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Evaluation of some small seeded aromatic indigenous genotypes for commercial utilization as high value rice

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ABSTRACT

Eighteen aromatic genotypes were collected and evaluated along with one high yielding variety IR 36 to assess its quality/speciality at Gontra village, Chakdah, Nadia, West Bengal during kharif season of 2016 and 2017 in Randomized Block Design with three replications following standard agronomic practices. Seed yield of those small grain indigenous genotypes ranged from 240.5g/ m^2 (Radhunipagol) to 525.6 g/m^2 (Kedargouri) against the check variety IR-36 having yield of 527.5 g/m^2, which is marginally higher than that of Kedargouri. However, most of these small grain aromatic rice types require longer days to 50% flowering ranging from 102.2 days in Kalijoha to 130.8 days in Chinikamini against 88.5 days for IR-36. All these genotypes were very tall and plant height ranged from 120.2cm in Kalijira to 180.5cm Tulsimanjari, but average plant height of IR-36 was only 103.5 cm. Thousand grain weight of aromatic types ranged from 10.2g in Danaguri to 28.1 g Agulha. Though, these genotypes did not have significant edges in yield advantage and duration, a good number of genotypes are preferred by the farmers for various purposes for multiplication. Most of the small grain aromatic rice returns more money than most of the popular high yielding varieties from unit area of land.

Keywords: aromatic rice, high quality, commercial utilization

INTRODUCTION

Rice is the staple food of more than half of the world's population and has been cultivated in Asia since ancient time generation after generation. It is one of the most widely used cereals in Asia, Africa, Latin America (Richaria, 1960; Chang, 1964; Adair, 1966). Wild species of *Oryza* are the genetic foundation for the breeding efforts needed for enhancement and sustenance of productivity. Besides the landraces and wild species, the genetic resources of rice also include natural hybrids and a range of different genetic stocks comprising commercial and obsolete varieties (Bordolui *et al.*, 2006). Aromatic or scented rice have long been highly regarded in Indian society not only because of its excellent quality, but also because those had been considered auspicious. The aromatic rice varieties being grown in the states of West Bengal, Orissa, Chattisgarh, Bihar and North East region are very short, fine grained and highly scented. Each one is highly priced in the locality where they are grown. These varieties are characterized by weak stem, very long growth duration, low grain weight and poor yield. Farmers mainly grow aromatic rice for their own consumption as well as for use in ceremonial programmes, leading to non-existence of well developed market. Adaptation of high yielding varieties has resulted in rapid erosion of the traditional small seeded aromatic types. In course of development of modern agriculture, many cultivars, including land races and folk varieties, have been replaced by a much smaller number of varieties. It is increasingly felt that these traditional varieties having important unique characters, can be utilized in a better way for development of high quality types.

Uniqueness of aromatic genotypes based on intensity and type of aroma is dependent on its genetic architecture and the agro-climatic factors of its growing location. Active participation of farmers having experience on quality aspects is vital to protect the existence of such high value aromatic types of rice. It cannot be denied that any success in the persistence of these genotypes depends to a large extent on the personal motivation of the farmers who intimately know these genotypes.

Therefore, for making an attempt towards documentation of the available indigenous aromatic rice genotypes, it is important to exploit such intelligent and experienced farmers having high skill not only in growing rice crop but also in the

process of its evaluation. Keeping these aspects in consideration, present investigation was undertaken to evaluate a collection of 18 aromatic genotypes along with 01 high yielding variety for seed quality parameters at farmers' field, Gontra village, Chakdah, Nadia, West Bengal, India.

