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Participatory evaluation of some folk rice genotypes

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ABSTRACT

Farmers participated in their own way in selection, conservation and genetic improvement processes. 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. These are on many occasions termed as land races or folk varieties. Participatory Plant Breeding (PPB) has made many gains over the past decades. The ideal model of participatory breeding should be flexible enough to harvest benefit from collaboration between breeders and participatory farmers. Twenty-five aromatic and twenty non-aromatic genotypes were evaluated with three high yielding varieties and two hybrid varieties to determine ways to conserve these indigenous genotypes ex-situ in active participation of such experienced farmers at Gontra village, Chakdah, Nadia, West Bengal. All the genotypes were evaluated during kharif season of 2008 and 2009 in Randamised Block Design in three replications following standard agronomic practices. Seed yield among the indigenous genotypes ranged from 152g m^{-2} (Tulsimanjari) to 537 g m^{-2} (Chamarmani). Other genotypes which recorded comparatively superior performance were Sitashal (526 g m^{-2}), Kedargouri (526 g m^{-2}), Tilakkati (515 g m^{-2}), Langalmuthi (513 g/m^2), Dudkhas (508 g m^{-2}), Dadshal (498 g m^{-2}), Kalma (485 g m^{-2}), Kanakchur (470 g m^{-2}), Tulaipanji (471 g m^{-2}), Chinikamini (463 g/m^2), Chinigura (459 g m^{-2}), Chinapakri (485 g m^{-2}). The standard semi-dwarf check variety IET-4786 (Satabdi) and IET-4094 (Kshitish) recorded 602 and 608 g m^{-2}. However, most of these folk varieties had longer days to 50% flowering which ranged from 108 days in Mohanbhog to 131days in Kalma, Langalmuthi and Jugal whereas IET-4786 had 80 days to 50% flowering only. All these genotypes were very tall and plant height ranged from 121cm in Kalijira to 170cm Suonagra. Thousand grain weight ranged from 10.4g in Badshabhog to 28g Agulha and Tilakkati. Though, these folk varieties did not have significant edge in yield advantage and duration, several genotypes were preferred by the farmers for various purposes for multiplication.

Keywords **:** cultural value of rice indigenous rice genotypes, participatory method, social

Rice is the staple food of more than half the world's population, and has been cultivated in Asia since ancient time generation after generation. Rice is one of the most widely used cereals in Asia, Africa, Latin America (Richaria, 1960; Chang, 1964; Adair, 1966). The farmers have maintained thousands of different varieties (Jackson, 1995) and these landraces, together with the 22 pantropical, wild species of *Oryza*, are the genetic foundation for the breeding efforts needed to increase the productivity of rice and sustain. Besides the landrace varieties 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).

In the context of the substance of indigenous genotypes has the contribution and participation of the farmers who have trust on the merits of high value cultivars and as they did not allow the seeds such varieties ones to be obliterated and to them indigenous cultivars remained valuable for various economic and socio-cultural values. They participated in their own way in selection, conservation and genetic improvement processes. 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, any attempt towards documentation of the available indigenous rice genotypes, it is important to include such intelligent and involved farmers who can participate not only in growing the rice crop but also in the process of their character evaluation. Their help is valuable in any scientific team carrying out the same job. Keeping these considerations present investigation has been undertaken to evaluate a collection of 25 aromatic genotypes, 20 non-aromatic genotypes, 3 high yielding varieties and 2 hybrid varieties for seed quality parameters and determine ways to conserve these indigenous genotypes *ex-situ* through participatory rice breeding method at Gontra village, Chakdah, Nadia, West Bengal With respect to seed yield, the high yielding and hybrids score the highest performance.

