56	151.52	13.21	-6.61	1.24	151.52	5.59	13.21	-6.61	23.75	3.66*
5	RNR-21221	99.56	3.24	23.84	2.01	129.52	14.59	-5.23	-1.76	129.52	-16.40	14.59	-5.23	18.26	-1.83
6	RNR-21225	105.56	9.24	20.22	-1.60	181.52	14.35	-5.47	1.24	181.52	35.59*	14.35	-5.47	24.55	4.46*
7	RNR-21233	99.56	3.24	23.00	1.17	141.52	16.17	-3.65	-0.76	141.52	-4.41	16.17	-3.65	22.60	2.51
8	RNR-19405	99.56	3.24	21.89	0.06	221.52	17.71	-2.12	0.24	221.52	75.59*	17.71	-2.12	22.81	2.72
9	RNR-19397	100.56	4.24	19.13	-2.69	190.52	22.11	2.29*	1.24	190.52	44.59*	22.11	2.29*	26.95	6.86*
10	RNR-21280	98.56	2.24	16.84	-4.98	203.52	19.85	0.03	1.24	203.52	57.59*	19.85	0.03	24.96	4.87*
11	RNR-19399	98.56	2.24	19.49	-2.33	161.52	18.30	-1.52	1.24	161.52	15.59	18.30	-1.52	20.26	0.17
12	RNR-21271	99.56	3.24	23.49	1.66	142.52	24.23	4.42*	3.24*	142.52	-3.41	24.23	4.42*	21.10	1.01
13	RNR-21268	99.56	3.24	25.31	3.48*	180.52	22.88	3.06*	2.24	180.52	34.59	22.88	3.06*	23.93	3.84*
14	RNR-17368	99.56	3.24	22.68	0.85	171.52	19.33	-0.48	1.24	171.52	25.59	19.33	-0.48	21.70	1.61
15	RNR-17422	101.56	5.24	22.59	0.76	125.52	21.12	1.30	0.24	125.52	-20.41	21.12	1.30	16.67	-3.42
16	RNR-21304	99.56	3.24	23.77	1.94	227.52	15.64	-4.17	0.24	227.52	81.59	15.64	-4.17	24.25	4.16*
17	RNR-19410	87.56	-8.76*	22.04	0.22	169.52	20.56	0.74	-0.76	169.52	23.59	20.56	0.74	20.47	0.38
18	RNR19412	88.56	-7.76*	23.79	1.96	115.52	19.99	0.17	-1.76	115.52	-30.41	19.99	0.17	21.22	1.13
19	RNR-19411	89.56	-6.76*	23.06	1.23	165.52	19.19	-0.63	-0.76	165.52	19.59	19.19	-0.63	24.50	4.41*
20	RNR-21245	102.56	6.24	23.89	2.06	207.52	15.49	-4.33	-1.76	207.52	61.59*	15.49	-4.33	26.75	6.66*
21	MTU-1075	105.56	9.24	21.36	-0.46	219.52	20.22	0.40	0.24	219.52	73.59*	20.22	0.40	25.37	5.28*
22	Surekha	97.56	1.24	21.67	-0.15	157.52	18.19	-1.63	0.24	157.52	11.59	18.19	-1.63	24.96	4.87*
23	Rajendra	94.56	-1.76	20.42	-1.41	122.52	19.35	-0.47	-1.76	122.52	-23.41	19.35	-0.47	19.31	-0.78
24	MTU-1001	105.56	9.24	21.86	0.03	199.52	20.85	1.03	-0.76	199.52	53.59*	20.85	1.03	24.92	4.83*
25	Bhadrakhali	91.56	-4.76	17.92	-3.91	153.52	22.63	2.81*	-1.76	153.52	7.59	22.63	2.81*	20.03	-0.06
26	Erramallelu	97.16	0.84	19.13	-2.69	56.68	-23.61	10.04	0.23	111.92	-34.01	16.94	-2.87	14.73	-5.36
27	IR-64	94.16	-2.16	15.07	-6.75	61.60	-18.69	10.04	0.25	143.92	-2.01	23.70	3.88*	16.45	-3.64
28	Sughandhamathi	89.16	-7.16*	17.88	-3.95	58.85	-21.44	11.04	1.23	153.92	7.99	18.97	-0.85	15.30	-4.78
29	RNR-17497	93.16	-3.16	21.63	-0.19	74.26	-6.03	7.04	-2.76	95.92	-50.01	14.78	-5.04	13.23	-6.86
30	MAS-29	94.16	-2.16	21.77	-0.06	89.70	9.41	11.04	1.23	127.92	-18.01	23.31	3.49*	20.55	0.46
31	JGL-20171	96.16	-0.16	24.97	3.14	70.20	-10.09	13.04	3.23*	139.92	-6.01	21.61	1.79*	16.21	-3.87
32	JGL-17004	95.16	-1.16	14.61	-7.22	57.00	-23.29	7.04	-2.76	132.92	-13.01	12.79	-7.03	16.16	-3.93
33	JGL-1798	96.16	-0.16	21.83	0.01	62.78	-17.52	10.04	0.24	197.92	51.99*	13.86	-5.96	19.84	-0.25
34	JGL-1118	91.16	-5.16	22.27	0.44	71.30	-8.99	9.04	-0.76	198.92	52.99*	13.56	-6.26	22.35	2.26
35	IRTON-7	100.16	3.83	21.84	0.01	70.10	-10.19	13.04	3.24*	140.92	-5.01	22.18	2.36*	20.02	-0.06
36	IIRON-57	97.16	0.83	26.10	4.27*	102.46	22.17*	9.04	-0.76	165.92	19.99	24.96	5.14*	23.22	3.14
37	IURON-2	91.16	-5.16	22.01	0.18	93.78	13.48*	7.04	-2.76	134.92	-11.01	26.34	6.52*	20.18	0.09

