SHORT COMMUNICATION

Varietal Identification of Four Rice Varieties from Chhattisgarh through DUS Characterization

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Rice is an important food crop in India and highest number of rice varieties have been released in India, among crop species, to cater the needs of the farmers and consumers. Assessment of genetic variation is an essential component in genotypes characterization and conservation. Continued usage of morphological data to describe cultivars indicates that these retain popularity in descriptors till date (Pauksens, 1975). Morphological descriptors provide unique identification of cultivated varieties but they not only reflect the genetic constitution of the cultivar but also the environmental interaction within which it is expressed. The basic objective of varietal characterization is to test the occurrence of traits that helps in identifying a particular variety. Keeping this in view, the study was taken up with the objective to determine the relative extent of distinctiveness, uniformity and stability of different morphological DUS descriptors in 4 rice varieties for their protection under the PPV&FR Act, because DUS data have not been available at the time of release.

The experimental material consisted of four rice varieties namely, Karmamahsuri, Danteshwari, Samleshwari and Mahamaya released by Indira Gandhi Vishwavidhyalaya (IGKV), Raipur. The trials were conducted during the two *kharif* seasons of 2011 and 2012 in randomized block design with three replications. Each replication consisted of three rows of 6 m length with 30 cm X 20 cm spacing. The observations were recorded on 30 of the 62 DUS characters at specified stages of crop growth period when characteristics under study had full expression (DRR 2002). Among the 30 morphological characteristics studied, 27 where visually assessed and three were measured. Similarity matrix was generated using the SimQual programme NTSYS-pc software version 2.02 (Rohlf, 1998). The similarity coefficients were used for cluster analysis and dendrogram

was constructed by Unweighted Pair-Group Method with Arithmetic Average (UPGMA) (Mathew *et al.*, 2000).

The various morphological traits recorded among rice genotypes are furnished in Table 1. The basal leaf sheath colour for the rice varieties varied from green to light purple in colour. Varieties Karmamahsuri, Danteshwari and Samleshwari had green basal leaf sheath colour, while Mahamaya exhibited as light purple. The intensity of green colour in leaf ranged from medium green to dark green in these varieties. Varieties Danteshwari, Samleshwari and Mahamaya had intensity of colour in leaf as medium green while, it was recorded as dark green in Karmamahsuri.

The anthocyanin colouration of leaf was absent in all the varieties. The pubescence of leaf blade surface was found to be weak in Danteshwari; medium in Samleshwari and it was strong in Karmamahsuri and Mahamaya. Leaf auricles were colourless in three varieties *viz.*, Karmamahsuri, Danteshwari and Samleshwari while, it was purple in Mahamaya. Anthocyanin colouration of collar was found absent in all the genotype except Mahamaya. Colour of ligule also showed variation and found to be white in Karmamahsuri, Danteshwari and Samleshwari while, it was light purple in Mahamaya. The leaf length of blade was noted as short for Danteshwari; medium for Karmamahsuri; long for Samleshwari and Mahamaya. The early observation for attitude of flag leaf revealed erectness in Danteshwari, Samleshwari and Mahamaya whereas, attitude was semi-erect in Karmamahsuri. However, the late observation on flag leaf attitude revealed that Danteshwari, Samleshwari and Mahamaya remained as erect while, Karmamahsuri showed horizontal attitude. The stigma colour was found to be white in three varieties *viz.*, Karmamahsuri, Danteshwari and Samleshwari whereas, it was purple in Mahamaya. The colour of tip of lemma appeared

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Table 1. Morphological characters of rice varieties based on DUS descriptor

S. No.	Character	Varieties			
		Karma-masuri	Dantesh-wari	Samlesh-wari	Maha-maya
1	Basal leaf sheath colour	1	1	1	2
2	Leaf: intensity of green colour	7	5	5	5
3	Leaf: anthocyanin colouration	1	1	1	1
4	Leaf: pubescence of blade surface	7	3	5	7
5	Leaf: auricles	9	9	9	9
6	Leaf: anthocyanin colouration of auricles	1	1	1	3
7	Leaf: collar	9	9	9	9
8	Leaf: anthocyanin colouration of collar	1	1	1	9
9	Leaf: ligule	9	9	9	9
10	Leaf: colour of ligule	1	1	1	2
11	Leaf length of blade	5	3	7	7
12	Leaf: width of blade	5	5	5	5
13	Culm: attitude	3	3	3	3
14	Fag leaf attitude of blade (early observation)	3	1	1	1
15	Lemma: anthocyanin colouration of area below apex	1	1	1	1
16	Spikelet: colour of stigma	1	1	1	5
17	Stem: anthocyanin colouration of nodes	1	1	1	1
18	Stem: anthocyanin colouration of internodes	1	1	1	1
19	Fag leaf attitude of blade (late observation)	5	1	1	1
20	Spikelet: colour of tip of lemma	3	2	2	5
21	Panicle: awns	1	1	1	1
22	Panicle: presence of secondary branching	1	1	1	1
23	Panicle: secondary branching	2	2	2	2
24	Panicle: exsertion	7	7	7	7
25	Panicle: curvature of main axis	7	7	7	7
26	Sterile lemma colour	2	1	1	1
27	Time of maturity (days)	5	3	3	5
28	Grain: weight of 1000 fully developed grains	5	5	5	9
29	Grain: length	3	5	3	3
30	Grain: width	3	3	5	7

yellowish for Danteshwari and Samleshwari; brown for Karmamahsuri; and purple for Mahamaya. Based on days to maturity, the varieties were grouped as early *viz.,* Danteshwari, Samleshwari and Mahamaya and medium *viz.,* Karmamahsuri. Based on 1000 grain weight, Karmamahsuri, Danteshwari and Samleshwari had medium test weight while, Mahamaya had it very high. Based on grain length Karmamahsuri, Samleshwari and Mahamaya had short grain length whereas, Danteshwari had medium length. The grain width was narrow in Karmamahsuri and Danteshwari, whereas, it was medium in Samleshwari and broad in Mahamaya.

