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# RESPONSE OF DIRECT SEEDING AND SEEDLING AGES ON YIELD AND YIELD ATTRIBUTES IN AMAN RICE (*Oryza sativa* L.) VARIETIES

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## ABSTRACT

An experiment was conducted at the Research Farm of Crop Physiology and Ecology Department, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh during June to October 2011 to find out the response of seedling ages on yield and yield contributing characteristics of rice varieties in *Aman* season. The research work was consisted of two rice varieties viz., BRRI dhan49 and BINA dhan7 and four seedling ages viz., direct seeding, 15, 25 and 30 days old seedlings. The design was randomized complete block design with three replications. The highest plant height, filled spiklets panicle$^{-1}$, unfilled spikelet panicle$^{-1}$ and straw yield was obtained by BRRI dhan49 with 25 days aged seedlings. On the other hand, BINA dhan7 with direct seeding produced highest tillers hill$^{-1}$, panicle hill$^{-1}$, 1000 grain weight and grain yield. However, the highest grain yield was produced by BINA dhan7 with direct seeding (5.16 t ha$^{-1}$) which was at par with BINA dhan7 and BRRI dhan49 when transplanted at 25 days aged seedlings (5.10 and 4.87 t ha$^{-1}$).

**Key words:** Aman rice, direct seeding, seedling ages, yield

## INTRODUCTION

One of the most important crops in the worldwide is rice, as in the most of the countries it is used as staple food (Dowling *et al*. 1998). Globally, Bangladesh is the fourth rice producing country where it is also primary food and its gross production near about 33.54 million metric tons per year as cultivated in *Aus, Aman and Boro seasons* (BSS 2011). In *Aman* season the rice production is about 2.26 metric tons hectare$^{-1}$ (BSS 2011) which is very low compared to other progressive rice producing countries. Obviously, the causes of low production of rice in Bangladesh are manifold for instance environmental, varietals and also most are technological necessities. On the other hand, in Bangladesh population is increased day by day in an unexpected rate which ultimately creates excessive pressure on the cultivable land and other resources. Allegedly, the rice production should be improved urgently to meet up the flourish demand. The farmers of Bangladesh use over aged seedling, therefore, the congenital growths of rice are checked notably by seedling age, response negatively and markedly reduces the production (Mahapatra *et al.* 1990). Like other management practices seedling age is a considerable and commencing practice by which plant height, panicle length, tiller formation, grain yield and other yield related characteristics are affected (BRRI 1981). Direct seeding technology of rice gives almost same yield with the conventional planted crop (Awan *et al*. 2006). In addition, seedling ages are not same for all varieties of rice and seasons. Therefore, the present investigation was conducted to evaluate the response of different aged seedlings of BINA dhan7 and BRRI dhan49 on their yield potential and yield contributing characteristics.

## MATERIALS AND METHODS

The experiment was conducted during June to October 2011 at the research farm of Crop Physiology and Ecology Department, Hajee Mohammad Danesh Science and Technology University, Dinajpur to search out the effect of different seedling ages on the yield potential and yield dependent characteristics of two rice varieties (BINA dhan7 and BRRI dhan49) in aman season. The experiment was set up in a factorial randomized complete block design with three replication and also treatments just as taking rice varieties as factor A (BINA dhan7 and BRRI dhan49) and different seedling ages (direct seeding i.e. 0, 15, 25 and 30 days old seedlings) as factor B. For raising seedlings 3 × 1 m$^2$ seedbed size was maintained. Afterwards, for getting 35, 25 and 15 days old seedlings the seeds were sown in the seedbed on 08, 18 and 28 June, 2011 consecutively. Then by using tube-well water both