cont..

Table 2. Mean and genotypic effect of 125 rice genotypes and 5 checks cultivated in aerobic situation in augmented design

S. No.	Genotype	Days to 50% flowering		Panicle length (cm)		Plant height(cm)		Effective tillers		Total Grains per Panicles		1000 seed weight (g)		Seed yield (g)	
		Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Adjusted Mean	Genotypic effect	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect
38	IURON-5	89.16	-7.16*	25.06	3.23	105.87	25.58*	9.04	-0.76	139.92	-6.01	21.99	2.17*	23.16	3.07
39	IURON-6	88.16	-8.16*	24.77	2.94	102.85	22.55*	10.04	0.24	147.92	1.99	21.63	1.81*	26.02	5.93*
40	IURON-8	91.16	-5.16	25.52	3.69*	106.40	26.11*	8.04	-1.76	141.92	-4.01	20.23	0.41	20.18	0.09
41	IURON-14	95.16	-1.16	25.97	4.14*	98.65	18.36*	8.04	-1.76	141.92	-4.01	21.42	1.60	19.12	-0.96
42	IURON-15	101.16	4.83	21.91	0.08	84.71	4.42	9.04	-0.76	158.92	12.99	21.70	1.88*	19.09	-0.99
43	IURON-33	95.16	-1.16	26.35	4.52*	87.26	6.96	10.04	0.23	137.92	-8.01	23.86	4.04*	19.21	-0.87
44	IURON-38	94.16	-2.16	24.47	2.64	91.70	11.40	7.04	-2.76	165.92	19.99	22.16	2.34*	19.98	-0.10
45	IURON-39	104.16	7.83	21.42	-0.41	71.87	-8.42	9.04	-0.76	127.92	-18.01	21.07	1.25	15.77	-4.31
46	CSR-23	102.16	5.83	21.77	-0.06	80.60	0.31	11.04	1.23	146.92	0.99	21.44	1.62	20.21	0.12
47	CSR-27	105.16	8.83	21.37	-0.46	85.23	4.93	14.04	4.23*	137.92	-8.01	22.71	2.89*	25.72	5.63*
48	NLR-3349	104.16	7.83	21.37	-0.46	93.05	12.75*	9.04	-0.76	213.92	67.99*	17.18	-2.64	25.57	5.48*
49	NLR-3242	103.16	6.84	18.77	-3.059	66.30	-13.99	13.04	3.24*	107.92	-38.01	20.61	0.79	17.10	-2.98
50	NLR-3353	99.16	2.84	19.67	-2.16	61.00	-19.29	14.04	4.24*	115.92	-30.01	16.66	-3.16	19.48	-0.61
51	KNM-605	93.76	-2.56	22.21	0.38	73.21	-7.08	12.24	2.43	124.32	-21.61	21.29	1.47	15.69	-4.39
52	KNM-604	99.76	3.44	25.28	3.45	87.13	6.83	10.24	0.44	210.32	64.39*	22.55	2.73*	26.33	6.24*
53	SKAU-389	94.76	-1.56	19.87	-1.95	72.54	-7.75	9.24	-0.56	143.32	-2.61	16.58	-3.24	16.65	-3.44
54	L-493	97.76	1.44	23.14	1.31	91.63	11.33	12.24	2.44	193.32	47.39*	18.52	-1.29	26.94	6.85*
