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Morphological Characterization of Selected Land Races of Rice (*Oryza sativa* L.)

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Authors Contribution

C. Deepika : Conceptualization, investigation, draft prepration and data alalysis; P. J. Devaraju : Conceptualization and data curation

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Abstract

Increasing interest in the descriptive characterization of plant varieties in the context of intellectual property rights is stimulated by the recent agreements within the framework of the World Trade Organization (WTO). The requirements of these activities vary, the varietal registration process (involving testing for distinctness, uniformity and stability-DUS) requires that a description of a newly bred variety be produced and compared with all existing varieties of common knowledge. Thirty one land races of rice (29 land races and 2 check varieties) maintained at Organic Farming Research Centre, UAHS, Navile, Shivamogga were utilized for the present study. These land races were raised in RCBD replicated thrice, they were evaluated for 43 morphological characters (9 quantitative & 34 qualitative) during *kharif* 2021. The local landraces exhibited sufficient genetic variation for most of the traits. There were 43 descriptors studied, out of which, six characters were found monomorphic, while rest of the characters showed polymorphic variations among the landraces. The genetic potential of the land races for the desired traits can be utilized in hybridization programme to select promising genotypes.

Keywords : Morphological, Characterization, Land races, Rice, Qualitative, Quantitative

Rice (*Oryza sativa* L.) plays a vital role in the national food security in India and contributes major source of calories for the urban and rural population. Rice belongs to the family graminae, recognized as 'Millennium Crop' expected to contribute towards food security in the world; It is one of the staple cereal crops and a primary source of food for more than half of the world's population (Ramesh Channannavar, 2019). The slogan 'Rice is Life' is most appropriate for India because this crop provides a living for millions of rural households (Renuka *et al.,* 2022). Rice has a large number of native varieties and landraces having unique characteristics and great adaptability and they are grown in different agro climatic zones. About 425,500 rice accessions conserved in various gene banks of the world are potential gene sources directed for crop improvement. India has a rich and wide range of genetic wealth of rice. It has been estimated from various surveys that nearly 50,000 of rice land races is still being grown in the country (Roy *et al*., 1985).

Major rice producing states in India are West Bengal, Uttar Pradesh, Punjab, Andra Pradesh, Odissa, Tamil Nadu and Madhya Pradesh. In world rice is grown in an area of 167.1 million hectares with the production and productivity levels of 782 million tonnes and 4678 kg per hectare, respectively. In India, rice is grown in an area of 46.15 million hectares with the production and productivity levels of 116.47 million tonnes and 2638 kg per hectare, respectively. In Karnataka rice is grown in an area of 1.13 million hectares with the production and productivity levels of 3.43 million tonnes and 3012 kg per hectare, respectively (Anonymous, 2020).

Introduction of high yielding varieties were released with new technologies have become a great threat to the security of the age-old practice of growing traditional varieties and landraces which may have immense potential for different important traits (Song *et al.*1999). The existing UPOV models of plant variety protection were not suitable for Indian requirements. The Government of India enacted our own legislation on the 'Protection of Plant Varieties and Farmers Act' (PPV & FRA) in 2001 for providing protection to plant varieties based on distinctiness, uniformity and stability (DUS) test apart from novelty. Which is a unique and model act gives equal importance to the farmers and breeders and treats them as partners in their efforts for sustainable food security (Patra, 2000).

The ability to distinguish and clearly identify the varieties of cultivated species is fundamental for the operational aspects in the seed trade. The new varieties developed in agricultural and horticultural crops should be distinct from other varieties, with the introduction of Indian legislation on 'The Protection of Plant Varieties and Farmer's Rights (PPV & FR) Act, 2001'. Morphological characterization of the released varieties and landraces helped in developing the database based on which new varieties developed can be distinguished and the characterization would also help in assessment of genetic diversity existing in the landraces and released varieties. Internationally, DUS testing is co-ordinated by the International Union for the Protection of New Varieties of Plants (UPOV), which produces guidelines detailing list of characters to be used for examination of different species. The present study was conducted to characterize the selected land races of rice based on DUS characters.

