

SHORT COMMUNICATION

Agro-morphological and Physico-chemical Characterization of Indigenous Scented Lal Badshabhog Rice of West Bengal, India

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The agro-morphological and physico-chemical characterization of traditional aromatic Lal Badshabhog rice landrace was done at BCKV, Kalyani, Nadia, West Bengal, India during *kharif* season of 2012, 2013 and 2014. The variety had long-statured plants (scale 7, 140-150 cm height) and late maturity (scale 7, 130-138 days). The lemma and palea of matured grain was brownish-red in colour, while sterile lemma was red and the awnless grains were short in length (5.98 mm) with very low test weight (10.6 g). The white-coloured kernels belonged to short-bold group (length 3.80 mm and width 1.87 mm), which had low amylose content (18.1%), medium alkali value (score 3.3) and medium aroma (score 2.1).

Key Words: Agro-morphological traits, Aromatic rice, Grain quality

There is a long history for cultivation and use of small and medium-grained non-Basmati type scented rices in Bengal region of Eastern India. Among such 35-40 aromatic rice landraces, Lal Badshabhog is traditionally cultivated in *rahr* (red and laterite) areas of West Bengal for hundreds of years. The name of 'Lal Badshabhog' paddy has two parts, 'Lal' and 'Badshabhog'; where 'Lal' meaning 'red' in Bengali represented the brownish-red colour of grain (lemma and palea) and the word 'Badsha' meaning 'emperor' or 'king' in Hindi indicating the origin of nomenclature of the variety during *mughal* regime in undivided Bengal, and the word 'bhog' was used for the 'pulse-mixed rice' (*khichuri*) mainly offered to Hindu God or Goddess in Bengal.

With quick adoption of high-yielding rice varieties during last 4-5 decades, Lal Badshabhog like other landraces has been restricted to localized cultivation in a few villages of dry farming region with a reported reference from Chorpahari area of Purulia district of West Bengal (Deb, 2005). Farmers in native areas, cultivate Lal Badshabhog rice following traditional practices during *kharif* (wet) season mainly for their domestic uses. In the present-day agricultural system, agro-morphological and physico-chemical characterization needs to be done to ensure proper conservation-*cum*-cultivation of Lal Badshabhog rice in the state.

The seeds of Lal Badshabhog landrace were collected from Model Organic Farm of Bidhan Chandra Krishi Viswavidyalaya (BCKV) and 25 days old seedlings @ single / hill were transplanted in an open puddled field with five replications at RKVY Project on 'Bengal Aromatic Rice' Centre, 'C' Block Farm (22°59'N, 88°27'E and 9.75 m above mean sea level) of BCKV, Kalyani, Nadia, West Bengal, India during *kharif* season of 2012, 2013 and 2014. Each experimental unit consisted of 6-metre row length comprising 30 rows with row to row distance of 30 cm and plant to plant distance of 20 cm. The morphological and related characteristics of Lal Badshabhog rice were recorded following 'DUS Test Guidelines for Rice' of PPV&FRA, Government of India (PPV&FRA, 2007). Grain quality parameters like size and shape of grain and kernel, amylose content, alkali spreading value and aroma were determined at Aromatic Rice Laboratory, Department of Agronomy, BCKV, Mohanpur, Nadia, West Bengal, India.

Lal Badshabhog rice was usually adaptable to rainfed medium land in *rahr* region of West Bengal, whose characteristics are described in Table 1.

Plant: Lal Badshabhog rice belonged to long-duration type with late heading (scale 7, 105 days) and late maturity (scale 7, 134 days) (Fig. 1).

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Table 1. Plant characteristics of Lal Badshahbhog rice following DUS guidelines

