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EFFECT OF AGE OF SEEDLINGS AND SPACING ON THE PERFORMANCE OF TRANSPLANT AUS RICE cv. BR3

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ABSTRACT

The research work was conducted at the Agronomy Field Laboratory of Bangladesh Agricultural University, Mymensingh during to study the effect of age of seedlings and spacing on the performance of transplanted aus rice cv. BR3. The results showed that the seedling age had significant influence on the various characters under study except 1000-grain weight. The highest number of tillers hill^{-1} (16.69), number of grains panicle^{-1} (136.39) and the highest grain yield (4.80 t ha^{-1}) were obtained from the treatment 25-day old seedlings. The lowest straw yield (6.88 t ha^{-1}) was also recorded from the same treatment. Spacing also showed significant effect on the studied characters except panicle length and 1000-grain weight. The highest grain yield of aus rice (1.15 t ha^{-1}) were obtained from 15 cm x 15 cm spacing. Results of the study also noted that 25-day old seedlings with 15 cm x 15 cm spacing may be practiced to the farmer level as well as obtain optimum grain yield from transplanted *aus* rice cv. BR3.

Key words: Seedling age, spacing, aus rice.

Introduction

Rice (*Oryza sativa* L.) is the staple food crop of Bangladesh and it plays absolutely a dominant role in the country's agriculture covering 89% of total cropped area with an average yield of 2.39 t ha^{-1} (BBS, 2004). It also provides nearly 40% of the total national employment, about two-thirds of the total calorie supply and about 50% of the total protein intake of an average person in the country (Bhuiyan, 1999). Bangladesh is yet self-sufficient in food production. Again, Aus rice has been contributing to food production in addition to other two rice crops (Aman and Boro) until mid-1980s. Aus rice began to lose its importance as farmers slowly started shifting to cultivation of irrigated Boro rice encouraged by its higher yields. So, it is necessary to produce more aus rice to achieve the goal of self-sufficiently in food. Thus, it is important to find out suitable management practices including age of seedlings and spacing are the major factors that needs to be considered during transplanting *aus* rice especially its influence on the tiller production, grains formation and other yield contributing characters (BRRI, 1981; Islam and Ahmed, 1981). Indeed, plant density has significant effects on rice production since interplant spacing influences rice growth, development, and yield in every circumstance (Sultana *et al*., 2012). More plant spacing means more functional leaves, leaf area, and total number of tillers per square unit area, which thus linearly increases the performance of individual plants (Devi and Singh, 2000). Closer plant spacing leads to more competition for growth factors such as water, nutrients, and light, hindering the yield of the crop, and wider spacing leads to less production per unit area (Kandil *et al*., 2010). Crop yield is a function of nutrient availability, moisture, solar radiation, and other growth input factors; thus, an optimum population of plants is crucial for an optimum level of production (Baloch *et al*., 2002). Seedlings age is another important factor due to its tremendous influence on plant height, tiller production, panicle length, grains per panicle and other yield contributing characters of T. Aus rice. The seedling age of the same variety differs with growing seasons. It was reported that the use of over aged seedling drastically reduced the yield (BRRI, 1981). So, it is very important to find out the optimum age of seedlings of variety for a particular season specifically in *aus* rice. Plant spacing is another factor that greatly influences the growth, development, yield and yield components of rice. Optimum plant spacing ensures proper utilizing more solar radiation and nutrients (Miah *et al.*, 1990). Under the conditions mentioned above further investigation is needed regarding the optimum seedling age and plant spacing for Transplant *aus* rice cv. BR3.