Material and Methods

A field experiment was conducted during *kharif*, 2021 at Organic Farming Research Centre (OFRC), University of Agricultural and Horticultural Sciences, Shivamogga. The research station is situated at 140 0' to 140 1' North latitude and 750 40' to 750 42' East longitude and at an altitude of 650 meters above the mean sea level. Morphological characterization of 31 land races (29 land races and 2 check varieties) of rice was done using 43 morphological traits (Plate 2 & 3). The land races were grown in RCBD design (Sundaraju *et al.,* 1972) with two checks and 29 landraces in three replications during *kharif* 2021 (Plate 1). Each land race was transplanted in five rows of 3m row length at spacing of 30 cm between rows and 10 cm between plants. Crop was raised by following recommended package of practices. Observations were recorded on 5 randomly chosen plants of each landrace per replication for 43 morphological traits.

Among the qualitative character, 34 visually assessed characteristics were observed according to the National Test Guidelines for DUS test in rice which

Plate 1 : General view of the experimental plot

Plate 2: Selected elite land races of rice seeds were used for the study

Plate 3: Selected elite land races of rice seeds used for the study

was developed by Directorate of Rice Research Rajendarnagar, Hyderabad (Shobha Rani *et al.* 2004). The observation of various characteristics was recorded at different stages of growth with appropriate procedures as per the DUS test guide lines of PPV & FR Act, 2001. Like UPOV, in PPV and FR Act, a variety must fulfill the criteria of Distinctiness, Uniformity, Stability and Novelty to get protection under this act (Anonymous 2001). The characters studied were Coleoptile colour, Basal leaf sheath colour, Intensity of green colour of leaf, Anthocyanin colouration of leaf, Distribution anthocyanin colouration of leaf, Anthocyanin colouration of leaf sheath, Pubescence of Leaf blade surface, Auricles, Anthocyanin colouration of auricles, Leaf collar, Anthocyanin colouration of collar, Leaf ligule, Shape of ligule, Colour of ligule, Culm attitude, Attitude of Flag leaf blade (early and late), Spikelet sterility, Spikelet: Density of pubescence of lemma, Anthocyanin colouration of keel, Anthocyanin colouration of area below apex, Anthocyanin colouration of apex, Colour of stigma, Anthocyanin colouration of nodes, Anthocyanin colouration of inter nodes, Curvature of Panicle main axis, Colour of tip of lemma, Panicle awns, distribution of awns, Presence of secondary branching, Attitude of branches, Panicle exertion and Sterile lemma colour, Leaf: Length of blade, Leaf: Width of blade, Time of heading (50% of plants with panicles), Stem: thickness, Stem: Length (excluding panicle), Panicle: length of longest awns, Panicle: length of main axis, Panicle: number per plant &Time of harvest (days).

Results and Discussion

Qualitative and quantitative characters were considered as marker characters in the identification of land races of rice, which are less influenced by environmental fluctuations. The 43 morphological characters (Table 2) were recorded in 31 rice land races. The qualitative characters which are less influenced by the environmental factors are used as morphological markers for the identification of rice land races (Rao *et al.,* 2013 and Kalyan *et al.,* 2017).

Table 1

List of land races of rice used for the study

Sl. No.	Name of Land races	Sl. No.	Name of Land races
1	Jasmine	17	Mysurumallige
2	Ratnachudi	18	Rajamudi
3	Nazarbad	19	Gowrisanna
4	Rajabhoga	20	Barmablack
5	Gandhasale	21	Doddabairunellu
6	Bangarasanna	22	Kempusale
7	Champakali	23	Navara
8	Dappavalya	24	Kempujiddu
9	Raichur sanna	25	Anekombinabhatta
10	Madras sanna	26	Kiruvani
11	Karigajavale	27	Rathnasagara
12	Karijiddu	28	Misebhatta
13	Neregulibhatta	29	Ambemohari
14	Puttabhatta	30	Jyothi-C
15	Jeerigesanna	31	MTU-1001-C
16	Gilisale		

