

Characterization of rice hybrids and their parental lines based on morphological traits

M R Chetan Kumar, P J Devaraju* and S Rajendra Prasad¹

National seed project (NSP), University of Agricultural Sciences, Bangalore

¹National Seed Research Centre, Mau, Uttarakhand

ABSTRACT

The genuineness of variety is one of the most important characteristics of quality seed. In addition, seed certification, which forms a link between variety registration and seed production, involves an assessment of both varietal identity and purity to assure the quality of seed for the farmer. Hence characterization of two hybrids such as KRH-2 and DRRH-2 including their parental lines viz., IR-58025A, IR-58025B, KMR-3R, IR-68897A, IR-68897B, and DR-714-1-2R based on the seed, seedling was taken up and distinguishing characters were described.

Key words: hybrid rice, characterization, parental lines, quality seed

Intensive crop improvement programme has resulted in the development of large number of hybrids and varieties in rice. However, there is lack of identification of diagnostic characters of these hybrids and their parental lines. Variety identification helps maintenance of genetic purity and confirming intellectual property rights. The morphological characters have been major components of variety identification and description should start from its early growth habit to maturity. With this background, a study was undertaken with the objective of characterizing and identifying distinguished features for KRH-2 and DRRH-2 hybrids including their parental lines.

Freshly harvested breeder seeds of IR-58025A, IR-58025B, KMR-3R, KRH-2 were collected from AICRP on Hybrid Rice, Mandya. Seeds of DRRH-2, IR-68897A, IR-68897B, DR 714-1-2R were obtained from Directorate of Rice Research, Hyderabad. Seed samples were studied for morphological characters like seed colour using Munsell colour chart (Anon., 1954), seed length, width, shape, dehusked seed length, width, shape using grain micrometer and 1000 seed weight. Four replications of fifty seeds each of selected cultivar were tested for germination by between paper method as per ISTA (1996). The rolled towels were incubated at $25 \pm 1^\circ\text{C}$. At the end of the 14th day 25 normal

seedlings from each replication were taken randomly and seedling morphological characters were recorded.

To study the plant morphological traits, seed samples of parents and hybrids were sown in the field during wet season, 2009 at Mandya. Ten plants selected at random from each variety were observed for various stable and distinguishable characters according to DUS guidelines (PPV and FRA 2007).

In the present study the rice parents and hybrids were grouped into five categories as short, medium, long and very long based on the seed length. However, based on the seed width the parents and hybrids were classified as narrow, medium and broad. The seed length varied from 6.69 (KMR-3R) to 9.73mm (IR-58025A) while the seed width varied from 2.04 (KRH-2) to 2.62 mm (KMR-3R).

The results indicated that, the longer grains tend to be narrow and shorter grains tend to be broader. Significant difference was observed in length to width ratio. There is a definite association between the length and length to width ratio. The longer the grain, the finer it tends to be. It is suggested that the genes governing length also partly govern the seed shape. In the present study, the length to width ratio was ranging from 2.55 (KMR-3R) to 4.52 (KRH-2.) (Table 1). However, the

length to thickness ratio varied from 3.31 (KMR-3R) to 8.10 (IR-58025A).

Based on the seed colour, the genotypes were grouped into five classes viz., pale yellow, yellow, very pale brown, yellowish brown and brownish yellow and based on dehusked seed colour it was classified as white, pale yellow and red. Thus the rice hybrids and their parents could be classified into several groups

variations in plant height at various growth stages that could be used for identification of off types at the time of field inspection. Similar variation was reported by Rosta (1975). Significant differences were observed for the panicle attitude of branches. The parents and hybrids were grouped as semi erect, semi erect to spreading and spreading, Based on the panicle exertion parents and hybrids were classified as partly exerted, exerted and well exerted.

Table 1. Seed morphological characters in rice hybrids and their parental lines.

Parents/ Hybrids	Seed length (mm)	Seed width (mm)	Seed thickness (mm)	L/WRatio	L/T Ratio	1000 Seed weight (g)
IR-68897A	8.82	2.34	1.59	3.78	5.58	23.46
IR-68897B	8.84	2.16	1.63	4.09	5.45	24.94
DR 714-1-2R	7.92	2.46	1.41	3.21	5.65	19.10
DRRH-2	8.52	2.24	1.42	3.82	6.04	23.75
IR-58025A	9.73	2.36	1.20	4.12	8.10	18.63
IR-58025B	9.34	2.18	1.35	4.28	6.91	19.36
KMR-3R	6.69	2.62	2.03	2.55	3.31	23.63
KRH-2	9.24	2.04	1.49	4.52	6.24	18.75
Mean	8.64	2.30	1.51	3.79	5.91	21.41
SEm±	0.32	0.11	0.11	0.27	0.56	0.53
CD (P =0.05)	0.97	0.35	0.03	0.81	1.68	1.59

based on seed colour. However, the seed colour is also influenced by environmental conditions during ripening besides the genetic effect (Pascual *et al.*, 1993).

In the present study significant differences were observed among the parents and hybrids with respect to shoot length, root length and mesocotyl length and based on these parameters the parents and hybrids were grouped as short, medium and long. The shoot length varied from 11.27 (IR-58025A) to 14.11cm (IR-68897B). However, the root length was highest in DRRH-2 (17.58 cm) and lowest in IR-58025A (14.10cm) whereas, mesocotyl length showed greater variation, which ranged from 1.60 to 2.00 cm (Table 2). The variation in mesocotyl length in rice genotypes was reported by Rohini Devi, 2000.

