Int. J. Sustain. Crop Prod. 4(1):58-61 (February 2009)

EFFECT OF SEEDLING AGE AND NUMBER OF SEEDLING PER HILL ON THE YIELD AND YIELD CONTRIBUTING CHARACTERS OF BRRI Dhan 33

M.O. FARUK, M.A. RAHMAN AND M.A. HASAN

Department of Agronomy, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh

Accepted for publication: December 20, 2008

ABSTRACT

Faruk M.O., Rahman M.A. and Hasan M.A. 2009. *Effect of Seedling Age and Number of Seedling per Hill on the Yield and Yield Contributing Characters of BRRI Dhan 33*. **Int. J. Sustain. Crop Prod. 4(1):58-61**

A field experiment was conducted at the Agronomy Research Field, Hajee Mohammad Danesh Science and Technology University, Dinajpur during June to December, 2007 to find out the effect of age of seedling and number of seedlings hill^{-1} on the yield of short duration transplant *aman* rice named BRRI Dhan 33. The treatments consisted of four seedling ages viz. 2, 3, 4 and 5 weeks old and three levels of number of seedling hill^{-1} viz. one, two and three. Various seedling ages, different levels of number of seedlings hill^{-1} and their interactions significantly influenced the yield parameters. The highest effective tillers hill^{-1}, panicle length, grain, and straw yields were found in four weeks old seedling but the lowest results were found from the two weeks old seedling. Two seedlings hill^{-1} were the best performer in respect of yield and yield components. Effective tillers hill^{-1}, grains panicle^{-1}, grain and straw yields were higher than one or three seedlings hill^{-1}. The 1000-grain weight was unaffected by the seedling ages, number of seedlings hill^{-1} and their interactions. Finally, four weeks aged seedling demonstrated the best performance in respect of grain yield and this variety may preferably be cultivated with two seedlings hill^{-1} to obtain appreciably good yield in *aman* season.

Key words: BRRl Dhan 33, seedling age and number, yield parameter

INTRODUCTION

Agriculture in Bangladesh is predominantly rice based and Bangladesh is the fourth rice producing country in the world. It is grown in 6.46 million hectares of land with a total production of 12.55 million tons in the year 2005-2006. Although rice is the staple food of her people, the average rice production is 1.94 t ha^{-1} (BBS, 2006), which is very poor compared to other advanced rice growing countries like South Korea, Spain, Australia, China and Japan where the average yield is more than 5 t ha^{-1} (FAO, 1993). Bangladesh lacks arable land to extend rice production. Besides, rice production is decreasing day by day due to high population pressure, continuing drought and flood in farming areas, and conversion of farmlands to grow cash crops instead of rice. Because of these problems, the price of rice raised up to 49 to 60 percent in recent year (Anonymous, 2008). Therefore, it is an urgent need of the time to increase rice yield in Bangladesh. The reasons for low yield of rice are manifold; some are varietals, others are technological and rests are climatic. Undoubtedly, with the introduction of high yielding varieties the yield of rice has been increased, but the trend of increase is not linear. The yield can be increased by using improved cultural practices like use of quality seed, high yielding varieties, adopting plant protection measures, optimum seedling age, optimum number of seedling hill^{-1}, seedling raising technique, judicious application of fertilizers, etc. Among the improved cultural practices, seedling age and number of seedling hill^{-1} can play important roles in boosting yield of rice. Age of seedling is an important factor as it has a tremendous influence on the tiller production, grain formation and other yield contributing characteristics (BRRI, 1981). Generally, farmers of Bangladesh do not give due attention to the age of seedlings at transplanting and use aged seedling. The use of over-aged seedling retard the general performance of crop and the yield of the crop reduces drastically (BRRI, 1981), as the farmers are not aware of this factor for rice production. For optimum yield, age of seedlings at transplanting of a particular variety at a particular season may not be suitable for other varieties at other season. So, it is very important to find out the optimum age of seedling of a particular variety for a particular season. Number of seedlings hill^{-1} is another important factor for successful rice production because it influences the tiller formation, solar radiation interception, total sunshine reception, nutrient uptake, rate of photosynthesis and other physiological phenomena and ultimately affects the growth and development of rice plant. In densely populated rice field the inter specific competition between the plants is high in which sometimes results in gradual shading and lodging and thus favour increased production of straw instead of grain. It is, therefore, necessary to determine the optimum number of seeding hill^{-1} for high yield. In view of above facts, the present study was carried out to determine the optimum seedling age, optimum number of seedling hill^{-1} and the interactions between them on yield and yield components of high yielding *aman* rice variety BRRI Dhan 33.

