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Yield Performance of Three Aromatic Fine Rice in a Coastal Low Land

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Abstract: A field experiment was conducted in a coastal low land to observe the performance of three aromatic rice varieties namely Begunbitchi, Chinigura-1 and Kalijira at the Field Laboratory of Agrotechnology Discipline of Khulna University during aman season 2003. The experiment was laid out in a Randomized Complete Block Design with five replications. Thirty-three days aged seedlings were transplanted with 3 seedlings/hill. Fertilizers were applied at the rate of 50, 35 and 88 kg N, P and K h^{-1}, respectively. The yield and yield components varied significantly among the varieties except 1000-grain weight. Chinigura-I gave the highest grain yield (2.30 t ha^{-1}) followed by Kalijira (2.08 t ha^{-1}) and Begunbitchi (0.85 t ha^{-1}). The highest grain yield of Chinigura-I was obtained due to its longer panicle, number of spikelets per panicle and higher harvest index. The yield of Chinigura-I in the coastal low land was almost similar to that of national average yield in Bangladesh for this variety (2.40 t ha^{-1}).

Key words: Coastal low land, aromatic fine rice

INTRODUCTION

Rice (*Oryza sativa* L.) is the worlds leading food crop, cultivated over an area of about 145 million ha with production of about 380 million tones[1]. It is the most extensively cultivated crop and viewed as staple food in Bangladesh. More than 90% of the people depend on rice for their diets. Among the major rice growing countries of the world, Bangladesh ranks third in rice area and fourth in production[2].

Aromatic rice is a general term used for rice varieties that have flavor and aroma. They are generally medium to long-grained and have a light, fluffy texture when cooked. The aromatic rice rated best in quality and fetches much higher price than high quality non-aromatic rices. Aroma of rice is due to certain chemicals present in the endosperm viz., 2-acetyl-1-pyrroline and 100 other volatile compounds[3].

The supply of aromatic rice is not sufficient to fulfill the demand of the people in Bangladesh because of its low area coverage as well as lower yield. However, its higher price and low cost of cultivation generated higher profit margins captured to other varieties[4]. Aromatic rices of Bangladesh have got the potential to enter the export trade and she exported 50-55 tones aromatic rices to Europe, The United States and the Middle East[5].

On the Agricultural front, virtually there is little scope of increasing production through horizontal expansion of hectareage in Bangladesh. What we must strive to achieve are: an increase in the output from our traditionally arable lands as well as an increase in the productivity of the marginal lands (e.g. saline soils) especially in coastal low lands which have so far remained under-utilized. The coastal saline soils, covering an area of almost 5,704 ha of low lands in the southern districts of the country[6] are the most important land resources. However, the potentiality of these land resources has not been explored properly. The selection and cultivation of crops tolerant to adverse soil conditions can be a better alternative to increase the overall productivity of this region. The land races of rice are well adapted in this region, but the information regarding the performance of aromatic rices is scanty. Das and Baqui[5] reported that most of the aromatic rice varieties in Bangladesh are of traditional type and are grown during aman season in the rainfed low land ecosystem. So, the present study was undertaken to observe the yield performance of three aromatic rice varieties in the coastal low-lying areas.

MATERIALS AND METHODS

This study was conducted during aman season 2003 at the Field Laboratory of Agrotechnology Discipline, Khulna University. It is located in the agro-ecological zone (AEZ) 13 (Gangetic Tidal Floodplain)[7]. The experimental site was characterized by moderately high temperature and heavy rainfall during the Kharif season (April-October) and scantly rainfall with moderately low temperature during the Rabi season (November-March).

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The texture of the soil was loam to clay-loam.

Three aromatic fine rice varieties were used in this experiment. These were Begunbitchi, Chinigura-1 and Kalijira.

This experiment was laid out in a Randomized Complete Block Design with five replications. The data recorded on different parameters were statistically analyzed with the help of "MSTAT" program. The differences between the treatment means were compared by LSD test after performing ANOVA[8].

Cultivation practices: A fertile, well-drained medium high land near the source of irrigation was selected for raising seedling. The seedbed was 10x2 m in size. It was made ready by ploughing 3 times with country plough followed by laddering under dry condition. Four kilogram of well-decomposed cow dung in each bed was applied 18 days before sowing and irrigated immediately to avoid drying of the manure. The field was puddled with sufficient water and leveled perfectly. The pre-tested seeds were soaked for 24 h. Then the seeds were allowed for sprouting. The well-sprouted seeds were broadcasted uniformly in each bed in slightly turbid 3-4 cm of standing water. The bed was kept wet by irrigation when it was necessary.

The main field was prepared by ploughing 3 times with a country plough and twice by a power tiller. The field was puddled, leveled and thus made ready for transplanting. Thirty-five days old seedlings were uprooted from the nursery and transplanted in the main field.

Nitrogen, Phosphorous and Potassium were applied @ 88, 50 and 35 kg h^{-1}, respectively. Full doses of Phosphorus and Potassium and 1/4th Nitrogen was applied one day before transplanting as basal application. The rest of Nitrogen was applied in three installments as top dressing. Gap filling, weeding, water management, plant protection measures and other operations were done when it was necessary.

The crops were harvested at maturity. Time of maturity was identified when 80% grains were matured. The variety Begunbichi was harvested 87 days after transplanting and the variety Chinigura-1 and Kalizira were harvested after 127 days. The harvested crops were threshed, cleaned and processed. Necessary data were collected on various parameters. Grain yield was expressed at 12% moisture content.

Data collection: Data regarding yield and yield contributing characters were collected and analyzed statistically.