Observations for 30 morphological traits taken on ten randomly selected plants in four varieties indicated that 16 traits showed a moderate range of variation *viz.,* Basal leaf sheath colour, leaf: intensity of green colour, Leaf: pubescence of blade surface, Leaf: anthocyanin colouration of auricles, Leaf: anthocyanin colouration of collar, leaf: colour of ligule, leaf: length of blade, flag leaf attitude of blade (early and late observation), spikelet: colour of stigma, spikelet: colour of tip of lemma, sterile lemma colour, time of maturity, grain: weight of 1000 fully developed grains, grain: length, grain: width. Among the traits exhibiting variation, most of the genotypes possessed a particular variant phenotype. Karmamahsuri can be identified by the characters such as intensity of green colour of leaf, pubescence of blade surface, length of leaf blade, flag leaf attitude, colour of tip of lemma, lemma colour, days to maturity and grain width. Like-wise, Danteshwari can be detected by pubescence of blade surface, length of leaf blade, days to maturity and grain length. Whereas characters like pubescence of blade surface, length of leaf blade, and grain width can be used to identify Samleshwari. while, Mahamaya can be distinguished on the basis of basal leaf sheath colour, anthocyanin colouration of auricles, anthocyanin colouration of collar, colour of stigma, colour of tip of lemma, 1000-seed weight and grain width. UPGMA cluster analysis was performed using SM similarity coefficient matrices calculated from morphological data to generate a dendrogram for four varieties (Fig. 1). The varieties were grouped into two major clusters. The similarity coefficient ranged from 0.62 to 0.87. In pair-wise comparison, the maximum similarity was obtained between Danteshwari and Samleshwari with a similarity index of 0.86, whereas Mahamaya showed least similarity with other varieties (similarity index 0.62). Cluster I consisted of variety namely Karmamahsuri,
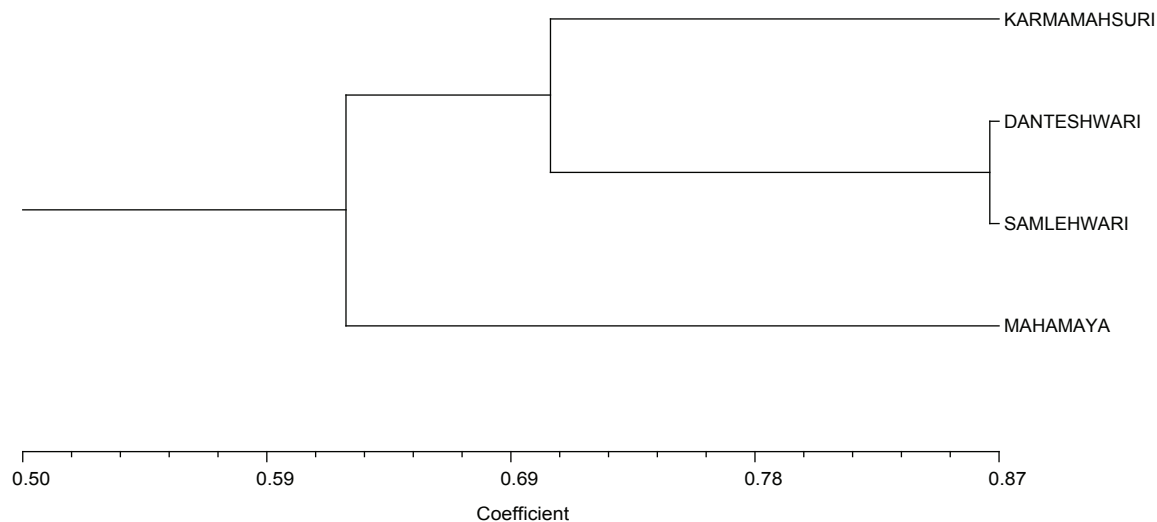
Fig. 1: Dendrogram of rice varieties based on morphological characters

Danteshwari and Samleshwari having 71% similarity whereas, Cluster II consisted of Mahamaya having 62% similarity among them. Cluster I again partitioned into two sub-clusters in which one sub-cluster had Danteshwari and Samleshwari with 87% similarity, whereas another sub-cluster had Karmamahsuri with 71% similarity with Danteshwari and Samleshwari. The basic objective of varietal characterization is to test the occurrence of traits that helps in identifying a particular variety. The characters that are used to distinguish cultivars should have the ability of precise description and recognition and is considered important only when they are not subjected to environmental influences. Thus, the ability to identify and distinguish between varieties is a fundamental component in seed quality programmes. This also benefits the seed production and certification authorities as well as the farmers in ensuring supply and distribution of genetically pure seeds. The morphological dendrogram generated from similarity or genetic distance matrices has provided an overall pattern of variation as well as the degree of relatedness among genotypes. It may be concluded that the morphological DUS descriptors can be effectively used for identification and grouping of

varieties. However, morphological descriptors alone may not be sufficient for DUS criteria. Hence, some other markers/ descriptors based on DNA (Simple Sequence Repeat) and protein (SDS-PAGE) markers could be considered for complementing the morphological DUS descriptors.

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