Materials and Methods

An experiment was conducted at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh to determine the effect of seedling age, spacing and their interactions on the performance of Transplant *aus* Rice cv. BR 3. The experiment included four seedling ages viz. 10, 15, 20 and 25 days and four spacing viz. 15 cm x 15 cm, 20 cm x 15 cm, 25 cm x 15 cm and 30 cm x 15 cm. The experiment was laid out in a randomized complete block design with three replications. The size of each unit plot was 4.0 m x 2.5 m and the space between blocks and between plots were 1.0 m and 0.05 m, respectively. The land was fertilized with recommended doses of urea, triple superphosphate, muriate of potash, gypsum and zinc sulphate. One-third of urea and full doses of other fertilizers were applied as basal dose before transplanting. The rest amount of urea was top-dressed in three equal splits at 15, 30 and 45 days after transplanting. Ten (10), 15, 20 and 25-day old seedlings were transplanted under 15 cm x 15 cm, 20 cm x 15 cm, 25 cm x 15 cm and 30 cm x 15 cm spacing at the rate of two seedlings hill^{-1}. Intercultural operations including weeding, water management and pest management were done whenever necessary. The Transplant *aus* rice cv. BR 3 was harvested on the end of August. Five hills were randomly selected from each unit plot prior to harvest for recording different data on plant characters, yield and yield components. Data on yield and yield contributing characters were recorded at harvest on the following parameters such as yield and yield components, the plant height, tillers number, panicle length, grains panicle^{-1}, 1000-grain weight, grain yield, straw yield, biological yield and harvest index, which were analyzed statistically following ANOVA technique and means were calculated by DMRT.

Results and Discussion

From the results, it was evident that seedling age had significant effect on most of the parameters studied, except panicle length, 1000-grain weight and harvest index. The 25- day old seedlings produced the shortest plant, highest total number of tillers hill^{-1}, highest number of grains panicle^{-1}, grain yield, lowest straw yield and highest biological yield. Whereas, the 10- day old seedlings produced the tallest plant, the lowest total number of tillers hill^{-1}, number of grains panicle^{-1}, grain yield, highest straw yield and lowest biological yield. The results showed that the plant height decreased with the increase in age of seedlings. The similar finding was reported by Kim *et al.* (1999). The younger seedlings produced less tillers than older ones. This result was supported by Roy and Satter (1992). The results also showed that grain yield decreased with decreasing seedlings age. Similar results were also reported by Roy *et al.* (1992), and Singh *et al.* (1999). Age of seedlings had no significant effect on number of 1000-grain weight (Table 1).

Plant height, total number of tillers hill^{-1}, number of grains panicle^{-1}, grain yield, straw yield, biological yield and harvest index were significantly affected by spacing. Closer spacing (15 cm x 15 cm) produced the tallest plant, highest total number of tillers hill^{-1}, number of grains panicle^{-1}, highest grain yield, straw yield, biological yield and harvest index. Whereas the wider spacing (30 cm x 15 cm) produced the lowest number of tillers hill^{-1}, number of grains panicle^{-1}, lowest grain yield, straw yield, biological yield and harvest index (Table 2). The result revealed that wider spacing produced the shortest plant and closer spacing the tallest. The results also showed that grain yield increased with decreasing spacing. Siddique *et al.* (1999) stated that grain yield of rice under closer spacing was significantly higher than wider spacing. Spacing had no significant effect ($p < 0.05$) on panicle length and 1000-grain weight.

The interaction of seedling age and spacing had significant effect on the production of number of grains panicle^{-1} and grain yield. The highest number of grains panicle^{-1} was obtained from 25 days old seedlings with closer spacing (15 cm x 15 cm) and the lowest number of grains panicle^{-1} was obtained from 10 days old seedlings with wider spacing (30 cm x 15 cm). The highest grain yield was obtained from 25 days old seedlings with closer spacing (15 cm x 15 cm) and the lowest grain yield was obtained from 10 days old seedlings with wider spacing (30 cm x 15 cm). The interaction between seedling age and spacing had no significant effect on plant height, total number of tillers hill^{-1}, panicle length, weight of 1000 grains and had a significant effect on number of grains panicle^{-1}, grain yield, straw yield, biological yield and harvest index (Table 3).

Table 1. Effect of age of seedling on different yield contributing characters and yield of transplanted aus rice

Seedling age	Plant height (cm)	No. of total tillers hill^{-1}	Panicle length (cm)	No. of grains panicle^{-1}	1000-grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
A1	90.07b	16.69a	25.11	136.39a	24.12	4.80a	6.88b	11.68b	40.96a
A2	91.64ab	13.48b	25.52	127.88b	25.33	4.53b	7.OOb	11.52b	39.21b
A3	93.12a	11.35c	24.20	117.29c	25.14	4.52b	7.60a	12.14a	37.20c
A4	93.86a	10.41 d	24.36	107.94d	24.96	4.48b	7.62a	12.09a	37.01 d
$S\bar{x}$	0.81	0.26	0.31	0.61	0.30	0.03b	0.05	0.07	0.19
Level of significance	**	**	NS	**	NS	**	**	**	**