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of the varieties seeds were soaked in containers for 24 hours. Following this, the seeds were incubated for 48 hours for sprouting. After this, by keeping 3 m × 3 m plot size total 24 (2 ×3 × 4) numbers of plots were prepared and also 1.0 m plot to plot and 2.0 m block to block distance was maintained. Fertilizer was applied at the rate of 140-35-100-25-3.5 kg $ha^{-1}$ N, P, K, S, and Zn in the form of urea, triple supper phosphate (TSP), muriate of potash (MoP), gypsum and zinc sulphate, respectively, as recommended dose for *aman* rice (BARC, 2005). A spacing of line to line distance 20 cm and hill to hill distance 20 cm was maintained. All management practices were done as and when necessary. Harvesting was done plot wise after full ripening of the crop and data recorded of plant height, number of tillers and panicles per hill, Panicle length, number filled and unfilled grains per panicle, Grain and straw yield, Thousand grains weight. The data were analyzed by partitioning the total variance with the help of computer by using MSTAT program. The treatment means were compared using Duncan's Multiple Range Test (DMRT) at $P \leq 5\%$ level of significance.

## RESULTS AND DISCUSSION

**Plant height (cm):** Plant height at harvest was not significantly influenced by the interaction effect of age of seedling and varieties of rice (Figure 1). The height of plant varied from 98.5 cm recorded in BINA dhan7 when seeded directly to 114.1 cm recorded in BRRI dhan49 transplanted 25 days old seedling. Hossain (1999) also reported similar results. Murthy *et al*. (1993) reported that plant height did not vary with the use of different aged seedlings for transplantation.

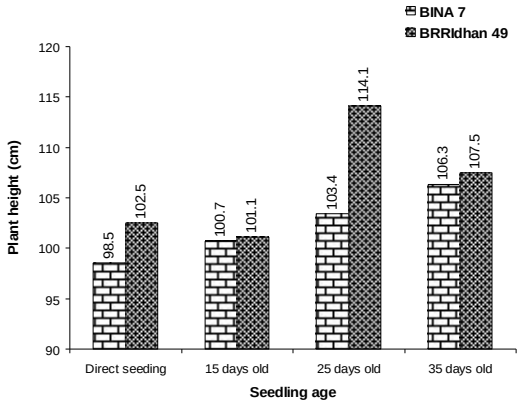


**Figure 1**. Effect of seedling age and varieties of rice on plant height at harvest.

**Panicle length (cm):** The interaction effect of age of seedling and varieties did not influence the length of panicle significantly (Figure 2). The length of panicle varied from 23.0 cm recorded in BRRI dhan49 when seeded directly in the main field to 27.3 cm recorded in BINA dhan7 transplanted 25 days old seedling. Faruk *et al.* (2009) also reported the higher panicle length, grain, and straw yields in four weeks (near about 25 days) old seedlings.

**Tillers number $hill^{-1}$:** Age of seedling at transplanting and rice varieties interacted significantly to influence the number of tiller $hill^{-1}$ (Table 1). The highest number of tiller $hill^{-1}$ (15.9) was obtained from BINA dhan7 directly seeded in the main field which was followed by that obtained from BINA dhan7 transplanted with 25 days old seedling (14.1). BRRI dhan49 transplanted with 35 days old seedling produced the lowest number of tillers $hill^{-1}$ (12.3) which was statistically equal to those obtained from all other treatment combinations. Ashraf *et al*. (1999) reported that 25- to 35-days old seedling produced significantly higher number of tillers and productive tillers $hill^{-1}$, paddy and straw yields. According to Alam *et al*. (2002) seedlings of 35 days performed better than 28 or 21 days old seedlings in aspect of number of tillers $hill^{-1}$, the number of effective tillers $hill^{-1}$, grain yield and straw.