MATERIALS AND METHODS

The field experiment was carried out at farmers' field during kharif season of 2016 and 2017 at Gontra village, Chakdah, Nadia, West Bengal in new alluvial soil having pH 7.07, organic carbon 0.8%, clay loam soil type, EC 0.7m mhs/cm^2, available Nitrogen, Phosphorus and Potassium as 222.6, 24.3 kg and 189.7 kg/ha respectively. 18 aromatic genotypes having diverse origin, popularly grown in varying agro-climatic conditions, along with one high yielding variety were grown in the farmers' field. Seedlings were raised in individual plots. Standard agronomic practices and intercultural operations were followed in the main field. 30 days old seedlings (one per hill) were transplanted in field with three replications following Randomised Block Design. Spacing was maintained as 25 cm between the rows, 20 cm between the plants and 50 cm between the two plots. Each plot was 2m length and 1m breadth. Fertilizers were applied in both the years as per standard recommendation (120:60:60:: N:P:K). Observations were recorded on plant height and number of effective tillers per hill at pre-harvest stage, days to 50% flowering, panicle length, test weight (thousand seed weight) and seed yield. Nature of aroma of individual genotypes was assessed through individual evaluation made by five persons (both scientists and farmers) and then average was made.

RESULTS AND DISCUSSIONS

Information on relevant characters of the genotypes is presented through Tables 1 and 2 based on observations during 1st year and 2nd year along with the pooled analysis. The magnitudes of average plant height of individual genotypes recorded in 1st year and 2nd year as well as for pooled condition were very close with each other indicating the non-existence of significant variation for this parameter over the years of study having negligible or no environmental influence during expression of the trait. However, the tallest and most dwarf plants were noted for Tulsimanjari and IR-36 respectively irrespective of the years of experimentation.

The maximum number of effective tillers was recorded for Danaguri, while it was minimum for Kedargouri and the magnitudes of this trait were almost similar for all the genotypes studied in all the situations. Chinikamini required the longest period (131.0 to 130.7 days for 1st and 2nd year respectively) to 50% flowering followed by Kalijira, Kalonunia, Parbatjira and Badshabhog. But the shortest duration for 50% flowering was noted for the high yielding variety IR-36. It is very important to note that all the aromatic types required significantly higher number of days to 50% flowering. Almost similar/same number of days required to 50% flowering for all the genotypes indicate the non existence of significant variation and it may be the more or less actual genetic expression of this trait (Sharma and Koutu, 2011).

Majority of the aromatic genotypes including the high yielding one exhibited almost similar panicle length over the years of study, while slight variation in this trait for only a few types over the years may be due to the effective environmental influence during its expression (Bordolui et al., 2015). However, average longest panicles were produced by Gobindo bhog followed by Tulsimanjari and Badsha bhog irrespective of the years of study, but the shortest panicles were consistently produced by Radhunipagol.

Agulha produced seeds with maximum density as indicated by 1000 seed weight followed by Kedargouri and Kalojira consistently over the years, while seeds of Badshabhog were of least weight in all situations and that of IR-36 were having medium weight. Consistency in performance of all the genotypes over the years may be due to no/negligible environmental influence for expression of this trait, rather expression of this trait was more specific to its genetic potentiality.

Maximum seed yield (g/m^2) was recorded after the high yielding variety IR-36, also noted by Hijam et al. (2011) and it was Kedargouri among the aromatic ones, though performance of these two genotypes were statistically at par over the years. However, the genotypes displayed significant variation in performance. On the other hand, more or less equal performance of each genotype over the years indicated that environmental variation exerted no/less influence on seed yield.

Table 1: Mean value of Plant height (cm), Effective tiller number and Days to 50% flowering in 1st year, 2nd year and pooled performance.