Table 2. Effect of spacing on different yield contributing characters and yield of transplanted aus rice

Spacing	Plant height (cm)	No. of total tillers hill^{-1}	Panicle length (cm)	No. of grains panicle^{-1}	1000-grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
S_1	90.10c	10.84d	24.66	112.17d	24.96	3.99d	6.94b	10.93d	36.53d
S_2	91.69bc	12.62c	25.52	116.80c	24.59	4.40c	7.39a	11.79c	37.35c
S_3	92.53ab	13.63b	24.19	127.15b	25.13	4.79b	7.34a	12.13b	39.50b
S_4	94.37a	14.84a	24.82	133.38a	24.88	S.15a	7.42a	12.58a	40.98a
$S\bar{x}$	0.81	0.26	0.31	0.61	0.30	0.03	0.05	0.07	0.19
Level of significance	**	**	NS	**	NS	**	**	**	**

Table 3. Interaction effect of age of seedling and spacing on yield and yield of transplanted aus rice

Seedling age x Spacing	Plant height (cm)	No. of total tillers hill^{-1}	Panicle length (cm)	No. of grains panicle^{-1}	1000-grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
$A_1 \times S_1$	86.53	14.82	25.55	131.14bc	23.74	4.02g	6.49c	10.52f	38.26d
$A_1 \times S_2$	89.09	16.72	25.98	133.77b	23.86	4.54de	6.83b	11.37de	39.92c
$A_1 \times S_3$	91.67	17.48	24.83	139.80a	24.78	S.15b	7.07b	12.22bc	42.13b
$A_1 \times S_4$	92.97	17.74	24.10	140.84a	24.12	5.49a	7.12b	12.61 ab	43.52a
$A_2 \times S_1$	90.00	10.43	24.33	120.49e	25.17	3.95g	7.03b	10.98e	35.98e
$A_2 \times S_2$	90.15	13.38	27.11	122.14e	24.95	4.39ef	6.99b	11.38de	38.57d
$A_2 \times S_3$	91.81	14.61	24.87	131.00bc	25.98	4.63cd	6.96b	11.59d	39.93c
$A_2 \times S_4$	94.60	15.53	25.77	137.90a	25.22	5.14b	7.00b	12.15c	42.34b
$A_3 \times S_1$	91.11	9,48	24.22	106.15g	24.95	4.00g	7.13b	11.12e	35.93e
$A_3 \times S_2$	92.75	10.62	24.54	113.75f	24.70	4.26f	7.88a	12.14c	35.12e
$A_3 \times S_3$	93.23	11.73	23.32	121.67e	25.37	4.66cd	7.67a	12.32bc	37.78d
$A_3 \times S_4$	95.40	13.57	24.73	127.58cd	25.55	5.18b	7.79a	12.97a	39.95c
$A_4 \times S_1$	92.74	8.65	24.53	90.901	25.98	4.00g	7.12b	11.12e	35.96e
$A_4 \times S_2$	94.77	9.76	24.46	97.54h	24.83	4.39ef	7.88a	12.27bc	35.80e
$A_4 \times S_3$	93.39	10.72	23.76	116.15f	24.40	4.73cd	7.67a	12.40bc	38.15d
$A_4 \times S_4$	94.51	12.52	24.68	127.19d	24.65	4.80c	7.79a	12.58ab	38.12d
$S\bar{x}$	1.62	0.52	0.62	1.22	0.59	0.07	0.09	0.13	0.38
Level of significance	NS	NS	NS	**	NS	**	**	*	**

In a column, figures with same letter or without letter do not *differ* significantly whereas figures with dissimilar letter differ significantly (as per DMRT)

S_1 = 30 × 15 cm
S_2 = 25 × I S cm
S_3 = 20 × 15 cm
S_4 = 15 × 15 cm

A_1 = 25 Days
A_2 = 20 Days
A_3 = 15 Days
A_4 = 10 Days

* = Significant at 5% level of probability
** = Significant at 1% level of probability
NS = Not significant

Results of the present experiment may be concluded that 25- day old seedlings with 15 cm x 15 cm spacing may be practiced to the farmer level as well as obtain optimum grain yield from transplanted *aus* rice cv. BR3.

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