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Promising indigenous rice cultivars of Dhemaji district, Assam based on panicle traits

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ABSTRACT

Identifying promising rice cultivars for yield and yield attributing traits by visual observation is not always effective. In this study various quantitative and qualitative panicle traits of sixty-five (65) indigenous rice cultivars were considered for selection of superior rice cultivars of Assam, by assigning ranks to each cultivar. Rank correlation study was also attempted to determine the significance of correlations among different panicle traits to grain yield. Considering seven quantitative panicle traits viz. grain yield, length of the panicle, number of spikelets panicle^{-1}, percentage of filled spikelets panicle^{-1}, spikelet density, number of panicles plant^{-1}, 1000 grain weight and one qualitative panicle trait viz. grain type simultaneously, only eight promising indigenous cultivars were selected out of sixty-five. Three high-yielding varieties were also taken for observation as check varieties.

Key words: *cultivar, rank correlation, panicle traits, spikelet density*

Traditional rice varieties play an important role in sustainable development of agriculture (Tang *et al.,* 2002). These traditional varieties or landraces appear to be inferior to modern varieties in terms of yield potential, however, they possess many vital qualities such as pest resistance, drought-resistance, high protein content, flavour etc. having unique source of genetic variation. Due to agricultural intensification, cultivation of such traditional rice varieties are decreasing, as most farmers prefer high yielding modern varieties (Maikhuri *et al.,* 2001). The exclusive dependence on high-yielding varieties and negligence of the bulk of the indigenous varieties in the rice fields of India has not only brought about genetic uniformity, but also vulnerability to diseases and pests. Selection of biologically superior and physiologically efficient indigenous cultivars with high grain yield potential is thus essentially required. District Dhemaji of Assam, shows immense potentiality of indigenous rice cultivars with great variations. Although, generally grain yield is the main criterion for selection of cultivars, other panicle traits, such as percentage of filled spikelets panicle^{-1}, spikelet density, 1000 grains weight etc. also show relation with grain yield. So along with grain yield, these traits should also be included in selection method. Again selection of cultivars based on visual observation is not always rewarding. Selection can be done more efficiently by assigning ranks against cultivars (Chakraborty *et al,* 1996). The main objective of the present study was to select rice cultivars after assigning ranks to each cultivar for various yield attributing traits.

Sixty five indigenous rice cultivars and 3 high-yielding varieties were taken for study. Field experiment was conducted with a randomized block design with three replications, during 2008-2009. The plot size was 8m x 1m with plant x raw spacing 20 cm x 20 cm. 30 days old seedlings were transplanted with one seedling hill^{-1}. Data were collected on five randomly selected plants in each plot for seven (7) quantitative and one qualitative traits, viz. grain yield, length of the panicle, number of spikelets panicle^{-1}, per cent of filled spikelets panicle^{-1}, spikelet density, number of panicles plant^{-1}, 1000 grain weight and one (1) qualitative panicle trait viz. grain type after completion of grain maturation. Grain yield plant^{-1} was computed according to Datta (1981) with slight modification as -

GY/P = [(Number of panicles plant^{-1}) x (number of spikelets plant^{-1}) x filled spikelets panicle^{-1}) x (1000 seeds wt.) x 10^{-5}]

Grain type was determined according to systematic classification of rice grain, Ramaiah Committee 1969, (as referred in Rice Research in India, ICAR Publication, 1985).

A range table starting from 1 (for showing high performance) and ending with 9 based on the performance of the cultivars regarding each trait, were assigned accordingly (Table 1). Lower ranks were considered more favourable for selection than higher ranks.

Correlations between grain yield and each remaining panicle traits were tested by Spearman's rank correlation coefficient. Analysis of variance for indigenous cultivars was also conducted to verify adequate variability for efficient selection.

Rank correlation studies showed that ranks of grain yield had highly significant positive correlation with ranks of panicle length (0.90816), number of panicles plant^{-1} (0.94403), percentage of filled spikelets (0.814091), spikelet density (0.94447), 1000 grains weight (0.93525) and spikelets plant^{-1} (0.95781) (Table 3). Thus these findings indicated that selection of cultivars should be done considering all the panicle traits, not on the basis of grain yield only. Similar finding was also reported by Chakraborty *et. al*, 1996.

