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Characterization of Commercially Cultivated Hybrid Rice in Bangladesh

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Abstract: Five varieties of hybrid rice were collected from different private seed companies and one hybrid and two checks from Bangladesh Rice Research Institute (BRRI) were used for this experiment. Varieties were Sonarbangla-1, Jagoron, Hira, Aloron, Richer, BRRI hybrid 1 and two checks are BRRI dhan 28 and BRRI dhan 29. In the experiment plant height for BRRI dhan 28 was 101.5 cm and lowest for Richer (82.5 cm). For days to 50% flowering BRRI dhan 29 required maximum days (116.3 days) and BRRI dhan 28 required lowest days (95 days). For number of effective tillers, Hira showed maximum performance (17.7) and Sonarbangla showed lowest performance (13.3). For days to maturity, Sonarbanglr required lowest days (118 days) and BRRI dhan 29, highest days (148 days). In panicle length status, Richer showed maximum performance (27.7 cm) and for BRRI dhan 28 was the lowest (26 cm). Number of filled grains was the highest for BRRI dhan 29 (163.3), whereas, Jagoron only 118. Number of total grains was highest in BRRI dhan 29 (201.7) and for Jagoron it was only 133.7. On the other hand, for 1000-grain weight, Aloron was the best than other hybrids. In biological yield (g), BRRI dhan showed highest yield (49.6 g) and Hira only 18 g. considering varietal characters performance, the variety Aloron was the best than the respective commercial variety under the study and will be cultivating for higher yield. So, more or less the genotype Aloron will be recommended for future.

Key words: Characterization · Harvest index · Cultivated · Variance and Hybrid Rice

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important crop of tropical world. It is the major sources of food for approximately half of the world population and hence the most important crop on the earth [1]. Rice is cultivated in about 152.04 mha and contributes 585.59 million tons of grains. Above 90% of total rice is produced and consumed in Asia-Pacific region. Rice provides 20-80% dietary energy and near about 12-17% of dietary protein for Asians [2]. In China, hybrid rice grows well and produce higher yield than modern cultivar and attracts farmer's attention [3]. Outside of China, India is the first country to develop and commercially exploit the hybrid technology and 17 hybrids have been released [4]. It is estimated that the population will gradually increases to 161 million in 2020 although the population growth rate will be much lower than that in 1991. Population predicted for 2020 will require 27.26 mMt. During this time, the total rice area will shrink from 10.71 to 10.28 million ha and the hectare rice will be needed to increase from 2.74 tons to 3.74 per capita.

Rice area will gradually shrink to only 0.149 acre in 2020 and the required rice/head per day will be decreased from 528g in 2001 to 463g in 2020 due to the increase of population. This indicates a decreasing trend of daily requirement of rice. Thus for maintaining the adequate level of rice yield required for the estimated population in the years to come rice research should continually develop improved and cost effective technologies [5].

In Bangladesh total rice growing area was 90,83,138.87 ha. Among the total area, hybrid growing area was only 1,88,274.493 ha during the year 2005 [5]. The population of Bangladesh is growing consequently and the country has to produce additional rice for about 2.2 million mouths every year. The country suffers an annual deficit of 2-3 million tons with annual addition of 0.45 million tons. In the year 2020, the country production of milled rice have to be increased 26.797 to 35 million tons [5] and the average yield of milled rice has to be doubled (i.e. 3.39t/ha) from the present level of 1.8 t/ha. To feed the fast increasing global population, the worlds annual rice production must be increase from 520 million tons of 1994 to 760 million tons by the year 2020 [6].

