

INFLUENCE OF CLONAL TILLER AGE ON GROWTH AND YIELD OF AMAN RICE VARIETIES

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ABSTRACT

A field experiment was carried out at Agronomy Field of Sher-e-Bangla Agricultural University, Dhaka during the period from June to November 2006 to study the growth and yield of inbred and hybrid rice with different clonal tillers age. The trial was conducted with two levels of treatments viz. A) Variety: BRRI dhan 32 and Sonarbangla 1; and B) Clonal tiller age 20, 25, 30, 35 and 40 days. Variety had significant effect on the parameters like total grains panicle⁻¹, filled grains panicle⁻¹, 1000-grain weight, grain yield and straw yield except effective tillers hill⁻¹ and harvest index. The higher grain yield (5.58 t ha⁻¹) was obtained from the hybrid variety (Sonarbangla 1) and lower grain yield (3.88 t ha⁻¹) with inbred variety (BRRI dhan 32). The hybrid variety had higher grain yield with all yield components as compared to inbred one. Clonal tiller age (days) had significant influence on panicle length, grain yield and straw yield. Clonal tiller of 25 days showed the best performance than other clonal tiller age. The highest grain yield (5.10 t ha⁻¹) was obtained from the clonal tiller of 25 days old and the lowest grain yield (4.31 t ha⁻¹) was obtained from the 40 days old clonal tiller. Irrespective of variety 25 to 35 days old clonal tiller showed superior performance. Hybrid variety transplanted with 25 days old clonal tiller gave significantly higher grain yield.

Key words : Rice, clonal tiller, growth, yield

INTRODUCTION

Rice (*Oryza sativa* L.) is the most important crop of tropical world. There are 111 rice-growing countries in the world that occupy about 146.5 million hectares land more than 90% of which is in Asia (Anon., 1999). Rice is the staple food for more than two billion people in Asia and many millions in Africa and Latin America. To feed the fast increasing global population, the world's annual rice production must increase to 760 million tons by the year 2020 (Kundu and Ladha, 1995). In Bangladesh there are three diverse growing seasons of rice namely Aus, Aman and Boro. About two-thirds of the cultivated land area of Bangladesh is occupied by rice. Increased rice production in this country is essential to meet the food demand of the teeming population. Unfortunately, the yield of rice is very low in Bangladesh (3.34 t ha⁻¹) compared to Australia (9.65 t ha⁻¹), Korean Republic (6.59 t ha⁻¹), Japan (6.70 t ha⁻¹) and Spain (6.59 t ha⁻¹) (FAO, 2004). Among the three distinct rice groups, transplanted Aman rice covers the largest area of about 5.678 million hectares with a production of 11.520 million tons of rice (BBS, 2004).

As rice is the main crop of Bangladesh, so more emphasis should be given on its cultivation practices. Rice can be cultivated either by seeds, seedlings or clonal tillers. In Bangladesh flooding starts in the month of June-July and reaches its peak in the month of August-September thus Aman rice may be badly affected by the flood. Although rice is adapted to lowland, complete submergence for more than 2-3 days may kill most of the rice cultivars (Mishra *et al.*, 1996) with serious damage for dwarf and semidwarf varieties and may lead to total crop loss. Clonal tillers are those tillers that can be collected from mother plants and transplanted as a new crop. It is possible to collect tillers from the undamaged fields and to transplant the damaged field after recession of flood water. Roy *et al.* (1990) and Biswas and Salokhe (2001) recommended to transplant the field using clonal tillers of 30 days old. Research findings are not available regarding other ages of clonal tillers.

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Further more, hybrid rice cultivation is gradually increasing in Bangladesh. One of the major constraints of hybrid rice is its higher seed cost and farmers have to purchase seeds every year from the traders. The above situation can be overcome by using clonal tillers that is now a days a proven technology (Biswas, 2001; Biswas and Salokhe, 2001; Biswas and Salokhe, 2002; Roy *et al.* 1990; Sharma, 1992). Research on use of different aged clonal tiller of aman rice is scanty in Bangladesh context. Hence an experiment was conducted with different ages of clonal tillers using inbred and hybrid variety of rice.

MATERIALS AND METHODS

The experiment was conducted at the Agronomy field at Sher-e-Bangla Agricultural University, Dhaka-1207 during June, 2006 to November, 2006. The experimental field belongs to the Agro-ecological zone of "The Modhupur Tract" (AEZ-28) with sub tropical climate. The land was fertilized with 120, 80, 120, 55 and 10 kg ha⁻¹ N, P₂O₅, K₂O, S and Zn applied in the form of urea, triple super phosphate (TSP), muriate of potash (MP), gypsum and zinc sulphate, respectively. The entire amounts of TSP, MP, gypsum and zinc sulphate were applied at final land preparation as basal dose. Urea was applied in two equal installments as half at 7 days after transplantation (DAT) and the second half at maximum tillering stage (25 DAT). The experiment was designed with two varieties viz. inbred variety (BRRI dhan 32) and hybrid variety (Sonarbangla-1) and five clonal tiller age (days) viz. 20, 25, 30, 35 and 40.