Sl. No.	Characteristics	Scale	Remarks measured values etc.
1	Coleoptile: colour	1	White
2	Basal leaf sheath colour	1	Green
3	Leaf : Intensity of green colour	5	Medium
4	Leaf : anthocyanin colouration	1	Absent
5*	Leaf : distribution of anthocyanin colouration		
6	Leaf sheath : anthocyanin colouratin	1	Absent
7	Leaf sheath: intensity of anthocyanin colouration		
8	Leaf: pubescence of blade surface	5	Medium
9	Leaf : Auricles	9	Present
10	Leaf : anthocyanin colorations of auricles	1	Colourless
11	Leaf : collar	9	Present
12	Leaf : anthocyanin colouration of collar	1	Absent
13	Leaf : ligule	9	Present
14	Leaf: shape of ligules	3	Split
15	Leaf: colour of ligule	1	Green
16	Leaf : length of blade	7	Long (70.1 cm)
17	Leaf : width of blade	3	Narrow (10.6 mm)
18*	Culm : attitude (for floating rice only)		
19	Culm : attitude	3	Semi-erect
20	Time of heading (50% of plants with panicles)	7	Late (105 days)
21	Flag leaf attitude of blade (early observation)	3	Semi-erect
22	Spikelet : density of pubescence of lemma	3	Weak
23	Male sterility	1	Absent
24	Lemma: anthocyanin colouration of keel	1	Absent
25	Lemma: anthocyanin of area below apex	1	Absent
26	Lemma: anthocyanin colouration of apex	1	Absent
27	Spikelet : colour of stigma	1	White
28	Stem: thickness	5	Medium (0.57 cm)
29	Stem: length (excluding panicle)	7	Long (143.5 cm)
30	Stem: anthocyanin coloration of nodes	1	Absent
31	Stem : intensity of anthocyanin colouration of nodes		
32	Stem : anthocyanin colouration of internodes	1	Absent
33	Panicle: length of main axis	5	Medium (25.6 cm)
34	Flag leaf: attitude of blade (late observation)	3	Semi-erect
35	Panicle: curvature of main axis	3	Semi-straight
36	Panicle: number per plant	3	Few (10.67)
37	Spikelet: colour of tip of lemma	4	Red
38	Lemma & Palea : Colour	6	Brown (Tawny)
39	Panicle: awns	1	Absent
40*	Panicle: colour of awns (late observation)		
41*	Panicle: length of largest awn		
42*	Panicle: distribution of awns		
43	Panicle : presence of secondary branching	9	Present
44	Panicle : secondary branches	2	Strong
45	Panicle : attitude of branches	3	Erect to Semi-erect
46	Panicle: exertion	7	Well exerted
47	Time of Maturity	5	Medium (134 days)
48	Leaf : senescence	5	Medium
49	Sterile lemma: colour	3	Red
50	Grains: weight of 1000 fully developed grains	1	Very low (10.6 g)
51	Grain : length	1	Very short (5.98 mm)
52	Grain : width	2	Narrow (2.23 mm)
53	Grain : phenol reaction of lemma		

Sl. No.	Characteristics	Scale	Remarks measured values etc.
54	Decorticated grain: length	1	Very short (3.80 mm)
55	Decorticated grain: width	1	Very narrow (1.87 mm)
56	Decorticated grain shape	2	Short bold
57	Decorticated grain: colour	1	White
58	Endosperm: presence of amylose	9	Present
59	Endosperm: content of amylose	3	Low (18.1%)
60*	Varieties with endosperm of amylose absent only-polished grain : exertion of white core		
61	Gelatinization temperature through alkali spreading value	3	Medium (score 3.3)
62	Decorticated grain : aroma	9	Present (score 2.1)

* Not applicable



Fig. 1. Lal Badshabhog paddy at maturity stage



Fig. 2. Ligule and auricle of Lal Badshabhog



Fig. 3. Panicle of Lal Badshabhog



Fig. 4. Change of grain colour of Lal Badshabhog rice

Stem: It had long statured plant with average stem length of 143.5 cm excluding panicle. The thickness of stem was medium (scale 5) with mean diameter of 0.57 cm. There was no anthocyanin colouration on nodes and internodes. The attitude of the culm could be categorised as semi-erect (scale 3) at booting stage.

Leaf: The variety produced long, narrow and green leaves. The colour of basal leaf sheath was green (scale 1), while the intensity of green colour of the leaf was medium (scale 5) with no anthocyanin colouration on leaf sheath. The average length and width of leaf blade were noted as 70.1 mm and 10.6 mm, respectively. The split-type ligule (scale 3) and sickle-shaped auricle at leaf base were found in the plant (Fig. 2). The attitude of the flag leaf was semi-erect (scale 3) at both early and late observation.

Inflorescence: The length of panicle of Lal Badshabhog rice was categorized as medium (scale 5, 25.6 cm) with the curvature of the main axis as semi-erect (scale 3) (Fig. 3). The plant produced few (scale 3, mean 10.67) well-exerted panicles in the field. The colour of

lemma and palea was green at anthesis, which turned to brownish-red at ripening stage (Fig. 4). The variation in colour of grain between Badshabhog (golden-yellow) and Lal Badshabhog (brownish-red) was reported by Roy (2015), which could be considered as an important parameter to differentiate these two scented rice varieties.

Flower: The variety produced bi-sexual flowers including six yellow coloured anthers, and an ovary with white coloured feathery stigma.

Grain: The grains of Lal Badshabhog rice were short in size (mean length 5.98 mm and width 2.23 mm) and awnless. The weight of 1000 fully-developed grains was very low (10.6 g). The colour of lemma and palea was brownish-red (scale 6) (Fig. 5), while that of sterile lemma was red (scale 3).

The kernels were short-bold in shape (length 3.80 mm and width 1.87 mm) and white in colour (Fig. 5), which had low amylose content (18.1%), medium alkali spreading value (score 3.3) and medium aroma (score 2.1).



Fig. 5. Grains and kernels of Lal Badshahog

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