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Hybrid rice has about a 30% yield advantages over the conventional pure line varieties [7]. Rice is grown in Bangladesh in three distinct seasons namely Aus, Aman and Boro. Rice is grown in 11.025 million hectares of land with a production of 26.796 million tons [8]. The yield of Aus was 1.43 t/ha, Aman 1.82.07 t/ha and Boro was 3.35 t/ha respectively [5]. But the yield of hybrid rice was higher i.e. near doubled (4t/ha) from the average yield 2.15t/ha [9]. The population of Bangladesh is increasing day by day and that is why horizontal expansion of rice area is not possible due to high population pressure on land, to ensure the food security for her increasing population. Therefore, it is an urgent need of the time to increase rice production through increasing yield. Proper practices are the most effective means for increasing yield of rice at farmers level using inbred and hybrid varieties [5].

MATERIALS AND METHODS

The experiment was conducted in Randomized Complete Block Design (RCBD) with three replications. There were eight treatment combinations. Five hybrid rice varieties from different private seed companies, one hybrid and two check varieties from Bangladesh Rice Research Institute were used for this experiment.

Varieties are: V_1=Sonarbangla 1, V_2=Jagoron, V_3= Hira, V_4= Aloron, V_5= Richer V_6= BRRI hybrid 1, V_7= BRRI dhan 28(Check) and V_8= BRRI dhan 29(Check)

List of the genotypes used in the experiment with their origin

Varieties	Origin	Imported by
Sonarbangla-1	Imported from China	Mollica seed company
Jagoron (GB 4)	Imported from China	BRAC
Aloron	Imported from China	BRAC
Hira	Imported from China	Surreme seed company
Richer 101	Imported from China	Chens crop science
BRRI hybrid-1	Released by BRRI	
BRRI dhan-28	Released by BRRI	
BRRI dhan-29	Released by BRRI	

Spikelets Fertility (%): At the harvesting, five panicles were harvested at maturity from five randomly chosen plants in each of the hybrids and the number of filled, unfilled and total spikelets was counted. spikelets fertility percentage was then computed as

$$\text{Spikelets fertility (\%)} = \frac{\text{Number of filled spikelets in the panicle}}{\text{Total number of spikelets in the panicle}} \times 100$$

Harvest Index (HI): The ratio of grain weight to total above ground plant dry weight (Biological yield). Harvest index was computed by using the following formula:

$$\text{HI} = \frac{\text{Economic yield (Grain weight)}}{\text{Biological yield (Total dry weight)}}$$

Analysis of Variance: Differences between genotypes for the characters studied were tested for significance by the Analysis of Variance technique.

Analysis of variance was done on the basis of the following model:

$$Yij = m+gi+rj+eij$$

where, Yij = Phenotypic observation on i^{th} genotype in j^{th} replication, m = general mean, gi = effect of i^{th} genotype, rj = effect of j^{th} replication and eij = random error associated with i^{th} genotype and j^{th} replication

The structure of Analysis of Variance (ANOVA)

Sources of variation	df	MSS	Expected MSS	F-value
Replication	(r-1)	Mr	$\sigma_e^2+g\sigma_r^2$	
Mg/Me				
Treatment/genotype/hybrids /parents/checks	(g-1)	Mg	$\sigma_e^2+r\sigma_g^2$	
Error	(r-1)(g-1)	Me		σ_e^2
Total	(rg-1)			

where, r = No. of replication and g = No. of genotypes (treatments)

Mr, Mg and Me = Mean sum of squares due to replications, genotypes and error respectively

σ_e^2 = Error variance = Me, σ_g^2= Genotypic variance = (Mg – Me)/r and σ_p^2= Phenotypic variance = $\sigma_e^2+\sigma_g^2$

MSS due to genotype were tested against the error variance using 'F' test at p = 0.05 or p = 0.01 with degree of freedom for higher and lower value of variance.

RESULT AND DESICCATION

In the present study, six hybrids were collected from different seed companies and from research organization have been evaluated for their performance. Generally, a breeder aims at accumulating favorable genes from diverse resources in a particular genotype, which would largely depend upon the availability of genetic variability in the germplasm in respect of any particular character and evaluate that character for better use of human beings. The discussions on mean performance of yield and yield components of the hybrids and check varieties have been presented here under (Table 1).