55	GSR-2	96.76	0.44	23.51	1.68	88.91	8.61	11.24	1.44	138.32	-7.61	26.89	7.07*	23.68	3.59*
56	GSR-22	101.76	5.44	20.67	-1.16	72.07	-8.22	11.24	1.44	144.32	-1.61	19.88	0.06	24.68	4.59*
57	GSR-34	106.76	10.44	22.05	0.22	78.36	-1.93	12.24	2.44	174.32	28.39	22.65	2.83*	20.93	0.84
58	GSR-40	99.76	3.44	23.01	1.18	75.57	-4.73	10.24	0.44	128.32	-17.61	26.28	6.46*	21.83	1.74
59	IET-24151	99.76	3.44	24.11	2.28	86.01	5.71	11.24	1.44	178.32	32.39	20.43	0.61	23.98	3.89*
60	IET-24342	102.76	6.44	20.84	-0.99	73.68	-6.62	11.24	1.44	189.32	43.39*	25.38	5.56*	28.08	7.99*
61	IET-24356	104.76	8.44	21.87	0.04	74.81	-5.48	10.24	0.44	110.32	-35.61	21.51	1.69*	21.54	1.45
62	IET-24297	93.76	-2.56	24.71	2.88	81.91	1.61	11.24	1.44	190.32	44.39*	18.24	-1.58	29.76	9.67*
63	NDR359	86.76	-9.56*	19.14	-2.68	66.09	-14.21	8.24	-1.56	131.32	-14.61	22.29	2.47*	20.78	0.69
64	RP5715-323-3-1-1	102.76	6.43	22.32	0.49	74.54	-5.75	7.24	-2.56	138.32	-7.61	22.88	3.06*	20.73	0.64
65	IET-23227	91.76	-4.56	19.39	-2.43	62.57	-17.72	7.24	-2.56	112.32	-33.61	23.68	3.86*	16.30	-3.78
66	RTN 605-111-1-2	102.76	6.44	23.51	1.68	81.57	1.27	9.24	-0.56	90.32	-55.61	22.35	2.53*	15.82	-4.26
67	PAU 3835-12-1-1-2	90.76	-5.56	20.51	-1.32	59.21	-21.08	8.24	-1.56	102.32	-43.61	23.42	3.60*	13.00	-7.08
68	Culture KAU MK 157	93.76	-2.56	24.01	2.18	99.41	19.11*	8.24	-1.56	107.32	-38.61	28.59	8.77*	16.62	-3.47
69	NDR3308	91.76	-4.56	22.31	0.48	84.95	4.65	12.24	2.44	146.32	0.39	21.65	1.83*	23.53	3.44*
70	UPR-3841-3-2-1	89.76	-6.56*	20.51	-1.32	67.91	-12.38	7.24	-2.56	120.32	-25.61	25.09	5.27*	13.35	-6.74
71	CRR 484-2-1-1-1-1	94.76	-1.56	27.14	5.32*	90.72	10.42	6.24	-3.56	154.32	8.39	21.56	1.74	21.05	0.96
72	RP5892-32-9-5-4-3-2	93.76	-2.56	20.91	-0.92	66.91	-13.38	10.24	0.44	132.32	-13.61	20.17	0.35	21.54	1.45
73	HKR 10-34	87.76	-8.56*	23.01	1.18	75.51	-4.78	12.24	2.44	162.32	16.39	23.24	3.42*	25.56	5.47*
74	R 1641-914-1-400-1	97.76	1.44	19.21	-2.62	66.71	-13.58	11.24	1.44	164.32	18.39	18.12	-1.69	26.64	6.55*