RESULTS AND DISCUSSION

Plant height: The plant height did not vary significantly among the varieties at 35 and 50 days after transplanting (DAT) but during harvest significant variations in plant height were found among the varieties tested (Table 1). The plant height was maximum in Kalizira (148.75 cm) and the minimum was in Begunbitchi (115.60 cm). In a study of BRRI[9], the plant height of Chinigura-1 was found 147 cm, which is similar to the result of the study.

Number of tillers per hill: The number of tiller per hill was significantly influenced by the variety at three different stages (35 and 50 DAT and at harvesting). The highest number of tillers was found in Chinigura-1 (8.00) at 35 DAT and Kalijira at 50 DAT (10.50) and lowest in Begunbitchi (6.00 and 7.25 at 35 and 50 DAT, respectively) (Table 1). At harvesting, Kalijira produced the maximum effective tillers (8.50) among the varieties.

Days required for booting, heading and flowering: The days required for booting, heading and flowering in the study was significantly influenced by varieties. Chinigura-I required the maximum days for booting (86.00), heading (88.50) and flowering (91.50) while Begunbitchi required the lowest i.e. 50.25, 52.50 and 55.25 days, respectively for booting, heading and flowering (Table 2) suggesting that Begunbitchi is a short durated variety.

Panicle length: The panicle length was significantly influenced by the varieties. The highest length was found in Chinigura-I (26.70 cm) followed by Kalizira (26.05) and the lowest was in Begunbichi (24.45 cm) (Table 3). The highest panicle length of Chinigura-1 contained the highest number of spikelets that contributed to the maximum yield.

Number of spikelets per panicle: The number of spikelets $panicle^{-1}$ was significantly influenced by variety. Chinigura-1 contained the highest number (188.75) of spikelets $panicle^{-1}$ and Begunbitchi possessed the lowest (137.65) (Table 3). There was no significant difference between Chinigura-1 and Kalijira. Because of the lowest number of spikelets $panicle^{-1}$ as well as the effective tillers per hill, Begunbitchi produced the lowest yield.

1000-grain weight: The 1000-grain weight was not significantly influenced by varieties. The highest 1000-grain weight was found in Chinigura-1 (12.803 g), which contributed to highest yield finally and the lowest was in Kalijira (12.250 g) (Table 3).

Table 1: Plant height and number of tillers hill^{-1} of three aromatic rice varieties measured at different stages

	35 DAT		50 DAT		At harvesting	
Varieties	Plant height (cm)	Tillers hill^{-1}	Plant height (cm)	Tillers hill^{-1}	Plant height (cm)	Tillers hill^{-1}
Begunbitchi	59.80	6.00	74.45	7.25	115.60	5.00
Chinigura-1	51.35	8.00	74.65	10.25	146.25	8.25
Kalijira	53.80	7.25	69.80	10.50	148.75	8.50
CV (%)	8.09	4.08	3.35	3.09	2.82	9.40
$LSD_{(0.05)}$	NS	0.75	NS	0.75	10.13	1.80

NS= Non significant
CV= Co-efficient of variation
LSD= Least significant difference

Table 2: Days required for booting, heading and flowering of three aromatic rices

Varieties	Booting (DAT)	Heading (DAT)	Flowering (DAT)
Begunbichi	50.25	52.50	55.25
Chinigura-1	86.00	88.50	91.50
Kalijira	84.50	87.25	89.75
CV (%)	0.82	1.14	0.97
$LSD_{(0.05)}$	1.57	2.27	2.00

CV= Co-efficient of variation
LSD= Least significant difference

Table 3: Yield and yield contributing characters of three aromatic rice varieties grown in coastal low land

Variety	Effective tiller hill^{-1}	Panicle length (cm)	No. of spikelets panicle^{-1}	1000 grain weight (g)	Grain yield (t ha^{-1})	Harvest index (%)
Begunbichi	5.00	24.45	137.65	12.41	0.850	42.15
Chinigura-1	8.250	26.70	188.75	12.80	2.305	48.54
Kalijira	8.50	26.05	176.00	12.25	2.087	42.26
CV (%)	9.48	1.67	6.90	6.28	10.500	6.59
$LSD_{(0.05)}$	1.801	1.13	30.30	NS	0.483	5.06

NS = Non significant
CV= Co-efficient of variation
LSD= Least significant difference

Grain yield: The grain yield was significantly influenced by the varieties. The highest grain yield was found in Chinigura-1 (2.305 t ha^{-1}) and the lowest was in Begunbitchi (0.85 t ha^{-1}) (Table 3). There was no significant difference between Chinigura-1 and Kalijira. Chinigura-1 produced the highest yield as its yield contributing parameters were maximum among the varieties except number of effective tillers per hill. According to BRRI[9], the mean yield of Chinigura-I is 2.4 t ha^{-1}, which is similar to that of this study.

Harvest index: Harvest index was significantly influenced by the varieties. The highest harvest index was found in Chinigura-1 (48.543%) and the lowest was in Begunbitchi (42.148%) (Table 3). There was no significant difference between Begunbitchi and Kalijira. The highest harvest index contributed positively to the highest yield in Chinigura-I.

The present study revealed that the tested varieties gave the satisfactory yield compared to the national average of 1.5-2.0 t ha^{-1}[4] for aromatic rice. So there is a great scope of producing aromatic fine rices in the coastal region. From this point of view it can be culminated that the aromatic fine-grained rice would be potential rice variety for the coastal low land areas. Future experiments would be conducted taking a large number of varieties in different locations of the coastal areas.

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