

## Yield Performance of Six Local Aromatic Rice Cultivars

Nahida Islam<sup>1</sup>, Md. Yamin Kabir<sup>2</sup>, Sanjoy Kumar Adhikary<sup>3</sup>,  
Md. Sarwar Jahan<sup>4</sup>

<sup>1</sup>(Additional Agriculture Officer, Department of Agricultural Extension, Ministry of Agriculture, Bangladesh)

<sup>2</sup>(Associate Professor, Agrotechnology Discipline, Khulna University, Bangladesh)

<sup>3,4</sup>(Professor, Agrotechnology Discipline, Khulna University, Bangladesh)

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**Abstract:** An experiment was conducted to evaluate the performance of local aromatic rice cultivars viz. Kalijira, Khaskani, Kachra, Raniselute, Morichsail and Badshabhog. The rice cultivars varied considerably in terms of crop growth characteristics as well as yield and yield contributing characters. The highest plant height (116.00 cm) was found in the variety Morichsail and the lowest in the variety Khaskani. Number of filled grains panicle<sup>-1</sup> was found highest (100) with the variety Khaskani and the lowest was recorded in the variety Raniselute. Raniselute produced the highest 1000-grain weight (32.09 g) and the lowest (13.32 g) was recorded from the variety Kalijira. The variety Morichsail produced the highest grain yield (2.53 t ha<sup>-1</sup>) followed by Kachra (2.41 t ha<sup>-1</sup>), Raniselute (2.13 t ha<sup>-1</sup>) and Badshabhog (2.09 t ha<sup>-1</sup>) and the lowest grain yield (1.80 t ha<sup>-1</sup>) was obtained from Kalijira. The results of various characters studied in the experiments suggested that some good characters exist in local aromatic rice cultivars which can be exploited through breeding.

**Keywords:** Aromatic rice, growth parameters, yield contributing characters, yield

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### I. Introduction

Aromatic rice contributes a small but an important sub-group of rice. These rices are rated best in quality and fetch much higher price in international market. These rices have long been popular in the orient and are now becoming more popular in Middle East, Europe and the United States. Most of the aromatic rice cultivars in Bangladesh are of traditional type, photoperiod-sensitive and are grown during *Aman* season in the rainfed low land ecosystem [1]. Baqui *et al.* [2] revealed that among the aromatic rice cultivars, Chinigura was the predominant one that covered more than 70% farms in the northern districts of Naogaon and Dinajpur. In these districts, 30% of the rice lands were covered by aromatic rice cultivars during *Aman* season. Islam *et al.* [3] observed that the yield of aromatic rice was low (1.5 to 2.0 t ha<sup>-1</sup>) but its high price and low cost of cultivation generated higher profit margins compared to other rice cultivars. There are hardly 3,000-5,000 local cultivars under cultivation in Bangladesh [4]. The rapid rate of extinction of indigenous cultivars of local rice points to the danger of narrowing genetic base.

For the development of high yielding aromatic rice varieties our indigenous aromatic rice cultivars may play a vital role as parent material because they are most adaptive to our environment. Although some research works were done and a few high yielding aromatic rice varieties were released by BRRI, our indigenous cultivars were given less attention and their yielding ability was not studied well. Therefore, the present study was undertaken to explore the yielding ability of six indigenous aromatic rice cultivars.

### II. Materials and Methods

The experiment was conducted at the Field Laboratory of Agrotechnology Discipline, Khulna University, Khulna during the *Aman* season of 2006 with six indigenous aromatic rice cultivars namely Kalijira (V<sub>1</sub>), Khaskani (V<sub>2</sub>), Kachra (V<sub>3</sub>), Raniselute (V<sub>4</sub>), Morichsail (V<sub>5</sub>) and Badshabhog (V<sub>6</sub>) as six treatments following Randomized Complete Block Design with three replications.

**Data collection:** Data were collected on different growth parameters such as plant height, tiller number and dry matter accumulation and yield contributing characters viz. number of effective tillers per hill, length of panicle, number of grains per panicle, 1000-grain weight, grain yield, straw yield, biological yield, harvest index and grain weight.

**Statistical analysis:** The data were analyzed by MSTAT-C program and treatment means were compared using Duncan's Multiple Range Test [5]. Functional relationships were determined among different growth and yield parameters using simple regression analysis.