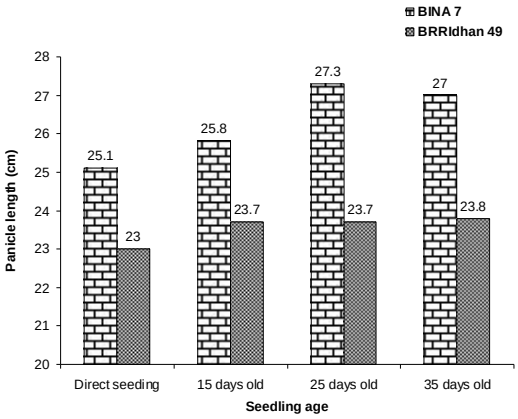


**Figure 2.** Effect of seedling age and varieties of rice on panicle length at harvest

**Filled spiklets $panicle^{-1}$:** Seedling age and rice varieties interacted significantly to influence the number of filled spikelets $panicle^{-1}$ (Table 1).The highest number of filled spikelets $panicle^{-1}$ (146) was obtained from BRRI dhan49 with 25 days old seedling which was followed by those obtained from BRRI dhan49 with 35 days old seedling (135), BINA dhan7 seeded directly in field (128), BRRI dhan49 with 15 days old seedling (125) and BINA dhan7 with 25 days old seedling (124). Singh *et al.* (1998) observed that transplanting of 25 days old seedlings significantly improved yield attributes and yield. BINA dhan7 with 15 days old seedling gave the lowest number of filled spikelets $panicle^{-1}$ (117) which was statistically similar to

those obtained from BINA dhan7 with 35 days old seedling (120) and BRRI dhan49 seeded directly (123).

**Unfilled spiklets panicle$^{-1}$:** Seedling age and varieties interacted significantly to influence the number of unfilled spiklets panicle$^{-1}$ (Table 1).The highest number of unfilled spikelets panicle$^{-1}$ (17) was obtained from BRRI dhan49 with 25 days old

**Table 1.** Effect of seedling age and varieties on yield attributes and yield of Aman rice at harvest

| Variety | Seedling age | Tillers hill$^{-1}$ | Panicles hill$^{-1}$ | Filled spiklets panicle$^{-1}$ | Unfilled spiklets panicle$^{-1}$ | 1000 grain weight (g) | Grain yield (t ha$^{-1}$) | Straw yield (t ha$^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| BINA dhan7 | Direct seeded | 15.9 a | 13.8 a | 128 bc | 12 bc | 22.73 a | 5.16 a | 5.28 cd |
| | 15 days old | 12.7 bc | 11.5 bc | 117 c | 10 cd | 21.78 bc | 4.43 bc | 4.90 d |
| | 25 days old | 14.1 b | 13.8 a | 124 bc | 8 d | 21.20 cd | 5.10 a | 5.56 c |
| | 35 days old | 13.2 bc | 11.0 c | 120 c | 10 cd | 22.17 ab | 4.05 c | 5.14 cd |
| BRRI dhan49 | Direct seeded | 12.7 bc | 11.7 bc | 123 c | 12 bc | 21.10 cd | 4.48 bc | 7.11 b |
| | 15 days old | 12.5 c | 11.2 bc | 125 bc | 12 bc | 20.90 cd | 4.48 bc | 7.23 b |
| | 25 days old | 13.3 bc. | 12.4 b | 146 a | 17 a | 20.66 d | 4.87 ab | 8.59 a |
| | 35 days old | 12.3 c | 11.9 bc | 135 b | 15 ab | 19.39 e | 4.43 bc | 8.11 a |
| Level of significance | | * | * | * | ** | ** | ** | * |
| CV (%) | | 5.95 | 5.81 | 3.32 | 11.63 | 1.73 | 5.33 | 4.83 |

Column, values having same letter(s) do not differ significantly by DMRT at P ≤ 5% level.

seedling which was statistically similar to that obtained from the same variety 35 days old seedling (15). BINA dhan7 with 25 days old seedling provided the lowest number of unfilled spiklets panicle$^{-1}$ (8) which was statistically alike to that obtained from the same variety with 15 days old seedling (10).