Sl .	Designation	Plant height (cm)			Effective tiller number			Days to 50% flowering		
No		1st year	2nd year	pooled	1st year	2nd year	pooled	1st year	2nd year	pooled
1.	Gopalbhog	161.7	161.0	161.3	7.0	7.7	7.3	117.5	117.5	117.5
2.	Khaskani	154.3	155.3	154.8	8.0	9.2	8.6	110.0	110.3	110.1
3.	Kalojira	171.5	173.1	172.3	9.0	8.0	8.5	120.3	117.5	118.9
4.	Radhunipagol	160.3	157.7	159.0	7.5	7.5	7.5	121.3	120.7	121.0
5.	Mohan bhog	157.0	157.0	157.0	10.0	8.0	9.0	119.0	108.3	113.7
6.	Agulha	127.3	129.3	128.3	9.5	8.0	8.7	108.6	108.7	108.7
7.	Danaguri	127.3	127.7	127.5	13.0	12.8	12.9	118.3	117.7	118
8.	Kalonunia	151.0	151.0	151.0	7.8	8.5	8.1	127.3	126.7	127
9.	Badshabhog	148.3	148.7	148.5	7.5	7.5	7.5	125.3	124.7	125
10.	Gobindo bhog	161.8	161.3	161.6	11.0	11.2	11.1	126.3	125.7	126
11.	Tulsimanjari	180.0	181.0	180.5	10.0	10.7	10.3	108.6	108.7	108.7
12.	Parbatjira	154.3	154.3	154.3	9.0	9.0	9.0	125.3	125.3	125.3
13.	Chinigura	168.0	167.7	167.8	9.2	9.1	9.1	112.3	111.7	112.0
14.	Kalijira	119.0	121.3	120.2	8.0	8.0	8.0	128.0	128.3	128.2
15.	Tulaipanji	156.2	156.1	156.2	9.3	9.3	9.3	115.0	115.0	115.0
16	Kalijoha	137.3	138.3	137.8	9.0	9.1	9.0	102.3	102.0	102.2
17	Chinikamini	139.8	139.0	139.4	10.0	10.2	10.1	131.0	130.7	130.3
18	Kedargouri	142.8	143.7	143.3	7.1	7.0	7.0	119.0	117.7	118.3
19	IR-36	104.3	102.7	103.5	10.0	10.1	10.1	88.7	88.3	88.5
SEm (±)		**2.694**	**2.941**	**2.817**	**1.107**	**0.676**	**0.891**	**0.565**	**0.8771**	**0.721**
LSD (0.05)		**5.34**	**5.82**	**5.58**	**2.19**	**1.34**	**1.76**	**1.12**	**1.74**	**1.43**

Table 2: Mean value of Panicle length (cm), thousand grain weight (g) and Yield (g/m^2) in 1st year, 2nd year and pooled performance.

Sl.	Designation	Panicle length (cm)			Thousand seed weight (g)			Yield (g/m^2)		
No.		1st year	2nd year	pooled	1st year	2nd year	pooled	1st year	2nd year	pooled
1.	Gopal bhog	29.5	29.5	29.5	10.8	10.9	10.8	257.3	257.7	257.5
2.	Khaskani	32.2	32.0	32.1	10.8	10.8	10.7	318.0	387.3	352.6
3.	Kalojira	30.3	30.3	30.3	23.2	23.0	23.1	374.7	382.0	378.3
4.	Radhunipagol	23.2	23.5	23.3	14.5	14.5	14.5	240.3	240.7	240.5
5.	Mohanbhog	29.0	29.0	29.0	12.4	12.4	12.4	240.7	241.3	241.0
6.	Agulha	26.0	25.9	25.9	28.2	28.0	28.1	403.7	402.3	403.0
7.	Danaguri	29.0	29.0	29.0	10.3	10.1	10.2	340.3	340.0	340.2
8.	Kalonunia	30.0	30.0	30.0	15.4	15.3	15.3	346.0	345.3	345.6
9.	Badsha bhog	30.0	29.8	29.9	10.5	10.3	10.4	324.7	324.7	324.7
10.	Gobindo bhog	32.3	32.5	32.4	11.5	11.3	11.4	300.3	310.3	305.3
11.	Tulsimanjari	30.0	32.0	31.0	12.7	12.8	12.8	273.3	277.3	275.3
12.	Parbatjira	20.5	20.5	20.3	13.3	13.3	13.3	403.7	270.4	337.1
13.	Chinigura	25.2	26.5	25.8	15.5	15.5	15.5	459.3	459.3	459.3
14.	Kalijira	24.5	24.6	24.5	20.5	20.5	20.5	376.7	376.7	376.7
15.	Tulaipanji	24.8	24.8	24.8	17.5	17.1	17.3	471.7	471.7	471.6
16	Kalijoha	29.1	29.1	29.0	15.2	15.5	15.3	354.0	353.7	353.8
17	Chinikamini	21.0	23.5	22.2	19.5	19.2	19.4	462.0	463.0	462.5
18	Kedargouri	25.5	27.0	26.2	23.5	23.9	23.7	525.3	526.0	525.6
19	IR-36	25.7	25.5	25.6	21.8	22.2	22.0	528.7	626.3	527.5
SEm (±)		**1.326**	**0.835**	**1.082**	**1.423**	**0.427**	**0.925**	**7.646**	**27.858**	**17.8**
LSD (0.05)		**2.626**	**1.660**	**2.143**	**2.817**	**2.665**	**2.742**	**15.139**	**8.002**	**11.6**