### III. Results and Discussion

#### 3.1 Growth parameters

**Plant height:** Plant height increased progressively reaching a maximum or peak at 78 days after transplanting (DAT), thereafter it nearly reached a plateau (Fig. 1). The highest plant height (116.00 cm) was found in the

variety Morichsail and the lowest (63.70 cm) in Khaskani. Variation in plant height might be due to the differences in their genetic make up. These results were in consistent to those of Sawant *et al.* [6], Shamsuddin *et al.* [7], Hossain *et al.* [8] and Khatun [9] who also observed variable plant heights among the varieties.

**Tiller dynamics:** Tiller production was affected markedly by the variety. Tiller number in most of the treatments increased almost exponentially upto 78 DAT and after that a gradual decline in tiller number was noticed and before harvest it reached a plateau (Fig. 2). The maximum number of tillers  $m^{-2}$  (404.20) was observed in the variety Kalijira and the minimum (108.90) was recorded in the variety Khaskani. Variation in tiller number might be due to the differences in their genetic make up. Similar results was also reported by Ramasamy *et al.* [10] who stated that number of tillers  $m^{-2}$  differed due to varietal variation.

**Dry matter accumulation:** Results revealed that dry matter (DM) accumulation over time varied considerably due to variety (Fig. 3). Among different Days After Transplanting (DAT), Kachra produced the highest dry matter (1420.7  $g m^{-2}$ ) and Kalijira produced the lowest dry matter (1105.7  $g m^{-2}$ ) at 92 DAT. These results are supported by the result of Vergera *et al.* [11] who reported that dry matter accumulation increased with time and the initial increase was slow then it was accelerated.

### 3.2 Varietal differences of yield and yield contributing characters

**Effective tillers per hill:** The highest number of effective tillers  $hill^{-1}$  (13.0) was produced by Kalijira and the lowest number of effective tillers  $hill^{-1}$  (7.13) was observed in Morichasail (Table 1). The reason of difference in effective tillers  $hill^{-1}$  is the genetic makeup of the variety, which is primarily influenced by heredity. This result was supported by Chowdhury *et al.* [12] and Anonymous [13] who stated that effective tillers  $hill^{-1}$  varied with the variety.

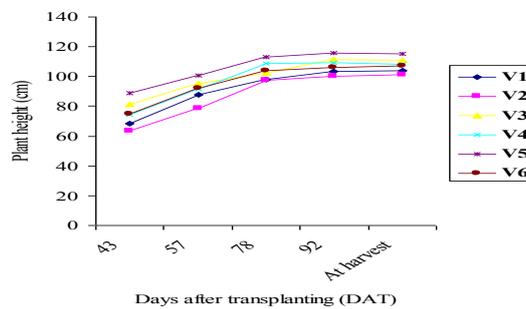


Fig. 1. Plant height over time as found in different aromatic rice cultivars.

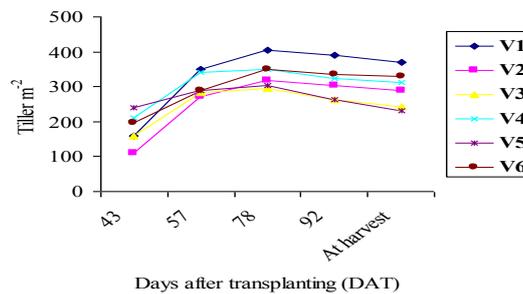


Fig. 2. Tiller dynamics over time as observed in different aromatic rice cultivars.

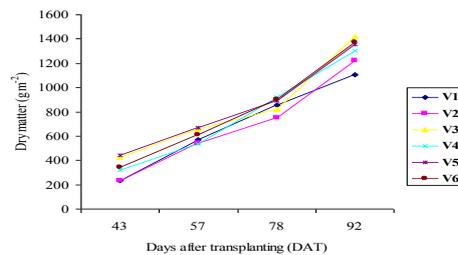


Fig. 3. Total dry matter production as recorded in different aromatic rice cultivars.

V<sub>1</sub>=Kalijira, V<sub>2</sub>=Khaskani, V<sub>3</sub>=Kachra, V<sub>4</sub>=Raniselute, V<sub>5</sub>=Morichsail and V<sub>6</sub>=Badshabhog

**Panicle length:** Panicle length recorded was the highest (23.25 cm) in the variety Morichsail and the variety Kalijira produced lowest panicle length (20.03 cm) (Table 1). Similar result was also recorded by Idris and Matin [14] and Anonymous [15] who reported that panicle length influenced by variety. The variation as assessed might be mainly due to genetic background of the variety. A simple linear regression using panicle length as independent variable and yield as dependent variable showed a positive but non significant relationship (Fig. 4). The value of  $R^2$  (0.59) indicates that about 60% variation in yield could be explained by the variation in panicle length.

