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Yield Performance of Three Aromatic Fine Rices in a Coastal Medium High Land

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Abstract: The study was carried out during aman season in the Field Laboratory of Agrotechnology Discipline, Khulna University, Khulna, Bangladesh to observe the yield performance of aromatic fine rices (*Oryza sativa* L.) in the medium high land of coastal region. The experiment was laid out in a Randomized Complete Block Design with three popular aromatic rice varieties of Bangladesh namely Begunbitchi, Chinigura-1 and Kalijira and five replications. All the parameters e.g. tiller number per hill, days required for booting, heading and flowering, panicle length, spikelet number per panicle, 1000-grain weight, grain yield and harvest index varied significantly among the varieties. Chinigura-1 produced the highest grain yield (2.47 t ha⁻¹) followed by Kalijira (2.15 t ha⁻¹) and Begunbitchi (0.92 t ha⁻¹). The yield of Chinigura-1 obtained in this study is almost similar to that of national average (2.40 t ha⁻¹). Chinigura-1 may be a potential aromatic rice variety in the coastal medium high lands of Bangladesh.

Key words: Coastal medium high lands, aromatic fine rices

INTRODUCTION

Rice (*Oryza sativa* L.) is the major food crop of Bangladesh. In Bangladesh, the area under rice cultivation was 10.71 million ha in 1999-2000, which produced 23.06 million tons of grains with an average yield of 2.15 ton ha⁻¹[1]. Among the rice varieties, scented or aromatic rice is popular in Asia and has gained wider acceptance in Europe and the United States because of their aroma, flavor and texture. Aromatic varieties command a higher price in rice market than do the non-aromatic ones. It is generally used to prepare dishes such as polau and biriani which are served on special occasions. Demand for aromatic rices in recent years has increased to a great extent for both internal consumption and export[2].

Most of the aromatic rice varieties in Bangladesh are traditional type, photoperiod-sensitive and are grown during transplanted aman season in the rainfed lowland ecosystem[3]. Baqui *et al.*[4] found that among the aromatic rice varieties of Bangladesh, Chinigura-1 is the predominant one that covers more than 70% farms in the northern districts of Noagaon and Dinajpur. The other important aromatic varieties are Kalijira (predominant in Mymensingh) and Begunbitchi. Islam *et al.*[3] observed that the yield of aromatic rice was lower (1.5-2.0 t ha⁻¹) but its higher price and low cost of cultivation generated higher profit margins captured to other varieties.

In Bangladesh, over 30% of the net cultivable land lies in the coastal zone. Out of 2.85 million ha coastal and off-shore land, about 1 million ha constitutes about 52.8% of the net cultivable area in 64 thanas of 13 districts. This area is affected by varying degrees of salinity[5] with the cropping intensity much less than the national average.

The coastal and off-shore land of Bangladesh is dominated by medium high lands-which is normally flooded upto about 90 cm deep. There is more than 1.156 million ha of medium high lands in coastal region[5]. Rice is the common crop in these areas, but salt-tolerant modern varieties of rice suitable for the coastal zone are not yet available except a few salt tolerant lines developed by BRRI. The aromatic varieties are grown on lands where the existing modern varieties are un-adaptable[4]. From this context, aromatic rice cultivation is an important alternative to explore the potentiality of these lands. Thus, this study was undertaken to observe the yield performance of aromatic rice varieties in the coastal medium high lands.

MATERIALS AND METHODS

The 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)[6] of Bangladesh. The experimental site is characterized by moderately high temperature and heavy rainfall during the

Kharif season (April-October) and scanty rainfall with moderately low temperature during the Rabi season. (November-March). The soil of the experimental area was loamy to clay-loam in texture.

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

This experiment was laid out in 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^[7].

Cultivation procedure: 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 kg of well-decomposed cowdung 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 ha⁻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 recorded on yield and contributing characters were statistically analyzed.

RESULTS AND DISCUSSION

Plant height: Table 1 shows that plant height varied significantly among the varieties. At 35 and 50 DAT the highest plant height was found in Begunbitchi (66.52 and 83.52 cm, respectively) and the lowest in Chinigura-1 (57.48 cm) but at harvesting the highest value was observed in Chinigura-1 (148.20 cm) and the lowest in Begunbitchi (124.08 cm). At all these stages, the plant height of Kalizira was statistically similar with Chinigura-1. In a study of BRRI^[8], the plant height of Chinigura-1 was found 147 cm, which is similar to the findings of this study.