Table 3: Yield of such selected genotypes and cost effectively of production

Sl. No.	Genotypes	Desirable trait (s)	Yield of clean rice (husk less) (kg/ha)	Rate (Rs./kg)	Value (Rs./ha)
1.	Gopal bhog	Small grain, high aroma	1493.5	55	82142.5
2.	Khaskani	Small grain, high aroma	2045.08	55	112479.4
3.	Kalojira	Small grain, high aroma	2194.14	58	127260.1
4.	Radhunipagol	Small grain, high aroma	1394.9	60	83694
5.	Mohanbhog	Small grain, high aroma	1397.8	53	74083.4
6.	Agulha	Small grain, high aroma	2337.4	50	116870
7.	Danaguri	Small grain, high aroma	1973.16	50	98658
8.	Kalonunia	Small grain, high aroma	2004.48	55	110246.4
9.	Badsha bhog	Small grain, high aroma	1883.26	55	103579.3
10.	Gobindo bhog	Small grain, high aroma	1770.74	62	109785.9
11.	Tulsimanjari	Small grain, high aroma	883.34	60	53000.4
12.	Parbatjira	Small grain, high aroma	1955.18	52	101669.4
13.	Chinigura	Small grain, high aroma	2663.94	54	143852.8
14.	Kalijira	Small grain, high aroma	2184.86	55	120167.3
15.	Tulaipanji	Small grain, high aroma	2735.28	52	142234.6
16	Kalijoha	Small grain, high aroma	2052.04	45	92341.8
17	Chinikamini	Small grain, high aroma	2682.5	51	136807.5
18	Kedargouri	Small grain, high aroma	3048.48	48	146327
19	IR-36	Popular HYV	3291.5	28	92162

Milling quality is often expressed as a ratio of head rice yield to milled rice yield. For example, a 58/70 value would indicate a head rice yield of 58 percent, milled rice yield of 70 percent, and 12 percent broken kernels, the difference between the two values i.e., milling percentage is 58.

Table 3 clearly depicted the comparative yield performance and money return from one hectare of land. Most of the small grain aromatic rice types showed higher money return than that of the popular high yielding varieties from one hectare of land. Most of the quality parboiled rice also showed higher money return than IR-36 (high yielding variety) from one hectare of land. Examples of those varieties are Kedargouri, Tulaipanji and Chinigura etc. As the small grain aromatic rice varieties do not require high input, the cost of cultivation is less than high yielding variety.

CONCLUSION

The genotypes were collected from different places through direct involvement of farmers. Most of the small grain aromatic rice returns more money than most of the popular high yielding variety. These small grain aromatic high value rice genotypes give higher money return and also require low inputs which are cost effective for the farmers.

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