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MATERIALS AND METHODS

The field experiment was carried out at farmer's field during *kharif* season 2008 and 2009 at Gontra village, Chakdah, Nadia, West Bengal. In new alluvial soil having at ph 7.07, organic carbon 0.8% soil type clay loam, EC 0.7m mh-s/cm2, available Nitrogen 222.6 kg ha^{-1}, Phosphorus 24.3 kg ha^{-1} and potassium 189.7 kg ha^{-1}. Seeds of 25 aromatic genotypes, 20 non-aromatic genotypes, 3 high yielding varieties and 2 hybrid varieties of rice were grown in the experimental plots. Seedlings were raised in individual plots following standard

Table 1: Plant height, effective tiller number and days to 50% flowering of folk rice genotypes

Sl No.	Designation	Plant height (cm)			Effective tiller number			Days to 50% flowering		
		1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled
1.	*Danaguri*	127.3	127.7	127.5	13.0	12.8	12.9	118.3	117.7	118
2.	*Kalonunia*	151.0	151.0	151.0	7.8	8.5	8.1	127.3	126.7	127
3.	*Badsha bhog*	148.3	148.7	148.5	7.5	7.5	7.5	125.3	124.7	125
4.	*Gobindo bhog*	161.8	161.3	161.6	11.0	11.2	11.1	126.3	125.7	126
5.	*Tulsimanjari*	180.0	180.0	180.0	10.0	10.7	10.3	108.6	108.7	108.7
6.	*Gopal bhog*	161.7	161.0	161.3	7.0	7.7	7.3	117.5	117.5	117.5
7.	*Khaskani*	154.3	155.3	154.8	8.0	9.2	8.6	110.0	110.3	110.1
8.	*Radhunipagol*	160.3	157.7	159.0	7.5	7.5	7.5	121.3	120.7	121.0
9.	*Mohan bhog*	157.0	157.0	157.0	10.0	8.0	9.0	119.0	108.3	113.7
10.	*Agulha*	127.3	129.3	128.3	9.5	8.0	8.7	108.6	108.7	108.7
11.	*Gayasur*	134.0	136.0	135.0	9.3	9.1	9.2	131.3	130.7	131.0
12.	*Kalojira*	172.3	170.3	171.3	9.0	8.0	8.5	119.3	117.7	118.5
13.	*Fulpakri*	129.7	127.0	128.3	13.0	13.0	13.0	117.6	118.3	118.0
14.	*Rupsail*	152.0	150.7	151.3	8.0	8.3	8.2	127.3	127.3	127.3
15.	*Sonajhuli*	148.0	147.7	147.8	7.2	7.0	7.1	125.3	125.3	125.3
16	*Chinapakri*	162.5	163.0	162.7	11.0	11.0	11.0	126.3	125.7	126.0
17	*Pakri*	182.3	180.3	181.3	10.0	11.2	10.6	108.6	108.7	108.7
18	*Raghushal*	162.3	160.7	161.5	7.0	7.0	7.0	117.5	117.5	117.5
19	*Chamarmani*	155.3	156.0	155.7	9.2	9.4	9.2	110.3	110.3	110.3
20	*Sitashal*	160.0	160.3	160.2	7.5	7.5	7.5	121.3	121.3	121.3