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Table 2: Mean and genotypic effect of 125 rice genotypes and 5 checks cultivated in aerobic situation in augmented design

S. No.	Genotype	Days to 50% flowering		Panicle length (cm)		Plant height(cm)		Effective tillers		Total Grains per Panicles		1000 seed weight (g)		Seed yield (g)	
		Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Adjusted Mean	Genotypic effect	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect
75	RP 5883-IR-83142-B-57-B	92.76	-3.56	19.71	-2.12	70.11	-10.18	7.24	-2.56	132.32	-13.61	23.41	3.59*	20.00	-0.08
76	KPH-466	95.76	-0.56	17.96	-3.87	59.47	-20.82	10.04	0.23	155.12	9.19	20.44	0.62	17.51	-2.58
77	HRR 08-29	90.76	-5.56	16.46	-5.37	48.47	-31.82	7.04	-2.76	116.12	-29.81	22.06	2.24*	15.14	-4.95
78	RP 4978-60-3-2-2	93.76	-2.56	18.21	-3.62	60.72	-19.57	13.04	3.24*	129.12	-16.81	18.15	-1.66	16.82	-3.26
79	HKR 09-104	101.76	5.43	15.46	-6.37	52.97	-27.32	12.04	2.24	114.12	-31.81	22.09	2.27*	15.79	-4.29
80	CR2274-2-3-3-1	96.76	0.44	20.46	-1.37	64.97	-15.32	6.04	-3.76	108.12	-37.81	22.67	2.85*	14.77	-5.32
81	AAGP9772	94.76	-1.56	12.96	-8.87	44.47	-35.82	8.04	-1.76	133.12	-12.81	23.28	3.46*	18.04	-2.05
82	AYT-21	93.76	-2.56	23.06	1.23	78.77	-1.52	11.04	1.24	154.12	8.19	17.34	-2.47	21.79	1.70
83	L2-182	97.76	1.44	20.46	-1.37	75.97	-4.32	9.04	-0.76	113.12	-32.81	19.12	-0.69	17.84	-2.25
84	SVHR-3005	88.76	-7.56*	21.86	0.03	74.97	-5.32	9.04	-0.76	184.12	38.19*	21.44	1.62*	26.22	6.13*
85	NH12-144X	91.76	-4.56	20.46	-1.37	64.63	-15.66	7.04	-2.76	127.12	-18.81	18.59	-1.23	15.97	-4.12
86	NH12-103R	95.76	-0.56	24.12	2.28	70.57	-9.72	11.04	1.24	187.12	41.19*	21.09	1.27	26.82	6.73*
87	TCP-10246	93.76	-2.56	21.68	-0.15	76.12	-4.17	8.04	-1.76	127.12	-18.81	19.56	-0.25	15.78	-4.31
88	SV-315-081R	92.76	-3.56	18.96	-2.87	56.47	-23.82	9.04	-0.76	188.12	42.19*	15.39	-4.42	25.72	5.63*
89	RPHR-1004	88.76	-7.56*	21.46	-0.37	63.97	-16.32	9.04	-0.76	117.12	-28.81	20.14	0.32	14.04	-6.05
90	ABU-10-82R	102.76	6.43	17.96	-3.87	66.97	-13.32	8.04	-1.76	146.12	0.19	21.85	2.03*	19.37	-0.72