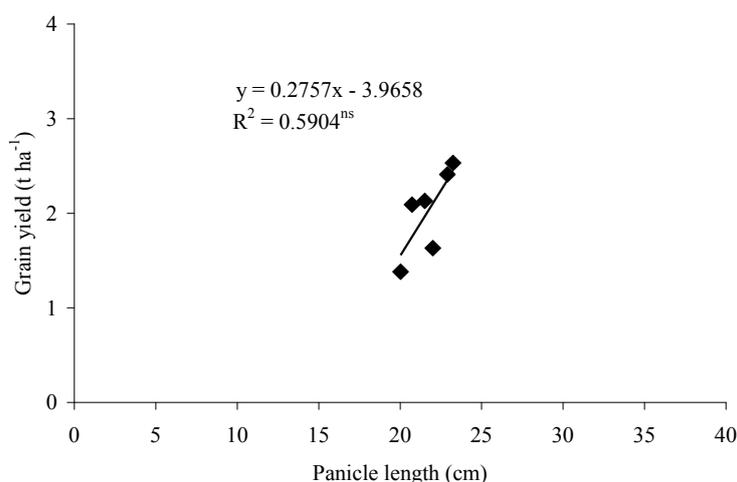
**Table 1. Varietal differences in yield and yield attributes of six local aromatic rice cultivars**

Variety	Effective tillers hill <sup>-1</sup>	Panicle length (cm)	Filled grains panicle <sup>-1</sup> (No.)	Unfilled grains panicle <sup>-1</sup> (No.)	1000-grain weight (g)	Grain yield (t ha <sup>-1</sup> )	Biological Yield (t ha <sup>-1</sup> )	Harvest index (%)
V <sub>1</sub>	13.0a	20.03c	67.69bc	21.17bc	13.32c	1.38b	3.87b	35.7
V <sub>2</sub>	11.40ab	22.01abc	100.0a	38.88a	14.77c	1.63b	4.52b	36.06
V <sub>3</sub>	8.26bc	22.91ab	51.61cd	12.0c	31.69a	2.41a	9.46a	25.48
V <sub>4</sub>	9.40abc	21.52abc	42.20d	11.96c	32.09a	2.13a	6.69ab	31.84
V <sub>5</sub>	7.13c	23.25a	57.30cd	11.17c	31.58a	2.53a	8.80a	28.75
V <sub>6</sub>	11.80ab	20.74bc	81.89ab	32.93ab	20.19b	2.09a	6.61ab	31.62
Level of Significance	0.05	0.01	0.01	0.01	0.01	0.01	0.01	NS
CV (%)	18.87	4.09	13.48	28.75	6.77	12.61	25	13.08

V<sub>1</sub> = Kalijira, V<sub>2</sub> = Khaskani, V<sub>3</sub> = Kachra, V<sub>4</sub> = Raniselute, V<sub>5</sub> = Morichsail and V<sub>6</sub> = Badshahog

**Filled grains per panicle:** Results presented in the Table 1 showed that number of filled grains panicle<sup>-1</sup> was found highest (100) with the variety Khaskani and the lowest was recorded with the variety Raniselute. Anonymous [16] reported that the number of filled grains panicle<sup>-1</sup> influenced significantly due to variety. The results were also supported by Singh and Gangwer [17].

**Unfilled grains per panicle:** Among the undesirable traits, number of unfilled grains panicle<sup>-1</sup> was important one and played a vital role in yield reduction. Effect of variety on the number of unfilled grains panicle<sup>-1</sup> was highly significant. Morichsail produced the lowest number of unfilled grains panicle<sup>-1</sup> (11.17) which contributed highest grain yield of that variety. This variation in number of unfilled grains panicle<sup>-1</sup> might be due to genetic characteristics of the varieties [12], [15]. A simple linear regression using unfilled grains as independent variable and yield as dependent variable showed a negative relationship suggesting that as the proportion of unfilled grains increased, yield of the varieties decreased.



**Fig. 4. Functional relationship between panicle length and grain yield in aromatic rice cultivars.**

**1000-grain weight:** Variety differed significantly among them regarding weight of 1000-grains (Table 1) and the highest 1000-grain weight (32.09 g) was produced by the variety Raniselute, might be due to its larger grain size and lowest 1000-grain weight (13.32 g) was recorded from the variety Kalijira for its smaller grain size. The variety Kalijira was also mentioned as having lowest 1000-grain weight by Khatun [9] and Sarkar [18]. From the Fig. 6, it was observed that grain yield has significant positive relationship with 1000-grain weight.