21	*Dudherswar*	161.5	162.3	161.7	8.0	8.0	7.0	118.3	117.7	118.0
22	*Jamainadu*	135.0	162.7	161.0	8.8	9.3	9.0	121.6	121.7	121.7
23.	*Langalmuthi*	172.5	134.3	134.7	9.0	9.1	9.0	130.3	130.7	130.5
24	*Suonagra*	129.7	170.3	171.4	7.6	8.6	8.1	118.6	117.7	118.2
25	*Hamilton*	134.0	130.0	129.8	8.0	8.3	8.1	108.6	108.7	108.7
26	*Mocha*	154.0	1363	135.2	8.0	8.1	8.0	122.3	121.3	121.8
27	*Tilakkati*	154.7	155.3	155.0	7.6	8.0	7.8	126.0	125.7	125.8
28.	*Khejurchari*	131.7	129.0	130.3	7.0	7.0	7.0	130.6	127.0	128.8
29	*Vasamanik*	125.5	127.3	126.4	9.1	9.0	9.0	128.3	128.0	128.2
30	*Jugal*	151.0	150.7	150.8	8.0	7.9	7.9	132.3	131.7	132.0
31	*Kalma*	137.4	138.7	138.0	9.0	10.1	9.5	128.3	127.7	128.0
32	*Tulsiphenu*	159.1	160.0	159.5	9.1	9.0	9.0	122.3	121.7	122.0
33	*BR-34*	161.8	160.0	160.9	8.0	6.9	7.5	129.0	129.3	129.2
34.	*Parbatjira*	154.3	154.3	154.3	9.0	9.0	9.0	125.3	125.3	125.3
35.	*Chinigura*	168.0	167.7	167.8	9.2	9.1	9.1	112.3	111.7	112.0
36.	*Kalijira*	119.0	121.3	120.2	8.0	8.0	8.0	128.0	128.3	128.2
37.	*Tulaipanji*	156.2	156.1	156.2	9.3	9.3	9.3	115.0	115.0	115.0
38.	*Kalijoha*	137.3	138.3	137.8	9.0	9.1	9.0	102.3	102.0	102.2
39.	*IET13544*	147.2	146.0	146.5	13.7	11.4	12.6	131.3	131.0	131.2
40.	*Chinikamini*	139.8	139.0	139.4	10.0	10.2	10.1	131.0	130.7	130.8
41.	*Kedargouri*	142.8	143.7	113.3	7.0	7.0	7.0	119.0	117.7	118.3
42.	*Dudhkhas*	164.7	165.0	164.8	10.5	10.5	10.5	120.3	120.3	120.3
43.	*Dadshal*	133.7	133.7	133.7	17.0	17.0	17.0	128.0	128.0	128.0
44.	*Gangajali*	140.3	141.3	140.8	14.0	15.0	14.5	127.3	126.7	127.0
45.	*Kanakchur*	135.7	126.7	131.2	12.0	12.7	12.4	132.3	132.3	132.3
46.	*IR-36*	104.3	102.7	103.5	10.0	10.1	10.1	88.7	88.3	88.5
47.	*IET-4094*	99.0	100.7	99.8	10.0	10.7	10.3	86.3	86.0	86.2
48.	*IET-4786*	98.7	100.3	99.5	14.0	13.6	13.8	81.0	80.7	80.8
49.	*CRHR-7*	98.0	98.0	98.0	12.0	12.3	12.2	81.3	81.3	81.3
50.	*PHB-71*	99.3	98.7	99.0	18.0	13.7	15.8	82.3	82.3	82.3
	Grand mean	**144.76**	**144.6**	**144.69**	**9.66**	**9.617**	**9.636**	**117.91**	**117.56**	**117.73**
	SEm (±)	**2.69**	**2.94**	**2.82**	**1.11**	**0.68**	**0.89**	**0.57**	**0.88**	**0.72**
	LSD (0.05)	**5.34**	**5.82**	**5.58**	**2.19**	**1.34**	**1.76**	**1.12**	**1.74**	**1.43**