Table 1: Mean performance of hybrids and checks for varietal characters

Sl No	Variety	PH (cm)	DFF	NET/p	DTM	PL (cm)	FG/p	TG/p	TGW (g)	BY/p (g)	HI (%)
1	Sonarbangla 1	89.52	97.66	13.33	118.00	27.47	145.40	166.50	28.28	29.58	60.43
2	Jagoron	85.80	97.00	15.33	123.00	27.34	118.00	133.66	28.24	26.02	63.97
3	Hira	87.67	96.00	17.66	125.00	27.53	135.66	153.33	25.82	28.00	51.49
4	Aloron	91.73	120.33	16.33	135.00	28.57	120.00	148.33	28.82	40.41	63.09
5	BRRI hybrid 1	100.31	123.00	16.00	148.66	27.60	148.66	213.33	27.90	46.45	48.00
6	Richer	82.46	118.00	15.66	135.00	27.73	118.06	137.66	26.98	32.88	57.64
Mean		89.58	108.66	15.72	130.77	27.70	130.96	158.83	27.67	33.89	57.43
7	BRRI dhan 28 (check)	101.54	95.00	16.33	123.00	25.96	124.66	145.33	20.31	31.01	38.00
8	BRRI dhan 29 (check)	97.50	116.33	16.33	148.00	27.50	163.33	201.66	20.92	49.61	54.32
Mean		99.52	105.66	16.33	135.50	26.73	144.00	173.50	20.61	40.31	46.16
Grand mean		92.06	107.91	15.87	131.95	27.46	134.22	162.50	25.91	35.49	54.61
SEd		2.82	0.40	1.86	0.16	0.85	13.59	9.51	1.46	4.31	2.57
CV%		3.76	0.46	14.38	0.15	3.83	12.40	7.17	6.94	14.90	5.78
CD%		6.05	0.86	3.99	0.35	1.84	29.15	20.39	3.14	9.24	5.52

PH=Plant height, DFF=Days to 50% flowering, NET/p=No. of effective tillers/plant, DTM=Days to maturity, PL=Panicle length, FG/p=Filled grains/panicle, TG/p=Total grains/panicle, TGW=1000-grain weight, BY/p=Biological yield/plant, HI=Harvest index

Plant Height (cm): In the present study plant height of the hybrids ranged from 82.46 cm in Richer to 100.31 cm in BRRI dhan 28 with a mean of 89.58 cm.

For the checks the value ranged from 97.5 cm (BRRI dhan 29) to 101.5 cm (BRRI dhan 28), with a mean of 99.52 cm. Plant height of hybrids was lower than the checks. Among the 8 genotypes, BRRI dhan 28 showed a maximum plant height of 101.5 cm and Richer showed a minimum plant height of 82.5 cm. The grand mean value for this trait was 92.06 cm. The group of genotypes that showed higher plant height was constituted by BRRI dhan 28 (101.5 cm), BRRI hybrid 1 (100.3 cm) and BRRI dhan 29 (97.5 cm). The group of genotypes that showed lower plant height was constituted by BRRI dhan 28 (82.5 cm) and Jagoron (85.5 cm) respectively (Table 1). Here, Richer (82.5 cm) is lower in response of plant height and BRRI dhan 28 (101.5 cm) is higher for plant then comparing with others. Plant height was 88-89 cm directly related to yields [10]. Experiment showed that plant height ranged from 80.00 to 132.00 cm [11]. The average plant height of the hybrids (89.58 cm) studied in the present study is also smaller than checks (99.52 cm) [12], but no hybrids show lodging behavior. Considering all of them that short stature is effective for rice yield.