The analysis of variance (Table 2) for all the seven quantitative panicle traits revealed that the indigenous cultivars differed significantly for all the traits. This finding reveals that the cultivars possessed under study adequate differences, which is a prerequisite to fruitful selection. Similar findings were recorded by Rangel *et al.,* (1991); Singh *et al.,* (2010) and Rajesh *et al.,* (2010) for length of panicle and by Mondal *et al.* (2005) for 1000 seeds weight. Selection was completed in two phases. In the first phase, selection was done purely on the basis of grain yield because grain yield is the ultimate target. In this phase, out of 65 indigenous cultivars, 15 were selected which ranked 5th or lower (mean of lowest and highest ranks). The selected cultivars were *Memlahi, Nania, Monuharsali,*

Table 1. Range of different characters with respect to ranks

Assigned ranks	GrainYield (gm)	Grain type	Length of panicle (cm)	No. of SpikeletPanicle^{1}	% of filled SpikeletPanicle^{1}	Spikelet density	No. of paniclePlant^{1}	1000 Grain weight (gm)
1	81.2 & above	LS	33.7 & above	410.3 & above	95.2 & above	17.6 & above	13.6 & above	4.2 & above
2	72.3-81.1	SS	32-33.6	371.5-409.3	91.8-95.1	15.9-17.5	12.4-13.5	3.8-4.1
3	63.4-72.2	MS	30.3-31.9	331.8-370.5	88.4-91.7	14.2-15.8	11.2-12.3	3.4-3.7
4	54.5- 63.3	LB	28.6-30.2	293-331.7	85- 88.3	12.5-14.1	10-11.1	3-3.3
5	45.6- 54.4	SB	26.9-28.5	254.2-292.9	81.6-84.9	10.8-12.4	8.8- 9.9	2.6-2.9
6	36.7- 45.5	-	25.2-26.8	215.4-254.1	78.2-81.5	9.1-10.7	7.6- 8.7	2.2-2.5
7	27.8- 36.6	-	23.5-25.1	176.6-215.3	74.5-78.1	7.4- 9.0	6.4- 7.5	1.8-2.1
8	18.9-27.7	-	21.8-23.4	137.8-176.5	71.4-74.4	5.7- 7.3	5.2- 6.3	1.4-1.7
9	18.8 & below	-	21.7 & below	137.7 & below	71.3 & below	5.6 & below	5.1 & below	1.3 & below

Table 2. ANOVA for yield and yield components of 68 cultivars (including high yielding varieties)

Source	DF	Traits						
		Length of panicle (cm)	No. of SpikeletPanicle^{1}	% of filled SpikeletPanicle^{1}	Spikelet density	No. of paniclePlant^{1}	1000 Grain weight (gm)	Grain yield
Replication	4	4.779898	219.9588	26.00192	1.17576*	2.460294	0.635708	29740.51
Cultivars	67	67.4450**	32313.937**	182.1987**	37.915335**	84.885865**	122.9383**	1415233.2169**
Error	268	1.956847	136.184197	14.100918	0.345662	1.337906	0.98257	17571.42096