91	RPHR-517	93.76	-2.56	18.46	-3.37	72.97	-7.32	8.04	-1.76	104.12	-41.81	15.44	-4.37	17.78	-2.31
92	SG 26-120	87.76	-8.56*	23.79	1.95	119.57	39.27*	13.04	3.24*	121.12	-24.81	14.41	-5.40	18.98	-1.11
93	Akshayadhan	91.76	-4.56	16.06	-5.77	62.77	-17.52	11.04	1.24	114.12	-31.81	16.90	-2.92	15.98	-4.11
94	KMP-175	86.76	-9.56*	23.09	1.25	96.06	15.76*	9.04	-0.76	187.12	41.19*	18.61	-1.21	27.41	7.32*
95	BI-33	88.76	-7.56*	20.12	-1.71	67.30	-12.99	13.04	3.24*	128.12	-17.81	19.55	-0.26	15.97	-4.12
96	KMP-153	94.76	-1.56	20.46	-1.37	69.97	-10.32	11.04	1.24	109.12	-36.81	20.48	0.66	17.27	-2.81
97	KMP-128	93.76	-2.56	24.96	3.13	95.27	14.98*	12.04	2.24	186.12	40.19*	21.22	1.40	26.39	6.30*
98	RNR-20110	98.76	2.44	20.46	-1.37	80.17	-0.12	13.04	3.24*	127.12	-18.81	14.19	-5.63	22.83	2.74
99	RNR-20115	102.76	6.44	19.71	-2.12	81.97	1.67	14.04	4.24*	151.12	5.19	17.24	-2.57	22.98	2.89
100	RNR-20595	98.76	2.44	23.06	1.23	96.57	16.27*	11.04	1.24	141.12	-4.81	19.07	-0.75	20.57	0.48
101	RNR-20601	104.76	8.44	20.47	-1.35	76.32	-3.96	5.64	-4.16	101.12	-44.81	18.31	-1.51	14.61	-5.47
102	RNR-20611	94.76	-1.56	20.97	-0.85	74.32	-5.96	5.64	-4.16	104.12	-41.81	21.77	1.95*	13.30	-6.78
103	RNR-20710	97.76	1.44	24.17	2.37	93.32	13.03*	10.64	0.84	193.12	47.19*	18.22	-1.59	24.46	4.38*
104	RNR-20715	97.76	1.44	23.47	1.65	83.32	3.03	10.64	0.84	113.12	-32.81	21.32	1.50	12.10	-7.98
105	RNR-20719	99.76	3.44	24.47	2.65	79.82	-0.47	12.64	2.84*	108.12	-37.81	22.89	3.07*	16.40	-3.68
106	RNR-20729	97.76	1.44	24.30	2.47	85.98	5.69	9.64	-0.16	158.12	12.19	21.01	1.19	18.31	-1.77
107	RNR-20743	94.76	-1.56	23.47	1.65	93.32	13.03*	12.64	2.84*	155.12	9.19	24.28	4.46*	17.61	-2.47
108	RNR-20747	99.76	3.43	23.47	1.65	85.82	5.53	12.64	2.84*	185.12	39.19*	17.89	-1.93	25.10	5.02*
109	RNR-20749	87.76	-8.56*	18.63	-3.19	92.65	12.36	11.64	1.84	135.12	-10.81	20.14	0.32	17.31	-2.77
110	RNR-20763	87.76	-8.56*	24.97	3.15	135.32	55.03*	11.64	1.84	121.12	-24.81	20.08	0.26	14.61	-5.47
111	RNR-20764	93.76	-2.56	23.97	2.15	112.32	32.03*	12.64	2.84*	118.12	-27.81	21.25	1.43	13.61	-6.47