Days to 50% Flowering: Number of days taken for 50% flowering ranged from 96.0 days in case of Hira to 123.0 days in BRRI hybrid 1, with a mean being 108.66 days. Among the checks BRRI dhan 28 showed earlier flowering range 95.0 days and BRRI dhan 29 showed latest flowering (116.3 days), with a mean of 105.66 days. Hybrids showed maximum days to flowering then the checks. Among all the genotypes, it ranged from 96.0 days for Hira to 123.0 days for BRRI hybrid 1. The grand mean for days to 50% flower of all genotypes was 107.91 days. The group of genotypes that showed maximum days to flowering was constituted by BRRI dhan 29 (116.3 days), Richer (118.0 days), Aloron (120.3 days) and BRRI hybrid 1 (123.0 days). The group of genotypes that took minimum days to flowering was constituted by BRRI dhan 28 (95.0 days), Hira (96.0 days), Jagoron (97.0 days) and Sonarbangla 1 (97.7 days), respectively (Table 1). The tall hybrids BRRI hybrid 1 take exceptionally long duration for 50% flowering (123 days), which would be difficult to fit in presently practiced cropping system, but it would fit well in deep water and ill drainage condition where any other crop can not be grown. Flowering occurred 88 days after seedling emergence of hybrid [13]. Considering all of them that BRRI dhan 28 (95.0 days) is superior then others and BRRI hybrid 1 is inferior considering with others varieties/genotypes.

No. Of Effective Tillers: Among all the genotypes, Hira showed highest no. of effective tillers (17.7) and Sonarbangla 1 showed least no. of effective tillers (13.3) with a grand mean of 15.87. The group of genotypes that showed higher no. effective tillers per plant was constituted by Aloron (16.3) and Hira (17.7). The group of genotypes which showed least number of effective tillers per plant was constituted by Sonarbangla 1 (13.3) and Jagoron (15.3), respectively (Table 1). In the present study, hybrids have moderate number of effective tillers per plant. The importance of number of tillers/plant which influencing yield [14]. ADTRH1 is a rice hybrid. It tillers profusely (12-15 productive tillers per hill) with each panicle 27.5-cm long, producing 142 grains [15]. Tillers number varied widely among the varieties and the number of tillers per plant at the maximum tiller numbers stage ranged between 14.3, 39.5 and 12.2, 34.6 [16].

Days to Maturity: The days to maturity among hybrids ranged from 118.0 days for Sonarbangla 1 to 148.7 days for BRRI hybrid 1 with a mean of 130.77 days. In case of checks BRRI dhan 28 mature earlier (123.0) than both the checks, with a mean of 135.90 days. The ranged for days to maturity among all the genotypes varied from 118.0 days (Sonarbangla 1) to 148.7 days (BRRI hybrid 1). The grand mean for days to maturity of all the genotypes was 131.95 days. The group of genotypes that showed maximum days to maturity was constituted by BRRI dhan 29 (148.0 days) and BRRI hybrid 1 (148.7 days). The group of genotypes which showed least no. of days to maturity was constituted by Sonarbangla 1 (118.0 days) and Jagoron (123.01days) respectively (Table 1). In the present study, most of the hybrids took moderate days to maturity except BRRI hybrid 1. The growth duration of seventeen released hybrids ranged from 105 days (HRI-120) to 135 days (KRH-2 and PHB-71). Five hybrids of the present study (118 to 135 days) fall I the dame ranged noted and only one hybrid show longer duration which only maturing in (149 days) of 118 days in the best grain yielder [17]. Shorter field duration was observed in Sonarbangla-1 than the control [18].

Panicle Length (cm): Among the hybrids, the length of main panicle ranged from 27.3 cm in Jagoron to 28.6 cm in Aloron, with a mean of 27.70 cm. In case of checks the panicle length ranged from 26.0 (BRRI dhan 28) to 27.5 (BRRI dhan 29), with a mean of 26.73 cm. The mean value of panicle length for all the genotypes ranged from 26.0 cm (BRRI dhan 28) to 28.6 cm (Aloron). The grand mean value for this trait was 27.46 cm. The group of genotypes that showed longer panicle length was constituted by Richer (27.7 cm) and Aloron (28.6 cm). The group of genotypes which showed shorter panicle length was BRRI dhan 28 (26.0 cm) and Jagoron (27.3 cm) are in Table 1. In the present study, hybrids showed longer panicle length than the checks. The length of panicle varied from 26.30 cm to 27.00 cm among the *indica/japonica* hybrids [10]. But in the present study the range of panicle length of hybrids is from 27.30 to 28.6 cm.