MATERIALS AND METHODS

The study was carried out at the Agronomy Field Laboratory, Hajee Mohammad Danesh Science and Technology University, Dinajpur during June to December 2007 with a view to find out the effect of age of seedling and number of seedlings hill^{-1} on the yield of short duration transplant *aman* rice named BRRI Dhan 33. The treatments consisted of four seedling ages viz. 2, 3, 4 and 5 weeks old and three levels of number of seedling hill^{-1} viz. one, two and three. The experiment site belongs to the Old Himalayan Piedmont Plain area (AEZ-1). The experiment was laid out in a medium high land. The soil texture was sandy loam with pH 5.1. The structural class of the soil was fine and the organic matter content was around 1.06%. The experiment was laid out in a Randomized Complete Block Design (RCBD) with four replications. For raising of seedlings, a piece of high land was selected. First of all the whole nursery bed was divided into four equal plots. Each plot size was 8 m^2. Then sprouted seeds (500 g plot^{-1}) were sown in the first plot on 17 June, 2007. Similarly seed sown operation was performed at one week interval on 24 June to 8 July; 2007 in the 2nd, 3rd and 4th plot, respectively by following the treatments. The seedlings were uprooted on 22 July, 2007 and transplanted accordingly on the basis of experimental design. The size of each unit plot was 4.0 m x. 2.5 m and space between replications 1.0 m and plot to plot distance was 75.0 cm. The plot were uniformly fertilized as per recommendation with Urea, TSP, MP, gypsum and zinc sulphate at the rate of 180, 100, 70 and 60 kg ha^{-1} as source of N, P_2O_5, K_2O and S, respectively. Except urea all the fertilizers were applied as basal dose. Urea was top dressed in three equal splits at 15, 35 and 50 days after transplanting. All management practices were done as and when necessary. Five hills from each unit plot were taken randomly to record yield contributing attributes and the whole plots harvested to obtain grain and straw yield. The collected data were analyzed using the ANOVA technique and the significance of the mean differences was adjudged by the Duncan's New Multiple Range Test (DMRT) with the help of computer package MSTAT-C programme (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Effect of age of seedling on yield and yield components of BRRI Dhan 33

Age of seedling had significant influence on the yield and yield contributing characters of BRRI Dhan 33. The highest plant height (117.7cm) was recorded from four weeks old seedling. The lowest plant height (113.1cm) was recorded from two weeks old seedling. Among the ages, four weeks old seedling produced the highest number of bearing tillers hill^{-1}(8.26). The lowest (6.82) one was recorded from two weeks old seedling. Similar results were also reported by Kim *et al.* (1999). They told that young seedlings had lower effective tiller rate when compared with more aged seedlings. Maximum non-bearing tillers (3.15) were recorded from two weeks old seedlings and the lowest one (2.05) was in four weeks old seedling (Table 1). The findings indicated that number of unbearing tillers hill^{-1} increased by decreasing seedling age. This is might be due to the production of secondary and tertiary tillers in the main field by low aged tillers which are incapable for production of panicle. It was observed that the highest panicle length was found when four weeks old seedlings was transplanted which was statistically indifferent to the three weeks old seedlings and the lowest one was found when two weeks aged seedlings was transplanted which was statistically identical to the five weeks old seedlings. This variation as assed might be mainly due to optimum seedling age influenced by heredity. The highest number of grains panicle^{-1} (118.8) was recorded from four weeks aged seedlings and the lowest one (105.6) was five weeks old seedlings. This might be due to the contribution of the highest panicle length, the highest number of total spikelets panicle^{-1} and less number of sterile spikelets panicle^{-1}. Again maximum sterile spikelets were recorded from five weeks aged seedlings. 1000-grain weight was unaffected by age of seedling. Grain yield is the ultimate object of rice cultivation. From the Table 1, it was observed that the highest grain yield (4.07) was found when four weeks old seedlings was transplanted and the lowest grain yield (3.5 t ha^{-1}) was recorded when two weeks old seedlings transplanted. The highest grain yield was obtained by four weeks old seedlings might be due to the highest number of total bearing tillers hill^{-1}, panicle length and grains panicle^{-1}. Kamdi *et al*. (1991) found the similar results at 25 days (near about four weeks) old seedlings. The highest straw yield (5.54 t ha^{-1}) was produced by four weeks old seedling and the lowest one (4.24 t ha^{-1}) was in two weeks old seedlings (Table 1). Panikar *et al.* (1981) reported the similar information.