Number of tillers per hill: The number of tillers per hill was significantly influenced by the varieties at three different stages (35 DAT, 50 DAT and at harvesting). The highest number of tillers was observed in Kalijira and lowest in Begunbichi in all stages (Table 1). Although Kalijira produced the maximum effective tillers (10.16) among the varieties its yield was lower than Chinigura-1 (Table 3).

Days required for booting, heading and flowering: The days required for booting, heading and flowering in the study varied significantly among the varieties. Chinigura-1 required the maximum days for booting (83.20), heading (86.00) and flowering (88.80) while, Begunbitchi required the lowest i.e. 47.00, 50.00 and 52.20 days, respectively for booting, heading and flowering (Table 2) indicating that Begunbitchi is a short-durated variety.

Panicle length: The length of panicle was significantly influenced by the varieties. The highest panicle length was found in Chinigura-1 (26.86 cm) followed by Kalijira (26.32 cm) and the lowest was in Begunbitchi (25.12 cm) (Table 3). Having long panicle, Chinigura-1 accommodated more number of spikelets.

Number of spikelets per panicle: Number of spikelets per panicle varied significantly among the varieties. The highest number of spikelets was obtained in Chinigura-1 (200.16) and the lowest in Begunbitchi (135.80) (Table 3). There was no significant difference between Chinigura-1 and Kalijira regarding number of spikelets per panicle.

1000-grain weight: The 1000-grain weight varied significantly among the varieties. The highest 1000-grain weight was observed in Chinigura-1 (16.41 g) and the lowest was in Kalijira (13.56 g) (Table 3). Begunbitchi produced the lowest yield though it showed higher 1000-grain weight than Kalijira. Because all the yield-contributing parameters were lower in Begunbitchi than Kalijira.

Table 1: Plant height and number of tillers hill⁻¹ of three aromatic rice varieties measured at different stages

Varieties	35 DAT		50 DAT		At harvesting	
	Plant height (cm)	Tillers hill ⁻¹	Plant height (cm)	Tillers hill ⁻¹	Plant height (cm)	Tillers hill ⁻¹
Begunbitchi	66.52	7.52	83.52	8.00	124.08	5.00
Chinigura-1	57.48	10.80	74.92	12.64	148.20	10.08
Kalijira	57.68	13.32	77.08	15.08	146.80	10.16
CV (%)	7.96	20.07	5.16	16.81	2.44	10.52
LSD (0.05)	7.03	4.49	5.90	4.24	7.23	1.93

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

Varieties	Booting (DAT)	Heading (DAT)	Flowering (DAT)
Begunbitchi	47.00	50.00	52.20
Chinigura-1	83.20	86.00	88.80
Kalijira	82.20	85.00	87.60
CV (%)	1.99	2.04	1.76
LSD (0.05)	2.98	3.18	2.84

Table 3. Yield and yield contributing characters of three aromatic fine rices

Varieties	No. of effective tiller hill ⁻¹	Panicle length (cm)	No. of spiketets panicle ⁻¹	1000 grain weight (g)	Grain yield (t ha ⁻¹)	Harvest index (%)
Begunbitchi	5.00	25.12	135.80	15.55	0.920	38.23
Chinigura-1	10.08	26.86	200.16	16.41	2.470	47.25
Kalijira	10.16	26.32	181.72	13.56	2.150	43.13
CV (%)	10.52	2.24	9.88	2.68	11.290	8.81
LSD (0.05)	1.93	1.24	3.61	0.86	0.445	6.27

LSD = Least standard deviation

CV = Co-efficient of variation

Grain yield: It was significantly influenced by the varieties. The highest grain yield was obtained in Chinigura-1 (2.47 t ha⁻¹) and the lowest was in Begunbitchi (0.92 t ha⁻¹) (Table 3). Chinigura-1 produced the highest yield as its yield contributing parameters were the highest among the varieties except number of effective tillers per hill. According to BRR^[8], the mean yield of Chinigura-1 was 2.4 t ha⁻¹, which was nearly equal to that of this study.

Harvest index: Harvest index in the experiment was significantly influenced by the varieties. The highest harvest index was obtained in Chinigura-1 (47.25%) followed by Kalijira (43.13%) and the lowest in Begunbitchi (38.23%) (Table 3).

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[3] 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 medium high land areas. Future experiments would be conducted taking a large number of varieties in different locations of the coastal areas.

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