**1000-grains weight (g):** The combined effect of seedling age and varieties on grain size which was expressed by 1000 grain weight was found to be significant (Table 1). BINA dhan7 when seeded directly produced the highest grain (22.73 g 1000-grain$^{-1}$) which was statistically at par with the same variety when transplanted with 35 days old seedling (22.17 g 1000-grain$^{-1}$). BRRI dhan49 with 35 days old seedling produced the lightest grain (19.39 g 1000-grain$^{-1}$) which was followed by BRRI dhan49 transplanted with 25 days old seedling (20.66 g 1000-grain$^{-1}$), BRRI dhan49 with 15 days old seedling (20.90 g 1000-grain$^{-1}$) and BRRI dhan49 seeded directly (21.1 g 1000-grain$^{-1}$).

**Grain yield** (t ha$^{-1}$): The interaction effect of age of seedling and varieties influenced grain yield of rice significantly (Table 1). BINA dhan7 seeded directly prouced the highest grain yield (5.16 t ha$^{-1}$) which was statistically at par with the same variety when transplanted with 25 days old seedling (5.10 t ha$^{-1}$) and BRRI dhan49 with 25 days old seedling (4.87 t ha$^{-1}$). Greater grain yield was contributed mainly by larger grain size, higher panicle number hill$^{-1}$ and higher number of filled spikelet panicle$^{-1}$ in the respective treatment combination. Singh *et al.* (2000) also found that among more than 20 genotypes tested some varieties were found better in direct seeding. Mollah (2001) observed that 28-day old seedlings produced more grain yield than 21-days old seedlings. Similar results also obtained by Kamdi *et al*. (1991) with 25 days old seedlings. BINA dhan7 with 35 days old seedling gave the lowest grain yield (4.05 t ha$^{-1}$) which was statistically equal to those obtained from the same variety with 15 days old seedling (4.43 tha$^{-1}$), BRRI dhan49 with 35 days old seedling (4.43 t ha$^{-1}$).

**Straw yield (**t ha$^{-1}$**):** The combined effect of seedling and varieties on straw yield was found to be significant (Table 1). Generally, BRRI dhan49 produced higher straw yield than BINA dhan7. BRRI dhan49 with 25 days old seedling provided the highest straw yield (8.59 t ha$^{-1}$) which was statistically similar with same variety transplanted with 35 days old seedling (8.11 t ha$^{-1}$). The straw yield of both of the treatment combinations were closely followed by those obtained from BRRI dhan49 with 15 days old seedling (7.23 t ha$^{-1}$) and

BRRI dhan49 seeded directly (7.11 t $ha^{-1}$). BINA dhan7 with 15 days old seedling gave the lowest straw yield (4.90 t $ha^{-1}$) which was followed by those provided by the same variety with 35 days old seedling (5.14 t $ha^{-1}$), seeded directly (5.28 t $ha^{-1}$) and with 25 days old seedling (5.56 t $ha^{-1}$).

## CONCLUSION

The tallest plant, filled spiklets $panicle^{-1}$, unfilled spikelet $panicle^{-1}$ and straw yield was obtained by BRRI dhan49 with 25 days aged seedlings. On the other hand, BINA dhan7 with direct seeding produced highest tillers $hill^{-1}$, panicle $hill^{-1}$, 1000 grain weight and grain yield. BINA dhan7 with 15 days old seedling gave the lowest straw yield (4.90 t $ha^{-1}$) than when transplanted it at 35 days (5.14 t $ha^{-1}$), seeded directly (5.28 t $ha^{-1}$) and 25 days (5.56 t $ha^{-1}$). The highest grain yield was produced by BINA dhan7 with direct seeding (5.16 t $ha^{-1}$) which was at par with BINA dhan7 and BRRI dhan49 when transplanted at 25 days aged seedlings (5.10 and 4.87 t $ha^{-1}$). So, cultivation of BINA dhan7 with direct seeding is a great approach in *Aman* rice production for *Monga* eradication in the northern part of Bangladesh.

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