The experiment was laid in a split-plot design with three replications having varieties in the main plots and clonal tiller age (days) in the sub-plots. The size of unit plot was 4m x 3m. Clonal tiller of different ages as per treatment was transplanted on the well puddled plots on August 28, 2006 maintaining the standard spacing of 25cm x 15cm with two tillers hill⁻¹.

During experimentation two hand weeding were done 20 and 35 DAT. Other intercultural operations were done as per standard procedure. The harvesting of hybrid and inbred variety were done on November 08 and November 27, 2006, respectively. Ten hills per plot were pre-selected randomly from which different yield attributes data were collected and 6 m² areas from middle portion of each plot was separately harvested for recording grain and straw yields and converted to ton per hectare. All the collected data were analyzed following analysis of variance (ANOVA) technique using the IRRISTAT computer package program and the mean differences were compared by least significant difference (LSD) test at 5 % level of significance.

RESULTS AND DISCUSSION

Effect of variety

Variety significantly influenced panicle length, number of total grains panicle⁻¹, filled grains panicle⁻¹, 1000 grains weight, grain yield and straw yield but not for effective tillers hill⁻¹ and harvest index (Table 1). Hybrid variety gave numerically maximum tillers hill⁻¹ (10.08), and significantly highest panicle length (27.36 cm), grains panicle⁻¹ (196.75), filled grains panicle⁻¹ (156.84), 1000- grain weight (27.40 g) which eventually elevated the grain yield (5.58 t ha⁻¹). These parameters were 9.8, 25.17 cm, 112.83, 86.77, 20.09 g and 3.88 t ha⁻¹, respectively as lowest measurements from inbred variety. The result supports the findings of Ashrafuzzaman (2006), Akbar (2004) and Leenakumari *et al.* (1993). They opined that hybrid variety of rice was superior to inbred variety of rice regarding yield and yield components. The maximum straw yield (7.36 t ha⁻¹) was obtained from the hybrid variety compared to the straw yield (4.71) of inbred variety. The result agreed with that of Om *et al.*

(1999), who observed that hybrid variety exhibited superiority to other inbred varieties in grain and straw yield.

Effect of clonal tillers age (days)

Influence of clonal tillers age (days) was significant for panicle length, grain yield and straw yield but not at effective tillers hill⁻¹, number of grains panicle⁻¹, filled grains panicle⁻¹, 1000 grains weight and harvest index (Table 1) It was revealed that almost all yield components are harvested as maximum using 25-35 days old clonal tillers. Very old (40 days) clonal tiller produced minimum effective tillers hill⁻¹ and filled grains panicle⁻¹. The higher and lower panicle length (26.71 cm) and (25.28 cm) were observed from the clonal tillers age of 20 DAT and 35 DAT respectively. Kabir (2000) and Biswas (2001) observed that panicle lengths at harvest were higher when tillers were separated at 30 DAT. Paul (1999) found the maximum panicle length at harvest when tillers were separated at 25 DAT. The highest grain yield (5.10 t ha⁻¹) was obtained from the tillers age of 25 days which was statistically similar to 20, 30 and 35 days whereas the lowest grain yield (4.31 t ha⁻¹) was obtained from the tillers age of 40 days which was statistically similar to the 20, 30 and 35 days (Table 1). The result was in conformity with the findings of Biswas and Salokhe (2001), BRR (1989), Mollah *et al.* (1992) who observed higher grain yield from the 30 days old clonal tillers. BRR (1990) stated that splitting of tillers at 30 or 40 DAT produced satisfactory grain yield without significant loss of the mother crop. The highest straw yield (6.36 t ha⁻¹) was found from the tillers age of 20 days which was statistically similar with all other ages of clonal tiller except 40 days and the lowest straw yield (5.67 t ha⁻¹) was found from the tillers age of 40 days which was statistically similar to the different ages of clonal tillers except 20 days old tillers. The result was in conformity with the findings of Biswas and Salokhe (2001), BRR (1989a) and Mollah *et al.* (1992) who observed highest straw yield from 30 days old tillers.

Table 1. Effect of variety and clonal tiller age (days) on the performance of aman rice

Treatments	Effective tillers hill ⁻¹ (No.)	Panicle length (cm)	Grains panicle ⁻¹ (No.)	Filled grains panicle ⁻¹ (No.)	1000 grains weight (g)	Grain yield (t ha ⁻¹)	Straw yield (t ha ⁻¹)	Harvest index (%)
Variety								
BRR dhan 32	9.80	25.17	112.83	86.77	20.09	3.88	4.71	45.25
Sonarbangla 1	10.08	27.36	196.75	156.84	27.40	5.58	7.36	43.52
LSD (0.05)	NS	0.589	15.037	15.129	0.667	0.378	0.309	NS
CV (%)	13.33	3.62	6.98	14.82	2.18	23.25	9.61	16.29
Clonal tiller age (days)								
20	9.80	26.71	161.00	123.00	23.59	4.76	6.36	45.06
25	10.03	26.41	139.30	118.80	23.78	5.10	6.01	45.75
30	10.03	26.15	162.90	124.90	23.70	4.86	6.12	44.32
35	10.50	25.28	152.30	123.40	23.89	4.64	6.02	43.44
40	9.33	26.20	158.50	118.30	23.77	4.31	5.67	43.36
LSD (0.05)	NS	0.932	NS	NS	NS	0.597	0.489	NS
CV (%)	10.44	2.98	6.79	5.08	3.54	15.14	10.02	5.70