Effect of number of seedling on yield and yield components of BRRI Dhan 33

All the yield parameters but 1000-grain weight and panicle length was influenced by number of seedling hill^{-1}. The tallest plant height (115.4cm) was recorded from two seedlings hill^{-1} and the shortest (114.8 cm) was recorded from three seedlings hill^{-1}. The highest number of bearing tillers hill^{-1} (9.86) was recorded from two

seedlings hill^{-1} and the lowest one (7.04) was in single seedling hill^{-1}. Single seedling produced the highest number of non-bearing tillers hill^{-1} (2.89) and the lowest one (2.36) was found from two seedlings hill^{-1}. The highest number of grains particle^{-1} (114.4) was recorded from two seedlings hill^{-1} and the lowest one (109.6) was in single seedling hill^{-1}. Again, the maximum number of sterile spikelets (26.33) was recorded from three seedlings and the lowest number of sterile spikelets (23.95) was recorded from two seedlings hill^{-1} which was statistically similar to single seedlings hill^{-1}. The highest grain yield (3.91 t ha^{-1}) was obtained by two seedlings hill. The lowest grain yield (3.63 t ha^{-1}) was obtained by one seedling hill^{-1}. These results were similar to the findings of Asif *et al*. (1997). They reported that two seedlings hill^{-1} produced the highest paddy yield. This is might be due to highest number of bearing tillers hill^{-1}, panicle length and grains panicle^{-1}. The highest straw yield (5.0 t ha^{-1}) was recorded from two seedlings hill^{-1} and the lowest one (4.73 t ha^{-1}) was recorded from single seedling hill^{-1} (Table 2).

Interaction effect

Number of effective tillers hill^{-1}, grains panicle^{-1}, sterile spikelets panicle^{-1}, grain yield, straw yield was significantly affected by the interaction between the seedling age and number of seedlings hill^{-1}. The combination of four weeks aged seedling with two seedlings hill^{-1} showed the best performance in respect of all yield contributing characters without sterile spikelets panicle^{-1} whereas the lowest results was observed from the combination of two weeks aged seedlings with single seedling hill^{-1} (Table 3). Incase of sterile spikelets panicle^{-1} the highest number of sterile spikelets was recorded by the interaction between two weeks old seedlings with three seedlings hill^{-1} and the lowest one was recorded in three weeks old seedlings with one seedling hill^{-1} which was statistically similar with three and four weeks old seedlings with two seedlings hill^{-1}.

Table 1. Effect of age of seedling on yield and yield components of BRRI Dhan 33

Age of seedling (weeks)	Plant height at harvest (cm)	Effective tillers hill^{-1}	Unbearing tillers hill^{-1}	Panicle length (cm)	Filled grain panicle^{-1}	Sterile grain panicle^{-1}	1000 seed weight (gm)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})
2	113.1d	6.82d	3.15a	23.93b	107.0c	26.95a	22.6	3.50d	4.24d
3	115.4b	7.69b	2.58b	26.31a	115.4b	22.81b	24.09	3.98b	5.13b
4	117.7a	8.26a	2.05c	26.39a	118.8a	22.30b	23.80	4.07a	5.54a
5	114.5c	7.24c	2.59b	24.28b	105.6c	27.36a	22.89	3.55c	4.47c
CV (%)	1.10	1.54	8.59	2.58	1.83	3.56	4.37	2.91	2.84
LSD(0.05)	0.083	0.09	0.18	0.53	1.69	0.73	-	0.02	0.03

Table 2. Effect of number of seedling hill^{-1} on yield and yield components of BRRI Dhan 33

Number of seedling hill^{-1}	Plant height at harvest (cm)	Effective tillers hill^{-1}	Unbearing tillers	Panicle length (cm)	Filled grain panicle^{-1}	Sterile grain panicle^{-1}	1000 seed weight (gm)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})
1	115.3b	7.04c	2.89a	25.01	109.6c	24.29b	23.48	3.634c	4.73c
2	115.4a	9.86a	2.36c	25.50	114.4a	23.95b	23.33	3.919a	5.00a
3	114.8c	7.57b	2.53b	25.17	111.1b	26.33a	23.22	3.782b	4.80b
CV(%)	1.10	1.54	8.59	2.58	1.83	3.56	4.37	2.91	2.84
LSD(0.05)	0.07	0.08	0.16	-	1.47	0.63	-	0.02	0.03

