J. Expt. Biosci. 6(2):33-36, July 2015 ISSN 223-9626 (Online). ISSN 2077-3358 (Print)

PERFORMANCE OF DIFFERENT EXOTIC INBRED RICE GENOTYPES DURING TRANSPLANTED AMAN SEASON

A. Kabir[1], M.J. Rahman[*2], M. M. Rashid[1], M. S. Islam[3]

**Corresponding author, E-mail: julfiker.rahman@brac.net*

Abstract

Five exotic rice genotypes including one check BRRI dhan39 were evaluated for the performance of growth and yield parameter during transplanted *Aman* season 2012 in BARDC, Gazipur, Bangladesh. The exotic genotypes were CNI9012, GSR IRRI I 2, OM576, Thai03 and Thai011. Experiment results showed the significant differences on growth and yield contributing parameters among the varieties. The yield of OM576 (5.81 t ha^{-1}) was higher than the popular check BRRI dhan39 and the lowest grain yield was found in Thai03. The highest yield was observed due to higher panicle number m^{-2} (443.3) and higher spikelet filling percentage. The growth duration of OM576 (101 days) was 17 days shorter than BRRI dhan39 (118 days). The result suggests that the genotype could be recommended to release as new variety in Bangladesh for increasing rice yield in *Aman* season.

Key words: Inbred, Rice and genotypes

Introduction

The people in Bangladesh depend on rice as staple food and have tremendous influence on agrarian economy of Bangladesh. Rice alone constitute of 95% of the food grain production in Bangladesh (Julfiquar *et al.*, 1998). Among different groups of rice, transplant *Aman* (T. *Aman*) rice cover about 47.73% of total rice area and it contributes to 33.44% of the total rice production in the country (BBS, 2008). Transplant *Aman* covers the largest area of 5.05 million hectare with a production of 9.66 million metric ton and the average yield of rice in Bangladesh is 2.73 t ha^{-1} (BBS, 2008), which is approximately 50% of the world average rice grain yield. The reason for low yield of rice is mainly associated with lack of use of improved varieties, balanced fertilizer and modern techniques of cultivation (Mamun *et al*., 2012). The country is now producing about 42.3 million tons of clean rice @ 3.78 t ha^{-1} in 11.2 million ha of land. A conservative statistics given by Bhuiyan *et al.* (2002) indicates that about 21% higher amount of rice than the production of 2000 have to be produced to feed the population by the year 2025. There is no opportunity to increase rice area consequently; much of the additional rice required will have to come from higher average yield on existing land. Clearly, it will require adoption of new technology such as high management package, high yielding cultivar, higher input use etc. (Wang *et al.*, 2002). The conventional varieties of rice in Bangladesh are comparatively lower yield and it seems impossible to change this yield with reachable resources under the prevailing situation (Awal *et al*, 2007). At this stage, high yielding varieties of rice may be a breakthrough, which could overcome perpetual yield stagnancy. To feed ever increasing hungry millions people of Bangladesh there is no option but go for high yielding rice. Development and introduction of high yielding genotypes should get topmost priority especially in *Aman* season. So for increasing our rice yield in *Aman* season it is very necessary to introduce high yielding rice genotypes in Bangladesh. Some exotic rice genotypes were used in this study aiming to find out the short growth duration and high yield suitable in Bangladesh.

Materials and Methods

Five exotic inbreed rice genotypes and one popular variety BRRI dhan39 were evaluated in the BRAC Agricultural Research and Development Centre at Gazipur during *Aman* season 2012. Seeds were

[1] Senior Agronomist, [2]Agronomist, [3]Programme Head, Agriculture and Food Security Programme, BRAC.

collected from four different sources viz, CNI9012 and GSR IRRI I 2 from International Rice Research Institute (IRRI), Thai03 and Thai011 from Thailand and OM576 from Vietnam. The popular rice variety developed by BRRI was used as standard check. The design of experiment was randomized complete block design (RCBD) with three replications. The area of unit plot was 10.26 m^2. The seeds were shown in a seedbed and 18 days old seedlings were transplanted following the spacing of 20 cm x 15 cm for all genotypes. Three seedlings were used in each hill. The fertilizer was used at the rate of 180-80-70-60-10 kg ha^{-1} of Urea, TSP, MoP, Gypsum and Zinc sulphate. TSP, Gypsum and Zinc sulphate were applied as basal at final land preparation. Urea was applied in three splits as basal, 25 DAT and at the time of heading. Half of MoP was used at final land preparation and half at 25 DAT. All other agronomic management was done as and when necessary in optimum level to maximize the yield. Data on grain yield was taken from 6 m^2 area and converted into ton per hectare. Growth duration was counted as the number of days required to physiological maturity from sowing. The data on plant height, tillers m^{-2}, panicles m^{-2}, spikelets $panicle^{-1}$, grain filling percentage, 1000 - grain weight and grain yield (t ha^{-1}) at 14% moisture content were recorded. Data was analyzed according to Gomez and Gomez (1984) and mean values were compared by LSD test. Productive tillers percentage was calculated using the following formula:

Productive tillers percentage = 100 X (Panicle number at PM/Tiller number at PI)

Results and Discussion

Plant height and tiller dynamics:

Different genotypes had significant effect on the plant height at different growth stages (Table 1). Thai 03 produced maximum plant height at all growth stages which was statistically similar with Thai 011 at 20 DAT and BRRI dhan39 at 50% flowering and maturity stage. At 20 DAT BRRI dhan39 produced the lowest plant height. At 40 DAT, 50% flowering stage and maturity stage OM 576 produced lowest plant height which was statistically similar with BRRI dhan39 at 40 DAT and Thai 011 at maturity stage. Dwarfism is one of the most valuable traits in rice because dwarf cultivars are more resistant to damage from wind and rain and are associated with stable, increased yields (Ji *et al*, 2013).

Table 1. Plant height and tiller dynamics at different growth stages of the rice genotypes grown during *Aman* season

Variety	Plant height (cm) at different growth stages				Tillers m^{-2} (no.) at different growth stages				PT (%)
	20 DAT	40 DAT	FL	PM	20 DAT	40 DAT	FL	PM	
CNI 9012	53	83	117	118	400	522	400	378	70
GSR IRRI I 2	52	84	116	120	433	511	367	356	65
OM 576	53	78	92	104	422	578	478	456	75
Thai 03	57	94	123	124	389	533	333	322	61
Thai 011	55	84	100	105	333	478	367	333	63
BRRI Dhan39	46	79	119	120	333	544	311	289	51
$LSD_{.(0.05)}$	2.95	4.40	3.67	4.02	65.19	67.35	57.18	42.88	9.18
CV (%)	3.08	2.89	1.82	1.92	9.30	7.01	8.36	6.63	7.86
F-test	**	**	**	**	*	*	*	**	**

* and ** Level of significance of F value at 0.05 and 0.01 probability levels, respectively, DAT= Days after transplanting, FL = 50% Flowering stage, PM = Physiological maturity stage and PT = Productive tillers

Tiller number m^{-2} was significantly influenced by different genotypes at all growth stages (Table 1). Tiller number m^{-2} increased with age but after flower initiation it declined. At 20 DAT the maximum tillers m-2 (433) produced GSR IRRI I 2 that was statistically similar with OM 576, CNI 9012 and Thai 03 and lowest tillers (333) produced Thai 011 and BRRI dhan39. At 40 DAT, 50% flowering and maturity stage OM 576 produced maximum tillers m^{-2} which was statistically similar with other variety except Thai 011 at 40 DAT. At 50 % flowering and maturity stage BRRI dhan39 produced lowest tillers m^{-2} that was similar with Thai 03, Thai 011 and GSR IRRI I 2 at 50 % flowering stage and Thai 03 at maturity stage. There was a significant difference of productive tillers percentage of tested varieties (Table 1). OM 576 produced the maximum productive tillers percentage (75%) which was similar with CNI 9012. The lowest productive tillers percentage (51%) was produced by BRRI dhan39.

Yield components

There was a significant difference of yield components such as panicles m^{-2}, spikelets panicle^{-1}, spikelet filling percentage and thousand grain weight in difference tested varieties. Yield components data measured in tested varieties are presented in Table 2. The maximum number of panicles m^{-2} was produced in OM 576 (433) and minimum number of panicle m^{-2} was produced by BRRI dhan39 (238) that was similar with Thai 011. BRRI dhan39 produced highest spikelets panicle^{-1} (132) which was statistically similar with CNI 9012 and lowest spikelets panicle^{-1} (86) produced Thai 011 that was statistically similar with Thai 03. The maximum spikelet filling percentage was produced OM 576 (80%) that statistically similar with CNI 9012 and lowest spikelet filling percentage was produced Thai 03 (56%). Rice cultivars with large panicles do not always guarantee high yield and grain quality, probably due to the slow grain filling and many unfilled grains of inferior spikelets (Dong, 2014). The highest 1000- grain weight produced in Thai 011 (29.88 g) which was similar with Thai 03 and lowest 1000 grain weight produced in CNI 9012 (17.79 g). Grain weight of Thai genotypes was higher because these genotypes produced bold grain compare to other tested genotypes.