Table 2: Panicle length, thousand grain weight and yield performance of folk rice genotypes

Sl	Designation	Panicle length (cm)			Thousand grain weight (g)			Yield (g m^{-2})		
No.		1st year	2nd year	Pooled	1st year	2nd year	Pooled	1st year	2nd year	Pooled
1.	*Danaguri*	29.0	29.0	29.0	10.4	10.0	10.2	340.3	340.0	340.2
2.	*Kalonunia*	30.0	30.0	30.0	15.4	15.3	15.3	346.0	345.3	345.6
3.	*Badsha bhog*	30.0	29.8	29.9	10.5	10.4	10.4	324.7	324.7	324.7
4.	*Gobindo bhog*	32.2	32.5	32.3	11.5	11.3	11.4	300.3	310.3	305.3
5.	*Tulsimanjari*	30.0	32.0	31.0	12.7	12.8	12.8	273.3	277.3	152.3
6.	*Gopal bhog*	29.5	29.5	29.5	10.8	10.9	10.8	257.3	257.7	257.5
7.	*Khaskani*	32.2	32.0	32.1	10.8	10.8	10.7	318.0	387.3	352.6
8.	*Radhunipagol*	23.2	23.5	23.3	14.5	14.5	14.5	240.3	240.7	240.5
9.	*Mohanbhog*	29.0	29.0	29.0	12.4	12.4	12.4	240.7	241.3	241.0
10.	*Agulha*	26.0	25.9	25.9	28.2	28.0	28.1	403.7	402.3	403.0
11.	*Gayasur*	30.0	29.8	29.9	23.7	23.3	23.5	393.7	393.7	393.7
12.	*Kalojira*	30.3	30.3	30.3	23.2	23.0	23.1	374.7	382.0	378.3
13.	*Fulpakri*	28.7	29.0	28.8	14.4	14.3	14.4	383.7	383.7	383.7
14.	*Rupsail*	30.0	30.0	30.0	16.2	16.1	16.2	251.0	250.7	250.8
15.	*Sonajhuli*	29.8	30.0	29.9	18.8	18.8	18.8	354.3	354.7	354.5
16	*Chinapakri*	32.5	32.5	32.5	25.7	25.7	25.7	485.0	485.0	485.0
17	*Pakri*	30.0	32.0	31.0	18.3	18.3	18.3	400.7	400.3	400.5
18	*Raghushal*	29.5	29.3	29.4	22.2	22.1	22.2	384.3	383.3	383.8
19	*Chamarmani*	31.7	32.0	31.8	24.7	24.6	24.7	540.7	534.3	537.5
20	*Sitashal*	23.1	23.5	23.3	22.2	22.1	22.1	525.2	527.2	526.2
21	*Dudherswar*	28.8	28.8	28.8	17.8	20.4	18.8	401.3	400.3	400.8
22	*Jamainadu*	30.5	30.5	30.5	26.5	26.6	26.5	292.8	292.5	292.6
23.	*Langalmuthi*	30.0	30.0	30.0	27.8	27.8	27.8	513.1	513.1	513.1
24	*Suonagra*	30.1	30.5	30.3	23.9	24.7	24.3	424.0	423.7	423.8
25	*Hamilton*	26.0	25.8	25.9	18.1	18.4	18.3	449.3	450.3	449.8
26	*Mocha*	24.0	24.5	24.2	25.2	25.3	25.3	414.7	415.3	415.0
27	*Tilakkati*	28.1	27.9	28.0	28.4	28.8	28.6	614.3	614.7	414.5
28.	*Khejurchari*	23.2	23.2	23.2	23.5	23.6	23.6	435.3	434.0	434.6
29	*Vasamanik*	24.0	24.0	24.0	14.3	14.2	14.3	383.7	385.0	384.3
30	*Jugal*	28.2	27.5	27.8	25.6	25.8	25.7	450.0	449.3	449.6
31	*Kalma*	24.8	25.5	25.1	26.2	26.1	26.2	485.3	485.0	485.2
32	*Tulsiphenu*	30.2	30.5	30.3	19.2	18.9	19.1	295.3	295.3	295.3
33	*BR-34*	26.2	26.5	26.3	14.5	14.6	14.5	382.3	383.0	382.6
34.	*Parbatjira*	20.5	20.5	20.3	13.3	13.3	13.3	403.7	270.4	337.1
35.	*Chinigura*	25.2	26.5	25.8	15.5	15.5	15.5	459.3	459.3	459.3
36.	*Kalijira*	24.5	24.6	24.5	20.5	20.5	20.5	376.7	376.7	376.7
37.	*Tulaipanji*	24.8	24.8	24.8	17.5	17.1	17.3	471.7	471.7	471.6
38.	*Kalijoha*	29.1	29.1	29.0	15.2	15.5	15.3	354.0	353.7	353.8
39.	*IET13544*	28.7	26.5	27.6	15.9	15.9	15.9	406.7	406.7	406.7
40.	*Chinikamini*	21.0	23.5	22.2	19.5	19.2	19.4	462.0	463.0	462.5
41.	*Kedargouri*	25.5	27.0	26.2	23.5	23.9	23.7	525.3	526.0	525.6
42.	*Dudhkhas*	28.9	29.1	28.9	21.8	22.0	21.9	508.3	407.3	507.8
43.	*Dadshal*	26.2	26.2	26.2	22.9	22.9	22.9	497.0	498.0	497.5
44.	*Gangajali*	25.8	25.8	25.8	23.1	22.9	23.0	439.0	405.7	422.5
45.	*Kanakchur*	26.8	27.1	26.9	17.8	14.8	16.3	471.0	470.0	470.5
46.	*IR-36*	25.7	25.5	25.5	21.8	22.2	22.0	518.7	616.3	567.5
47.	*IET-4094*	28.1	28.4	28.2	24.3	24.5	24.4	608.3	607.3	607.8
48.	*IET-4786*	27.5	28.2	27.8	23.2	22.8	23.0	602.3	602.0	602.2
49.	*CRHR-7*	33.0	33.3	33.2	23.2	23.2	23.1	708.7	7.8.7	708.7
50.	*PHB-71*	27.7	28.0	27.8	23.0	23.0	23.0	711.0	711.3	711.1
	Grand mean	**27.79**	**28.03**	**27.91**	**19.54**	**19.62**	**19.58**	**426.10**	**426.4**	**426.20**
	SEm (±)	**1.33**	**0.84**	**1.08**	**1.42**	**0.43**	**0.93**	**7.65**	**27.86**	**17.75**
	LSD (0.05)	**2.63**	**1.66**	**2.14**	**2.82**	**2.67**	**2.74**	**15.14**	**8.00**	**11.57**