No. Of Filled Grains /Panicle: The mean of hybrids for no. of filled grains/panicle was 130.96, with the range being 118.0 (Jagoron) to 148.7 (BRRI hybrid 1). For the checks, the number ranged from 124.7 (BRRI dhan 28) to 163.3 (BRRI dhan 29), with a mean of 144.00. Among all the genotypes, the no. of filled grains/panicle varied from 118.0 (Jagoron) and 148.7 (BRRI hybrid 1), with a grand mean of 134.22. The group of genotypes that showed higher no. of filled grains/panicle was constituted by Sonarbangla 1 (145.4), BRRI hybrid 1 (148.7) and BRRI Dhan 29 (163.3). The group which showed least no. of filled grains/panicle included Jagoron (118.0) and BRRI Dhan 28 (118.1), respectively (Table 1). Most variation was observed for filled grain/panicle, number of fertile spikelets and grain yield/plant. Hybrids, in general, gave higher values for number of filled grains per panicle [18]. Yield advantage for the hybrid rice mainly due the proportion of filled grains per panicle, heavier grain weight (35%) and increased values than the control (28%).

No. of Total Grains/Panicle: The mean of hybrids for this character was 158.83 with the range being 133.7 (Jagoron) to 213.3 (BRRI hybrid 1). For the checks, the number ranged from 145.3 (BRRI dhan 28) to 201.7 (BRRI dhan 29) with a mean of 173.50. Among all the genotypes, the number of total grains/panicle varied from 133.7 (Jagoron) and 213.3 (BRRI hybrid 1), with a grand mean of 162.50. The group of genotypes that showed higher no. of total grains/panicle was constituted by BRRI dhan 29 (201.7) and BRRI hybrid 1 (213.3). The group which showed least no. of total grains/panicle included Jagoron (133.7) and Richer (137.7), respectively (Table 1). Yield components revealed that plant densities were low and that the most important components were the number of panicles per plant and the number of grains per panicle [19]. The variation in the yield components of 75 high-quality rice cultivars [7]. Among the yield components, the greatest variation was recorded for number of grains per panicle in indica rice and number of panicles in japonica rice. It was concluded that, BRRI hybrid 1 (213.3) is superior then others.

1000-Grain Weight (g): The highest thousand-grain weight was observed in Aloron (28.82 g) and the lowest in Hira (25.82 g) among the hybrids, with a mean of 27.67 g. Among the checks, the range was from 20.3 g (BRRI dhan 28) to 20.9 g (BRRI dhan 29) with a mean of 20.61g. Among all the genotypes Aloron showed highest 1000-grain weight (28.8 g) and BRRI dhan 28 showed lowest weight (20.3 g), with a grand mean of 25.91 g. The highly performing group was constituted by the genotypes Jagoron (28.24 g), Sonarbangla (28.28 g) and Aloron (28.82 g). The group which showed lowest 1000-grain weight was BRRI dhan 28 (20.31 g), BRRI dhan 29 (20.92 g) and Hira (25.82 g), respectively (Table 1). In the experiment, all the hybrids are superior then thecks. Chao Chan1 hybrid rice was 1000-seed weight was 28 g [20] which is directly related with yield. ADTRH1 a rice hybrid, 1000-grain weight was23.8 g. In different trials, ADTRH1 showed 26.9 and 24.5% higher yield over CORH1 and ASD18 [15].