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Table 2: Mean and genotypic effect of 125 rice genotypes and 5 checks cultivated in aerobic situation in augmented design

S. No.	Genotype	Days to 50% flowering		Panicle length (cm)		Plant height(cm)		Effective tillers		Total Grains per Panicles		1000 seed weight (g)		Seed yield (g)	
		Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Adjusted Mean	Genotypic effect	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect	Adjusted Mean	Genotypic effect
112	RNR-20767	104.76	8.43	20.30	-1.52	102.32	22.03*	10.64	0.84	113.12	-32.81	16.63	-3.18	15.11	-4.97
113	RNR-20770	102.76	6.44	23.97	2.15	116.82	36.53*	7.64	-2.16	108.12	-37.81	17.33	-2.48	16.31	-3.77
114	RNR-20774	99.76	3.44	24.47	2.65	120.57	40.28*	10.64	0.84	102.12	-43.81	16.03	-3.78	14.35	-5.73
115	RNR-20784	97.76	1.44	23.30	1.47	98.98	18.69	11.64	1.89	104.12	-41.81	13.75	-6.06	14.25	-5.83
116	RNR-20809	107.76	11.44	21.22	-0.60	76.07	-4.21	7.64	-2.16	132.12	-13.81	16.46	-3.35	15.70	-4.38
117	RNR-20819	87.76	-8.56*	24.97	3.15	87.32	7.03	8.64	-1.16	105.12	-40.81	17.43	-2.38	11.15	-8.93
118	RNR-20824	102.76	6.44	24.81	2.98	103.39	23.10*	6.64	-3.16	164.12	18.19	17.73	-2.08	18.41	-1.67
119	RNR-20829	100.76	4.44	24.97	3.15	108.32	28.03*	8.64	-1.16	141.12	-4.81	20.40	0.58	18.18	-1.90
120	RNR-20831	103.76	7.44	22.43	0.61	108.32	28.03*	5.64	-4.16	161.12	15.19	18.95	-0.86	16.12	-3.96
121	RNR-20847	101.76	5.44	22.81	0.98	98.32	18.03*	7.64	-2.16	151.12	5.19	20.07	0.25	18.82	-1.26
122	RNR-20879	100.76	4.44	22.97	1.15	88.24	7.95	7.64	-2.16	163.12	17.19	19.81	-0.01	22.25	2.17
123	RNR-21042	87.76	-8.56*	25.30	3.47*	100.40	20.11*	7.64	-2.16	165.12	19.19	13.95	-5.87	22.25	2.17
124	Anjali	95.76	-0.56	23.97	2.15	73.69	-6.5997	8.64	-1.16	132.12	-13.81	16.31	-3.51	16.50	-3.58
125	Vandana	87.76	-8.56*	24.87	3.05	108.32	28.03*	8.64	-1.16	129.12	-16.81	22.97	3.15*	21.03	0.95

Table 3: Simple correlation coefficients for grain yield and yield components

	Days to 50% flowering	Plant height (cm)	Panicle length (cm)	Effective tillers/ plant	No. of Grains / Panicle	1000 seed weight	Seed Yield
Days to 50% flowering	1.00000	-0.02800	-0.08473	0.13171	0.11075	-0.01398	0.11707
Plant Height (cm)		1.00000	0.74873***	0.02076	0.09962	-0.00916	0.21826**
Panicle length (cm)			1.00000	0.00129	0.25999***	0.03926	0.33904***
Effective tillers/plant				1.00000	0.07865	0.04491	0.19788*
No. of Grains /Panicle					1.00000	-0.10848	0.74732***
1000 seed weight						1.00000	-0.04258
Seed Yield							1.00000

*Significant at 5% level **Significant at 1% level

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