agronomic practices and intercultural operations in the plot, 30 days old seedlings (one per hill) were transplanted in the experimental plots with three replications following Randomised Block Design. Spacing was 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. Fertilizer was applied in both the years as per standard recomendation. Observations on different traits were taken by a specific method, like plant height, effective tiller number, days to 50% flowering, panicle length, test weight, seed yield.

RESULTS AND DISCUSSIONS

Table 1 and 2 shows the 1st year, 2nd year and pooled data of relevant characters of the genotypes.

The mean of plant height for 1st year and 2nd year as well as pooled performance indicates that there was no variation *i.e.* average plant height was same. This shows no environmental influence in on the trait. However the highest and lowest plant height was noted in *Tulsimanjari* and *CRHR7* in 1st year, 2nd year and for pooled performance. It is noted that other genotypes had more or less same performance in all years as well as pooled performance. Again it indicates that this trait might have more or less true genetic expression.

The maximum effective tiller number was in *PHB71* in 1st year, *Dadshal* in 2nd year and PHB71 in pooled performance. Maximum number was in *Raghushal* in 1st year, 2nd year and pooled performance did not differ much. The average performance of each genotype 1st year, 2nd year and pooled performance was more or less same.

With regard to days to 50% flowering *Jugal* had the longest period (128 to 132 days 1st year, 2nd year and pooled performance). But the shortest (80 to 82) days to 50% flowering was noted in *CRHR7* variety. The non existence of variation to 50% flowering indicates this trait was not influenced by environment and more or less true genetic expression was exhibited (Sharma and Koutu, 2011).

With respect to panicle length, there was variation in grand mean for 1st year, 2nd year and pooled performance through differences between the years and pooled performance was less. However the maximum panicle length was noted in CRHR7 for 1st year, 2nd year and pooled performance but the least panicle length was noted in *Chinikamini* for 1st year, in *Khejurchari* for 2nd year and in *Parbatjira* for pooled performance. It is also observed that panicle length exhibited variation for all genotypes except *CRHR7* in different years. It points out environmental influence on this trait.

Regarding thousand seed weight *Tilakkathi* scored the highest performance in 1st year, 2nd year and pooled performance, while *Badshabhog* recorded the least weight in all situations. Though the genotypes showed variation for the trait but consistent performance was observed in two years and in pooled performance as is evident from more or less similar results in grand means of around 19 gm.

The seed yield (g m^{-2}) was recorded highest in hybrids *CRHR7* and *PHB71* followed by the 3 high yielding Varieties (Hijam *et al*., 2011). Among other genotypes *Chamarmani* scored the highest yield (540.07g). However, the genotypes displayed significant variation in performance. On the other hand, the performance was more or less equal in both years as well as in pooled performance evident from more or less equal grand mean throughout the period. This shows less environmental effect on yield. The participation of farmers in bio-diversity conservation for selection evaluation and utilization of conserved genotype for their own uses based on their own selection criteria. The intuitive knowledge and long agricultural experience help them to select and utilize the conserved bio-diversity. Participation of plant breeder with modern scientific knowledge and blending the farmer's age long knowledge help to enhance the write selection process for better genotypes.

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