Table 3. Interaction of age of seedling and number seedling hill^{-1} on yield and yield components of BRRI Dhan 33

Age of seedling (weeks)	Number of seedlings hill^{-1}	Plant height at harvest (cm)	Effective tillers hill^{-1}	Unbearing tillers hill^{-1}	Panicle length (cm)	Filled grain panicle^{-1}	Sterile grain panicle^{-1}	1000 seed weight (gm)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})
2	1	113.1	6.40h	3.23	23.73	103.2f	25.01ef	22.80	3.39i	4.13h
	2	113.4	7.14f	2.87	24.14	110.0d	25.95de	22.65	3.60g	4.14h
	3	112.8	7.11f	3.10	23.92	107.7de	29.89a	22.34	3.51h	4.45f
3	1	115.5	7.32e	2.92	25.92	114.5c	21.00i	24.32	3.80e	5.18d
	2	115.8	7.97b	2.48	26.61	118.3b	22.19hi	24.13	4.15b	5.30c
	3	114.9	7.81c	2.33	26.10	115.0c	23.70fg	23.81	3.99c	4.91e
4	1	117.5	7.97b	2.27	26.21	113.1c	23.17gh	23.75	3.91d	5.33c
	2	118.1	8.69a	1.79	26.53	123.3a	21.24i	23.92	4.20a	5.70a
	3	117.4	8.12b	2.08	26.42	118.4b	24.02fg	23.72	4.12b	5.59b
5	1	114.4	6.68g	2.87	24.18	107.6de	27.96b	23.07	3.42i	4.29g
	2	114.9	7.62d	2.30	24.44	106.0ef	26.42cd	22.91	3.72f	4.86e
	3	114.1	7.41e	2.6	24.24	103.3f	27.69bc	22.69	3.50h	4.26g
CV(%)		1.10	1.54	8.59	2.58	1.83	3.56	4.37	2.91	2.84
LSD (.05)		-	0.16	-	-	2.78	1.27	-	0.04	0.06

Mean values in a column having the same letter (s) do not differ significantly at 5% level of probability as per DMRT

REFERENCES

Anonymous. 2008. The Monthly Current Memory" April, 2008. Glorious pub. Dhaka. p. 5

Asif, M.; Chowdhury, F. M. and Saeed, M. 1997. Panicle structure, kernel quality and yield of fine rice as influenced by different NPK levels and per hill seedling density. Pakistan J. Agril. Sci. 34 (1-4): 73-77

BBS (Bangladesh Bureau of Statistics) 2006. Statistical year book of Bangladesh. Bangladesh Bureau of Statistics, Statistics Division, Ministry of planning, Govt. of the people's republic of Bangladesh.

BRRI (Bangladesh Rice Research Institute). 1981. Annual Report for 1977-78. Bangladesh Rice Research Institute. pp. 9, 38

FAO (Food and Agriculture Organization). 1993. Zinc and Sulphure deficiencies Project. TCP/BDG/2203. UNDP, Bangladesh. pp. 9-16

Gomez, K. A. and Gomez, A. A. 1984. Statistical procedures for Agricultural Research, John willey and sons. New York, Brisbance. Singapore. pp. 139-240

Kamdi, J. T.; Hatwar, K. G.; Bodbe, G. N. and Patil, S. M. 1991. Effect of age of seedlings at transplanting on the yields of rice varieties. J. Soils and Crops. 1(2): 154-156

Kim, S. S.; Kim, B. K.; Choi, M. G.; Back, M. H.; Choi, W. Y. and Lee, S. Y. 1999. Effect of seedling age on growth and yield of machine transplanted rice in southern plain region. Korean J. of crop Sci. 44(2): 122-128

Panikar, K. S.; Pillai, P. B. and Chandrasekharan, P. 1981. Influence of age of seedlings, spacing and time of application of nitrogen on the yield of rice var. IR8. Agric. Res. Kerala. 16 (2): 227-229[Cited from Rice Abst. 4 (1): 10