

Potentiality of landraces of rice in crop improvement programme in New Alluvial Soil of West Bengal

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ABSTRACT

In West Bengal, it is most promising to tender early maturing high yielding varieties of rice since they can fulfil their life cycle successfully within short period of persisting cool temperature. The objective of this present investigation was to identify these high yielding early maturing genotypes of rice having quality characters and higher performance in grain yield. A study was conducted during kharif season 2010-12 at Zonal Adaptive Research Station, Krishnagar, Nadia, West Bengal to evaluate some promising traditional rice germplasms and to identify the suitable cultivars for early days (D) to maturity with high grain yield. Cultivars Machkata, Laldhula and Kalamkathi (white) showed high grain yield. Cultivars showing early maturity (112-120 days) were Netaisal (116D), Dhuri (116.5D), Kalamkathi (white) (117.5D), Jhuli (119D), Baidjhulur (120D) and Dhuladhan (120.5D). The superior variety which showed early maturity was Kalamkathi (white). Maximum cultivars had sweet fragrance except Laldhula and Malliksal which were with strong fragrance. Cultivars which showed extra long slender grain (> 7.5mm grain length and >3.0 grain length/breadth ratio) were Machkata, Laldhula, Kalamkathi (white), Badshabhog, Behalsal, Mallicksal, Netaisal, Kalma, Lalusri and Annada-

Keywords: Early maturity, extra-long slender grain, sweet fragrance

India with about 1.2 billion population supports about 18.6% of the world's human population and 2.4% of the global land area. The population is estimated to become 1.4 billion by 2025 and 1.7 billion by 2050 AD, needing annually about 380 million tonnes and 480 million tonnes food grain respectively. The growth rate of food grain production decelerated to 1.2% during 1990-2007. In India, rice is a dominating staple food crop of fertile and alluvial soils of North West India, particularly Indo-Gangetic plains (Walia and Walia, 2007). Because of the over increasing population and decline in per capita availability of land in the country, practically there is no scope for horizontal expansion of land for agriculture. Only vertical expansion is possible by integrating farming components requiring lesser space and time to produce crop per drop of water and per unit of land.

In India, an estimated area of 150 million ha suffers from various kinds of land degradation owing to water and wind erosion and other complex problems like alkalinity, salinity water logging and soil acidity. Droughts and floods are also a common feature in many parts of the country. The unabated soil erosion losses, imbalanced fertilization, falling and limiting water resources coupled with inefficient weed management practices etc. may limit the land capability to support the country's food demand.

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Agricultural scientists all over the world are getting increasingly concerned about the constraints in food production. Keeping the above matters in view, the present investigation has been made to find out the high yielding extra long slender traditional rice with sweet fragrance and with better adaptability at the gangetic alluvial plain of West Bengal which may be used as elite traditional rice cultivars in the future breeding programme.

MATERIALS AND METHODS

The present investigation was carried out using fifteen traditional rice cultivars, collected from the three districts of West Bengal viz., Nadia, Murshidabad and 24 Parganas(N) during kharif season of 2010-12 at the Instructional Farm of Zonal Adaptive Research Station, Krishnagar, Nadia, West Bengal (23°24'N latitude and 88°31'E longitude with an altitude of 9.75 meters above mean sea level). The soil reaction gives a slightly acidic pH of 6.0, with low soluble salts (EC of 0.15 dS m⁻¹), medium organic carbon content (0.57%), total N (0.056%), medium in available P (25.28 kg ha⁻¹) and K (148.77 kg ha⁻¹).

The materials were grown using completely randomized block design with three replications. Each entry was transplanted (25 days old seedling) in a plot of 6m² with a spacing of 20cm. between rows and 15cm. between plants in a row. A random sample of five competitive plants was used for observations on

different traits under study. Nutrients (N:P₂O₅:K₂O) @ 40:20:20 kg ha⁻¹ were applied. During the crop period the water depth of the field was 40-50cm.

Selection of some elite cultivars was made among the collected cultivars based mainly on grain yield, earliness and grain shape *i.e.*, grain length (L), grain breadth (B) and grain L/B ratio. Observations were made on seven characters *viz.*, maturity in days, grain length (mm), grain breadth (mm), grain L/B ratio, grain size, grain yield and grain aroma. Evaluation of landraces from gangetic alluvial zone was also done previously by Chakravorty and Ghosh (2013).

Normal agronomic practices were followed to obtain a good harvest. The aroma of rice grains were determined by a sensory evaluation panel according to the method of Sood and Siddiq (1978) with minor modification as made by Amarabwati *et al.* (2008). Grain yield was recorded from each plot in Kilograms and converted to tonnes per hectare. Pooled data over three consecutive seasons were statistically analyzed against the biometrical characters.