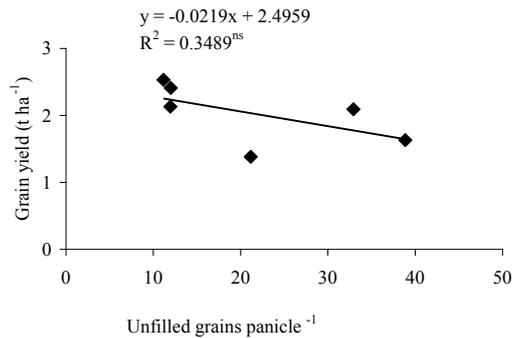


Fig. 5. Functional relationship between grain yield and unfilled grains panicle<sup>-1</sup> in aromatic rice.

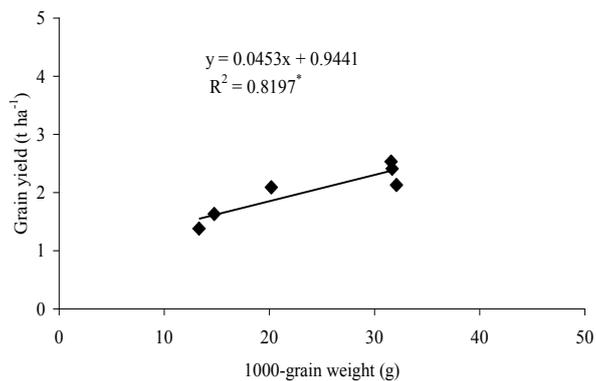


Fig. 6. Functional relationship between grain yield and 1000-grain weight of aromatic rice.

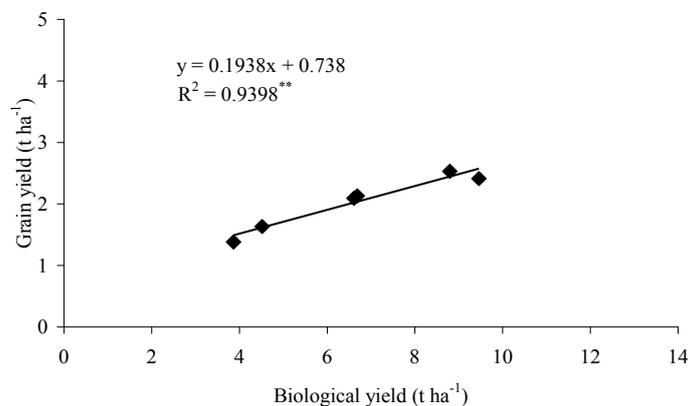


Fig. 7. Functional relationship between grain yield and biological yield of aromatic rice.

**Grain Yield:** Grain yield of rice mainly depends on the number of effective tillers per unit area, panicle length, filled grains panicle<sup>-1</sup> and 1000-grain weight. Results shown in the Table 1 presented that the grain yield differed significantly among the varieties. The variety Morichsail produced the highest grain yield (2.53 t ha<sup>-1</sup>) and the lowest yield (1.38 t ha<sup>-1</sup>) was obtained from Kalijjira. Similar yielding trend i.e. 1.92 to 2.56 t ha<sup>-1</sup> was also reported by Dwivedi [19] for aromatic rice cultivars.

**Biological Yield:** The highest biological yield (9.46 t ha<sup>-1</sup>) was obtained from the variety Kachra and the lowest biological yield (3.87 t ha<sup>-1</sup>) was recorded from the variety Kalijira. From the result it was observed that biological yield differed due to combined effect of grain yield and straw yield. Plotting grain yield against biological yield (Fig. 7) gave a significant positive linear relationship which indicates that as biological yield increased, grain yield also increased.

**Harvest Index:** From the results presented in Table 1 it was found that harvest index do not follow any regular trend and was not significant due to variety. However, numerically the highest harvest index (36.06%) was recorded from the variety Khaskani and the lowest (25.48%) was calculated from the variety Kachra that means the variety Kachra is less efficient to translocate the assimilates towards the grain. Shah *et al.* [20] reported that variety had a great influence on harvest index.

#### IV. Conclusion

From the above findings, it can be concluded that variation exists in different growth parameters and yield and yield contributing characters of selected aromatic rice cultivars. The variety Morichsail produced the highest grain yield compared to others which can be exploited through breeding.

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