Table 2. Yield components of different rice genotypes grown during *Aman* season

Variety	Panicles m^{-2} (no.)	Spikelets panicle^{-1} (no.)	Spikelet filling (%)	1000 - grain weight (g)	Grain yield (t ha^{-1})	Growth duration (days)
CNI 9012	364	128	77	17.79	4.59	108
GSR IRRI I 2	333	105	69	27.18	4.69	109
OM 576	433	73	80	22.83	5.81	101
Thai 03	322	88	56	29.55	3.45	95
Thai 011	300	86	67	29.88	4.48	94
BRRI Dhan39	278	132	68	22.12	4.95	118
LSD (0.05)	42.69	9.01	10.22	0.62	0.43	0.01
CV(%)	6.93	4.86	8.08	1.36	5.06	0.01
F-test	**	**	**	**	**	**

** Level of significance of F value at 0.01 probability level

Grain yield and growth duration

There was a significant difference of grain yield among tested varieties (Table 2). The maximum grain yield was obtained from OM 576 (5.81 ton h^{-1}) and minimum grain yield was obtained from Thai 03 (4.48 ton h^{-1}). The genotype OM576 produced highest grain yield because its maximum tillering ability, panicle number m^{-2} and spikelet filling percentage was higher compare to other genotypes. It is well documented that tillering capacity is one of the most important characters determining yield potential, as it is closely related with the number of panicle per unit area (Zou *et al*., 1991). Growth duration was significantly influenced by tested varieties (Table 2). The earliest genotypes was Thai 011 having growth duration 94 days and longest variety was observed BRRI dhan39 having growth duration 118 days. BRRI (2013) reported average growth duration of BRRI dhan39 is 122 days. The highest yielding genotype OM 576 required 101 days to maturity which was 17 days earlier compare to popular check BRRI dhan39. Short duration high yielding rice varieties have ability to increase cropping intensity and can be improved annual yield potential remarkably.

References

Awal, M. A., Habib, A. K. M. A. and Hossain, M. A. 2007. A study on comparative performances of hybrid and conventional rice varieties in aman season. *J. Agric. Rural. Dev.* **5**(1&2): 13-16.

BBS (Bangladesh Bureau of Statistics). 2008. Yearbook of Agricultural Statistics of Bangladesh. Stat. Div., Ministry of planning, Dhaka, Bangladesh, pp. 140-258.

Bhuiyan, N.I., Paul, D.N.R. and Jabber, M.A. 2002. Feeding the extra millions by 2025-challenges for rice research and extension in Bangladesh. A key note paper presented on national workshop on rice research and extension. Jan. 29-31. BRRI. p. 9.

BRRI (Bangladesh Rice Research Institute). 2013. Adhunik Dhaner Dhash (In Bangla), Bangladesh Rice Research Institute, Joydebpur, Gazipur. p. 10.

Dong, M., Gu, J., Zhang, L., Chen, P., Liu, T., Deng, J., Lu, H., Han, L. and Zhao, B. 2014. Comparative proteomics analysis of superior and inferior spikelets in hybrid rice during grain filling and response of inferior spikelets to drought stress using isobaric tags for relative and absolute quantification. *J. Proteomics*. 109:382.

Gomez, K. A., and Gomez, A. 1984. Statistical procedure for agricultural research, pp. 1-68.

Islam, M. S. 2008. Physiological traits for high grain yield, lodging characteristics and crop management for improving lodging resistance of hybrid rice. Ph. D. Thesis. Bangladesh Agricultural University, Mymensingh, Bangladesh. p. 47.

Ji, S. H., Gururani, M. A., Lee, J. W., Ahn B. O. and Chun, S. C. 2013. Isolation and characterisation of a dwarf rice mutant exhibiting defective gibberellins biosynthesis. *Plant Biology*. 16(2):1.

Julfiquar A. W., Haque, M. M., Haque, A. K. G. M. E. and Rashid, M. A. 1998. Current status of hybrid rice research and future programme in Bangladesh. A country report presented in the workshop on use and development hybrid rice in Bangladesh held at BARC on 18-19 May.

Mamun, M. A. A., Islam, S. M. M. and Rahman, M. M. 2012. Effect of NPKS mixed fertilizer on weed growth and performance of transplant Aman rice. *Bangladesh Agron. J.* **15**(1): 25-32.

Wang, S., Cao, W., Jiang, D., Dai, T. and Zhu, Y. 2002. Physiological characteristics and high-yield techniques with SRI rice. In: Assessments of the System of Rice Intensification. Proc. Intl. Conf., Sanya, Chaina. Apr. 1-4. pp. 116-124.

Zou, Y., Tang, Q., Hu, C., Liu, S. and Xiao, D. 1991. Dynamic simulation for rice growth and yield. II. The comparison and application of rice tillering statistical models. *Crop Research*. **5**(4):18–22.