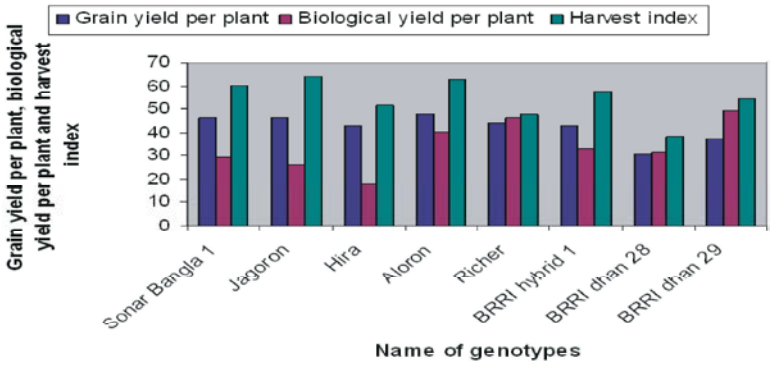

Fig. 1: Relative performance of hybrids and ckecks for grain yield per plant, biological yield per plant and harvest index

Biological Yield per Plant: Among the hybrids, biological yield per plant ranged from 28.0 g in Hira to 46.45g in BRRI dhan 29, with a mean value of 33.89 g. In case of checks, BRRI dhan 28 showed lowest values (31.01 g) and BRRI dhan 29 showed highest values (49.61 g), with a mean value of 40.31 g. The hybrids showed lowest biological yield per plant than the checks. Among all the genotypes, BRRI dhan 29 showed maximum biological yield per plant (49.61 g) and Hira showed minimum biological yield per plant (28.0 g), with a grand mean of 35.49 g. The highly performing groups of hybrids included Aloron (40.41 g) and BRRI dhan 1 (46.45 g,) respectively (Table 1). A comparative view of the results has been presented in Fig 1. In the present study, the variety BRRI dhan 29 (49.61 g) is betters then others. Hybrids that gave high grain yields also produced high biomass [21]. Superior yielding of hybrids over the controls resulted from increased total biomass and increased panicle weight, with almost the same level of harvest index [22]. Hybrid rice also accumulates more total dry matter than conventional rice.

Harvest Index: The mean harvest index of the hybrids was recorded 57.43 percent and range varied from 48.0 percent (BRRI hybrid 1) to 64.0 percent Lagoron, in case of hybrids. Whereas, the range of harvest index percent among the checks varied from 38.0% (BRRI dhan 28) to 54.3% (BRRI dhan 29), with a mean value of 46.16 percent. Among all the genotypes, Jagoron showed maximum harvest index (64.0%), with a grand mean of 54.61%. The highly performing group included Sonarbangla 1 (60.4%), Aloron (63.1%) and Jagoron (64.0%). Moreover, the group with least performance for this character was constituted by the genotypes BRRI dhan 28 (38.0%), BRRI hybrid 1 (48.0%) and Jagoron (51.5%), respectively (Table1). A comparative view of results of this trait has been presented in Fig 1. In the present study, the variety Jagoron (64.0%) is superior then to all. Compared 10 varieties for yield components. The yield increase of dwarf over tall varieties mainly resulted from higher harvest index, while the yield increase of hybrid rice over the dwarf varieties was mainly from higher biomass production [23]. Yield differences among cultivars were due to HI. The superiority of hybrids for biomass over conventional varieties is reported widely [24]. 10-20% superiority of hybrids for total biological yield and grain yield [25].

Analysis of Variance: Analysis of variance was carried out and the mean sum of squares for various characters was presented in Table 2. 'F' test revealed highly significant variation among eight genotypes for all the characters studied. The analysis of variance (ANOVA) presented in Table 2. Showed significant variation for all the yield and yield components studied.

Analysis of Variability and Heritability: The materials used in present study, show wide degree of variability maximum variation was found in unfilled grain/panicle (12.0-81.0, 575%), followed by biological yield per plant (23.21-56.19, 142.09%), harvest index (35.00-66.10, 88.85%), filled grain per panicle (104.0-190.0, 82.69%), total grain per panicle (126.0-225.0, 78.57%), 1000-grain weight (18.01-30.10, 67.12%), grain yield per plant (29.45-48.87, 65.96%), respectively (Table 3). A wide range of variation has been reported by several workers in the rice germplasm. The highest heritability value was registered for 1000-grain weight, followed by brown kernel length and grain length [26]. Grain weight and gain no. per panicle [27] and [28], tillers no. per plant [29] and [30], plant height [31] and harvest index [32-35].