The plant morphological characters differed significantly among the hybrids and parental lines. The plant height varied from 31.26 (IR-58025B) to 37.42 cm (IR-58025A) at 30 days, 38.48 (DR 714-1-2R) to 53.78 cm (KMR-3R) at 60 days. However, at 90 days it varied from 52.80 (DR 714-1-2R) to 72.17 cm (KRH-2), and at maturity it ranged from 77.00 (DRRH-2) to 124.33 cm (KMR-3R), which suggest that significant

Observations for 30 qualitative traits indicated that the fifteen traits did not show any variation (Table 3). Time of maturity and leaf senescence was observed at the ripening stage on the basis of toughness of the seed and colouration of seed. The number of days taken to maturity ranged from 112 days (IR-68897B) to 134 days (IR-58025B) and grouped into

Table 2. Seedling morphological characters in rice hybrids and their parental lines

Parents/ Hybrids	Shoot length (cm)	Root length (cm)	Mesocotyl length (cm)	Root to shoot ratio
IR-68897A	12.387	15.97	1.28	1.29
IR-68897B	13.283	14.10	1.60	1.00
DR 714-1-2R	13.917	15.35	1.37	1.10
DRRH-2	13.747	17.58	1.44	1.32
IR-58025A	11.377	13.99	1.13	1.19
IR-58025B	11.273	15.81	1.20	1.42
KMR-3R	14.110	17.39	1.29	1.23
KRH-2	12.390	13.99	2.00	1.16
Mean	12.810	15.52	1.41	1.21
CD (P=0.05)	1.642	2.253	0.234	0.058
CV (%)	7.41	8.39	9.59	2.75

Table 3. Qualitative characters in rice hybrids and their parental line

Characters	IR-68897A	IR-68897B	DR 174-12R	DRRH-2	IR-58025A	IR-58025B	KMR-3R	KRH-2
Basal leaf sheath colour	Green	Green	Green	Light purple	Green	Green	Green	Green
Leaf intensity of green colour	Dark	Light	Medium	Dark	Dark	Dark	Medium	Medium
Leaf anthocyanin colouration	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Leaf anthocyanin distribution	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Leaf sheath anthocyanin colouration	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Leaf sheath intensity of anthocyanin colouration	Very weak	Very weak	Very weak	Very weak	Very weak	Very weak	Very weak	Very weak
Leaf pubescence of blade surface	Weak	Weak	Weak	Weak	Absent	Weak	Weak	Weak
Leaf auricle	Present	Present	Present	Present	Present	Present	Present	Present
Anthocyanin colour of auricle	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless
Leaf collar	Present	Present	Present	Present	Present	Present	Present	Present
Leaf ligule	Present	Present	Present	Present	Present	Present	Present	Present
Shape of ligule	Acute	Split	Split	Split	Acute	Split	Split	Acute
Colour of ligule	Green	Green	Green	Green	Green	Green	Green	Green
Leaf length of blade	Medium (42cm)	Medium (40cm)	Medium (36cm)	Long (55cm)	Medium (32cm)	Medium (35cm)	Medium (41cm)	Long (46cm)
Culm altitude	Semi erect	Semi erect	Erect	Semi erect	Semi erect	Semi erect	Erect	Semi erect
Basal sheath colour	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless
Leaf senescence	Intermediate	Early	Late	Intermediate	Late	Late	Late	Late

early, medium and late, whereas, DRRH-2 Hybrid and its parents were early maturity type. However, leaf senescence was visually observed at caryopsis hardening stage and significant differences observed for IR-68897A, IR-68897B, DRRH-2 and DR 714-1-2R where as KRH-2 and their parents were grouped under late type.

Thus, it is concluded that the morphological characteristics of seed, seedling and plant were found useful for varietal characterization in rice hybrids and parents. Some of the distinguishing character like attitude of flag leaf blade, flag leaf length and width, days to 50 per cent flowering and maturity, stem length, degree of panicle exertion, presence of awns and seed traits such as 1000 seed weight, grain length and width and shape of grain were found to be more useful for identification and grouping of hybrids and parents to maintain genetic purity during seed production.

REFERENCES

Anonymous 1954. Munsell soil colour charts, Munsell Color Macbeth Division of Kollmorgen Corporation, 2441, North Calvert Street, Baltimore.

Geetha S, Soundarraj AMK and Palnisamy S 1994. Grain characteristics of rice hybrids. *Crop Res.*, 7(2): 303-305.

Ista 1996. Verification of species and cultivars. (Supplement) *Seed Sci. & Technol.*, 24: 253-270.

Pascual VM, Oritz JM and Coorreal E 1993. Morphometric characterization of seeds of *Euphorbia lagascae*. *Seed Sci & Technol.*, 21: 53-60.

PPV & FRA, Govt of Ind., Guidelines for the Conduct of Test for Distinctiveness, Uniformity and Stability on Rice (*Oryza sativa* L.), 2007, Plant Var. J. of India. Vol. 1(1).1-25

Rohini devi D 2000. Studies on the characterization of varieties based on morphological and biochemical traits in rice (*Oryza sativa* L.). M.Sc., (Agri.) Thesis submitted to University of Agriculture Sciences, Bangalore.

Rosta K 1975. Variety identification in rice. *Seed Sci. & Technol.*, 3: 161-169.