** 1% level of significance

Table 3. Assigned ranks to cultivars and selection

Sl. No	Name ofthe cultivar	Grain yield	Grain type	Length of the panicle	No. of spikelets Panicle^{-1}	% of filled spikelets	Spikelet density	No. of panicles plant^{-1}	1000 grain weight	Selected cultivars
1	Memlahi*	2	1	2	3	2	6	4	6	S
2	Rangabora	8	4	5	7	9	8	6	6	
3	Nania*	4	4	2	5	2	7	5	7	
4	Joha	8	1	4	7	4	8	8	6	
5	Niakadam*	5	1	5	7	3	8	7	2	
6	Salpuna	8	4	5	7	3	8	7	7	
7	Pakhoribora	7	4	5	7	6	8	7	6	
8	Kanjoha	8	3	4	1	3	3	8	9	
9	Sakuwa	6	4	4	6	2	7	7	5	
10	Manuharsali*	1	1	2	3	1	6	6	3	S
11	Jahingia	6	4	7	8	3	8	6	3	
12	Biwoilahi	6	1	4	6	5	7	5	6	
13	Bogisali*	5	4	1	2	3	5	5	5	S
14	Khoiron*	4	1	9	3	2	1	6	6	S
15	Gejepsali*	4	4	8	2	2	1	8	5	
16	Nekera*	1	4	2	2	1	5	4	6	S
17	Malbhug*	2	4	5	3	4	4	5	5	
18	Garundapakhi	9	4	8	9	3	9	8	6	
19	Bordhan	8	4	6	7	3	8	8	5	
20	Rangajoha	8	4	7	6	3	6	8	7	
21	Gumibora	9	4	9	9	4	8	7	6	
22	Johabora	8	4	9	7	3	6	8	6	
23	Moubora	8	4	9	9	2	8	8	5	
24	Harmoni	7	4	4	7	4	8	7	5	
25	Jaldubi	6	4	5	3	3	5	9	5	
26	Tilbora	7	4	5	6	5	6	8	5	
27	Sarujahingia	8	4	7	6	5	7	7	7	
28	Borjahingia	7	4	4	7	2	8	8	6	
29	Garakhiasali	7	4	5	7	5	8	7	6	
30	Apitia	9	4	6	9	4	9	6	6	
31	Bora	6	4	4	7	2	8	6	6	
32	Bogijul	6	1	3	3	9	6	7	7	
33	Guwahatiabora	8	4	5	6	3	7	8	7	
34	Laodubi	7	4	5	6	3	7	8	5	
35	Ahumsali*	1	4	2	3	3	6	5	5	S
36	Sowagmoni	6	4	6	7	4	7	6	5	
37	Kalapakhi	7	4	5	7	2	8	7	5	
38	Chutibora	9	4	8	8	8	8	8	7	
39	Nalsitiki	9	1	2	7	2	8	8	6	
40	Titaphuliabora	6	4	7	5	2	5	9	4	
41	Torawali	9	1	6	8	4	9	8	6	
42	Vasmoti	9	4	5	8	4	9	8	8	
43	Sunmoni	6	1	5	6	5	7	7	5	
44	Monlohi	8	4	6	7	6	7	8	6	
45	Negheribao*	5	4	4	4	4	6	5	7	
46	Kakuwabao*	5	4	2	6	7	8	3	6	
47	Panikakuwa*	3	4	2	4	3	6	4	6	
48	Panidhan	7	4	4	6	3	7	7	6	
49	Miabao	6	4	1	4	5	6	7	6	
50	Happybao	6	4	6	6	4	6	6	6	
51	Dalbao	6	4	2	6	3	8	7	6	
52	Amanabao*	2	4	5	3	2	4	5	6	S
53	Maguribao*	1	1	5	4	2	5	3	6	S
54	Bhuibao	7	4	5	5	4	6	8	7	
55	Rangadoria	8	4	5	4	3	6	8	6	
56	Maiguni	8	4	6	5	4	5	8	7	
57	Betguti	9	4	6	8	6	8	7	7	
58	Kapouguni	9	4	6	8	6	9	8	7	
59	Borguni	9	4	7	8	5	8	9	7	
60	Ranga-aahu	8	4	5	7	7	7	8	6	
61	Bejilahi	6	1	4	6	3	7	7	6	
62	Kala-aahu	6	4	7	7	4	7	5	7	
63	Akuhali	8	4	8	9	3	8	4	8	
64	Kalajoha	8	4	7	7	4	7	4	8	
65	Katibora	6	4	9	7	3	5	5	6	
66	Ranjit (Hy)	8	4	9	9	2	9	1	8	
67	Mala (Hy)	6	4	6	8	2	8	4	7	
68	Ijong (Hy)	7	1	7	7	3	7	5	8	
	Rank correlation Coefficient with grain yield			0.90816**	0.957**	0.81409**	0.9444**	0.94403 **	0.93525**	

** Highly significant at P= 0.01; * Cultivars selected in 1st phase, S : Cultivars selected in final phase, Hy : High yielding varieties

Khoiron, Gejepsali, Nekera, Malbhug, Ahumsali, Niokadam, Bogisali, Negheribao, Kokuwabao, *Maguribao, Amanabao* and *Panikokuwa.* In the final phase, these selected cultivars were again screened depending on the ranks of remaining panicle traits. The total rank values of these selected cultivars excepting grain yield ranged from 22 to 36 with a mean value of 29 (Table 3). The indigenous selected cultivars having total rank 29 or lower for the remaining seven traits were selected. It is observed that eight indigenous cultivars may be selected on the basis of grain yield and panicle traits. These are *Memlahi, Monuharsali, Khoiron, Nekera, Ahumsali, Bogisali, Amanabao* and *Maguribao.* Out of these selected cultivars Amanabao and *Maguribao* are deep-water rice. These selected cultivars may be considered for inclusion for future rice breeding programmes. *Maguribao* have been found to have superior physiological traits for growth among ten deep-water rice varieties (Baruah *et. al.,* 2006).

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