Broad sense heritability (h^2b) ranged from 99.93% for days to maturity to 11.49% for panicle length. High estimates of Broad sense heritability (h^2b) was revealed by characters like 99.93% for days to maturity, 99.84% for days to 50% flowering, 99.58% for grain yield per plot,

Table 2: Analysis of variance (ANOVA) for yield and its related characters in hybrids and check varieties

		Mean Sum of Squares (MSS)		
Sl. No.	Characters	Replication	Variety	Error
	d.f	2	7	14
1	Plant height (cm)	8.039	147.707**	11.970
2	Days to 50% flowering	0.292	465.976**	0.244
3	No of effective tillers/plant	4.875	4.565**	5.208
4	Days to maturity	0.042	410.899**	0.042
5	Panicle length	0.452	1.542*	1.109
6	Filled grain/panicle	136.115	857.516**	277.045
7	Total grains/panicle	28.500	2641.238**	135.738
8	Grain yield/plant	0.001	102.154**	2.857
9	Biological yield	25.661	236.276**	27.981
10	Harvest index	4.542	228.006**	9.970
11	1000 grain weight	2.088	34.666**	3.230
12	Grain yield/plot	0.001	0.720*	0.001
13	Grain yield/ha	0.003	1.992*	0.004

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

Table 3: Estimates of range, grand mean and heritability (broad sense) for yield and its related characters in hybrids and checks

Sl No.	Characters	GM	Range	% of Variation	h^2 (%) (bs)
1	Plant height (cm)	92.069	77.40-106.61	38.27	79.07
2	Days to 50% flowering	107.917	95.00-123.00	29.47	99.84
3	No. of effective tillers/plant	15.875	13.00-18.00	38.46	50.71
4	Days to maturity	131.958	118.00-149.00	26.27	99.93
5	Panicle length	27.463	23.80-29.57	24.24	11.49
6	Filled grain/ panicle	134.225	104.00-190.00	82.69	41.20
7	Total grain/ panicle	162.500	126.00-225.00	78.57	86.01
8	Grain yield/plant (g)	42.425	29.45-48.87	65.94	92.04
9	Biological yield//plant (g)	35.498	23.21-56.19	142.09	71.27
10	Harvest index	54.618	35.00-66.10	88.85	87.44
11	1000-grain weight (g)	25.911	18.01-30.10	67.12	76.48
12	Grain yield/plot (kg)	3.823	2.88-4.47	54.88	99.58
13	Grain yield/ha (t)	6.376	4.81-7.50	55.92	99.39

99.39% for grain yield per hectare, 92.04% for grain yield per plant, 91.70% for grain yield per square meter, 87.44% for harvest index, 96.01% for total grain per panicle, 80.36% for no. of filled spikelets per panicle, 79.07% for plant height and 76.48% for 1000-grain weight, respectively (Table 2).High estimates of broad sense heritability were also reported by some workers for character like days to 50% flowering, maturity and number of productive tillers per plant [31] and [36]. Broad-sense heritability was very high for all characters, except harvest index. Number of tillers per plant and number of grains per panicle exhibited positively high significant correlation with yield [37]. High genotypic co-efficient of variation and broad sense heritability with respect to biological yield in rice [35].

CONCLUSION

Hybrid Aloron was highest in mean performance with respect to grain yield, harvest index, 1000-grain weight and panicle length. The selected hybrids were of medium early to medium maturity period and had semi dwarf to tall plant stature. Considering varietal characters performance, the variety Aloron was the best than the respective commercial variety under the study and will be cultivate for higher yield. So, more or less the genotypes Aloron will be recommended for future.

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