NS= Not significant

Combined effect of variety and clonal tiller age (days)

Combined effect of variety and clonal tillers age (days) significantly influenced panicle length, grains panicle⁻¹, filled grains panicle⁻¹, grain yield and straw yield but insignificant at number of effective tillers hill⁻¹, 1000 grains weight and harvest index (Table 2). The longer panicle length (28.58 cm) was obtained from 40 days old clonal tillers of hybrid variety which was similar to 30 days old tillers of the same variety. The shorter panicle length (23.82 cm) was obtained from the 40 days old clonal tillers of the inbred variety which was similar to the 35 days old tillers of the same variety. The higher

number of grains panicle⁻¹ (208.10) was obtained from the 30 days old clonal tillers of the hybrid variety which was similar to all other ages of clonal tillers of the same variety and the lower number of grains panicle⁻¹ (91.43) was obtained from the 25 days old clonal tillers of the inbred variety where no variation in grains panicle⁻¹ was observed for different ages of clonal tillers of the inbred variety. The higher number of filled grains panicle⁻¹ (169.20) was obtained from 35 days old clonal tillers of the hybrid variety which was similar to other ages of clonal tillers of the same variety. The lower number of filled grains panicle⁻¹ (77.67) was obtained from the 40 days old clonal tillers of the inbred variety. The higher grain yield (5.83 t ha⁻¹) was observed from the 25 days old clonal tillers of the hybrid variety which was statistically similar to all other ages of clonal tillers of the same variety except 40 days. The lower grain yield (3.40 t ha⁻¹) was observed from 40 days old clonal tillers of the inbred variety which was similar to 20 and 35 days old clonal tillers of the same variety. The maximum straw yield (7.87 t ha⁻¹) was recorded from the 30 days old clonal tillers of the hybrid variety which was statistically similar to 20 and 35 days old clonal tillers of the same variety. The minimum straw yield (4.36 t ha⁻¹) was recorded from the 30 days old clonal tillers of the inbred variety which was statistically similar to 40 days old clonal tillers of the same variety.

Table 2. Combined effect of variety and clonal tillers age on the performance of aman rice

Treatments	Effective tillers hill ⁻¹ (No.)	Panicle length (cm)	Grains panicle ⁻¹ (No.)	Filled grains panicle ⁻¹ (No.)	1000 grains wt. (g)	Grain yield (t ha ⁻¹)	Straw yield (t ha ⁻¹)	Harvest Index (%)
V ₁ D ₁	10.07	26.35	129.90	93.93	20.04	4.17	5.08	46.71
V ₁ D ₂	9.80	26.03	91.43	93.40	20.03	4.37	5.11	45.75
V ₁ D ₃	9.60	24.93	117.60	84.70	20.24	3.95	4.36	47.32
V ₁ D ₄	10.53	24.72	113.50	84.13	19.84	3.52	4.61	42.89
V ₁ D ₅	9.00	23.82	113.80	77.67	20.32	3.40	4.40	43.62
V ₂ D ₁	9.53	27.07	192.20	153.20	27.13	5.35	7.64	43.43
V ₂ D ₂	10.27	26.78	187.10	144.30	27.53	5.83	6.91	45.75
V ₂ D ₃	10.47	27.37	208.10	165.20	27.17	5.76	7.87	41.33
V ₂ D ₄	10.47	26.98	191.20	169.20	27.93	5.76	7.43	43.99
V ₂ D ₅	9.67	28.58	205.20	152.40	27.22	5.21	6.94	43.10
LSD _(0.05)	NS	1.317	33.614	33.829	NS	0.844	0.692	NS
CV (%)	10.96	2.99	18.30	15.81	23.71	10.31	6.63	9.00

V₁=BRRI dhan 32, V₂=Sonarbangla 1, D₁=20 days, D₂=25 days, D₃=30 days, D₄=35 days, D₅=40 days, NS=Not significant

The hybrid variety gave higher yield than the inbred variety and the younger clonal tiller showed higher yield performance than the aged tiller. The 20-35 days old tiller can be used as clonal propagation of hybrid and inbred rice however, to reach a specific conclusion and recommendation, more research work on clonal tiller should be done in different Agro-ecological zones of Bangladesh.

Acknowledgement

The financial support by SAURES (Sher-e-Bangla Agricultural University Research System) for this work is gratefully acknowledged.

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