RESULTS AND DISCUSSION

The analysis of variance revealed highly significant mean squares due to genotypes for all the characters including the presence of significant

difference among genotypes. The considerable range of variation expressed for the traits indicated good scope for genetic improvement (Chakravorty and Ghosh, 2011).

Grain breadth, one of the important features of rice in determining its market price, showed a good deal of variation in comparison to other characters. Kalma recorded the minimum value (2.05 mm) for grain breadth followed by Kalamkathi (white) (2.20 mm), Badshabhog (2.20), Netaisal (2.55 mm) and Lalhusri (2.61mm) respectively. Highest L/B ratio was observed in Laldhula (4.96) followed by Kalma (4.50), Badshabhog (4.04) and Kalma (3.48) respectively (Table 1). The cultivars Kalma, Laldhula and Kalamkathi (white) showed superior performance in respect of L/B ratio except Nagra and Jhuli

In case of grain yield, all the cultivars showed considerable variability. Machkata, Laldhula and Kalamkathi (white) cultivars recorded a grain yield of 3t ha⁻¹ or more (Table 1).

In fact, the flowering time (heading time) and photoperiod insensitivity are mainly accountable for the crop growth duration. A large number of loci (23) are involved in controlling the heading time in rice (Nishida *et al.*, 2001) and seven quantitative traits loci

Table 1: Fifteen landraces with their average performance for various yield attributing traits

Sl. No.	Name of the cultivars	Grain length (mm)	Grain breadth (mm)	Grain L/B ratio	Grain size	Maturity in days	Grain yield (t ha ⁻¹)	Aroma
1	Machkata	9.34 ^{h^l}	3.10 ⁱ	3.01 ^{a^f}	Extra long	124.00	4.3	MS
2	Laldhula	7.90 ^{d^g}	3.20 ^k	4.96 ^l	Extra long	125.50	3.2	SS
3	Dhuladhan	7.90 ^{d^h}	3.05 ^{jⁱ}	2.5 ^{a^g}	Extra long	120.50	1.2	MS
4	Dhuri	8.90 ^{f^l}	3.05 ^{jⁱ}	2.93 ^{a^j}	Extra long	116.50	2.0	MS
5	Kalamkathi	9.90 ^{k^l}	2.20 ^b	4.50 ^{k^l}	Extra long	117.50	3.3	WS
6	Badsabhog	8.90 ^{f^l}	2.20 ^b	4.04 ^{i^l}	Extra long	128.00	2.2	MS
7	Behalsal	10.0 ^l	3.00 ^{hⁱ}	3.33 ^{c^k}	Extra long	125.50	1.2	MS
8	Malliksal	11.2 ^m	3.50 ⁿ	3.20 ^{c^j}	Extra long	122.50	2.4	SS
9	Nagra	8.90 ^{f^l}	3.50 ⁿ	2.54 ^{a^g}	Extra long	123.50	2.0	WS
10	Netaisal	8.30 ^{e^j}	2.55 ^{c^j}	3.26 ^{c^j}	Extra long	116.00	1.8	WS
11	Jhuli	8.15 ^{e^j}	3.50 ^{a^f}	2.32 ^{a^f}	Extra long	119.00	1.9	MS
12	Kalma	8.15 ^{e^j}	2.05 ^{e^k}	3.48 ^{e^k}	Extra long	122.50	1.7	MS
13	Lalhusri	8.33 ^{e^j}	2.61 ^{c^j}	3.19 ^{c^j}	Extra long	122.50	1.8	MS
14	Annada	8.50 ^{e^k}	3.10 ^{a^h}	2.74 ^{a^h}	Extra long	122.50	1.7	MS
15	Baidjhulur	7.30 ^{c^c}	3.50 ⁿ	2.08 ^{a^c}	Long	120.00	3.3	WS
LSD(0.05)						7.77	0.85	

Note: NS: Non-scented, WS: Weakly scented, MS: Moderately scented, SS: Strongly scented, Common letters in a column are not significantly different at 5% level of significance at DMRT

have been reported for the same also (Yano *et al.*, 1997). Physical properties like grain shape and size mainly determine market acceptability of rice. In this present investigation, Kalma, Laldhula and Kalamkathi (white) have proved their better performance (superiority) in respect of grain length, breadth, grain L/B ratio and grain yield performance.

The present investigation revealed that Machkata, Kalamkathi (white), Laldhula, Kalma, Behalsal, Netaisal, Lalhusri, Annada and Mallicksal have extra long slender grain with average yield potentiality. Moreover, they belong to the early maturity group and can be effectively grown during kharif season with their better adaptability to this region. Therefore, these promising elite cultivars of traditional rice can cater to the long-standing demand of high yielding quality rice in the gangetic alluvial soil of West Bengal.

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