The coleoptile colour varied among 31 rice land races studied as colorless and purple. Among the 31 land races 29 (94%) showed colorless and 2 (6%) (Nazarbad & Puttabhatta) land races had purple.Similar results were reported earlier by Priyanga *et al.* (2020). While colour of basal leaf sheath, among the 31 landraces 23 (74%) exhibited presence of green, 2 (7%) (Karigajavale and Puttabhatta) light purple, 5 (16%) purple lines and 1 (3%) (Nazarbad) land race showed uniform purple. Intensity of green colour, 20 (64%) land races found light green colour, 7 (23%) were medium and 4 (14%) were dark green colour. Lahkar and Tanti (2017) also reported similar results in land races. Out of thirty-one landraces 5 had leaf anthocyanin colouration, while distribution of anthocyanin coloration out of 5 land races, 4 (80%) landraces showed in margin and 1 (20%) (Nazarbad) had uniform purple colour similar result was reported earlier by Umarani *et al.* (2017). Anthocyanin colouration of leaf sheath was present in nine (29%) land races and absent in 22 (71%) land races (Table 3 & Plate 4). Pubescence of leaf blade surface, 15 (48%) were weak and 16 (52%) were medium. Leaf auricle (100%), collar (100%) and ligule (100%) present in all 31 landraces. For anthocyanin colouration of auricle, 28 (90%) land

TABLE 2

Essential characters along with DUS descriptor

Characters	Strategies				
Coleoptile colour	Colour less	Green	Purple	-	-
Basal leaf: Sheath colour	Green	Light purple	Purple lines	Uniform purple	-
Leaf: Intensity of green colour	Light	Medium	Dark	-	-
Leaf: Anthocyanin Coloration	Absent	Present	-	-	-
Leaf: Distribution of anthocyanin coloration	On tips only	On margins only	In blotches only	Uniform	-
Leaf Sheath: Anthocyanin colouration	Absent	Present	-	-	-
Leaf: Pubescence of blade surface	Absent	Weak	Medium	Strong	Very strong
Leaf: Auricles	Absent	Present	-	-	-
Leaf: Anthocyanin colouration of auricles	Colourless	Light purple	Purple	-	-
Leaf: Collar	Absent	Present	-	-	-
Leaf: Anthocyanin colouration of collar	Absent	Present	-	-	-
Leaf: Ligule	Absent	Present	-	-	-
Leaf: Shape of Ligule	Truncate	Acute	Split	-	-
Leaf: Colour of ligule	Membrane white	Light purple	Purple	-	-
Leaf: Length of blade	Short (<30 cm)	Medium (30-45 cm)	Long (>45 cm)	-	-
Leaf: Width of blade	Narrow (<1 cm)	Medium (1-1.5 cm)	Broad(>1.5cm)	-	-
Flag leaf: Attitude of blade (early observation)	Erect	Semi-erect	Horizontal	Deflexed	-
Flag leaf: Attitude of blade (late observation)	Erect	Semi-erect	Horizontal	Deflexed	-
Culm: Attitude	Erect	Semi-erect	Open	Spreading	
Time of heading (50% of plants with panicles)	Very early(<71days)	Early (71-90 days)	Medium (91-110 days)	Late (111-130 days)	-
Spikelet sterility	Absent	Present	-	-	-
Stem: Thickness	Thin	Medium	Thick	-	-
Spikelet: Density of Pubescence of lemma	Absent	Weak	Medium	Strong	Very strong
Lemma anthocyanin coloration of keel	Absent	Weak	Medium	Strong	Very strong
Lemma anthocyanin coloration of area below apex	Absent	Weak	Medium	Strong	Very strong
Lemma anthocyanin coloration of area apex	Absent	Weak	Medium	Strong	Very strong
Spikelet:Colour of stigma	White	Light green	Yellow	Light purple	Purple
Stem: Length (excluding panicle)	Very short (<91 cm)	Short (91-110 cm)	Medium (111-130 cm)	-	-
Stem: Anthocyanin colouration of nodes	Absent	Present	-	-	-
Stem: Anthocyanin colouration of inter- nodes	Absent	Present	-	-	-

Table 2 Contiuned....

Characters	Strategies				
Panicle: Curvature of main axis	Straight	Semi-straight	Dropping	Deflexed	-
Spikelet: Colour of tip of lemma	White	Yellowish	Brown	Purple	Black
Panicle: Awns	Absent	Present	-	-	-
Panicle : Distribution of awns	Tip only	Upper half only	Whole length	-	-
Panicle: length of longest awns	Very short	Short	Medium	Long	Very long
Panicle : Presence of secondary branching	Absent	Present	-	-	-
Panicle: Secondary branching	Weak	Strong	Clustered	-	-
Panicle: Exertion	Partly exerted	Mostly exerted	Well exerted	-	-
Sterile lemma: Colour	Straw	Gold	Red	Purple	-
Panicle: Attitude of branches	Erect	Erect to semi-Erect	Semi-erect	Semi-erect to spreading	Spreading
Panicle: length of main axis	Very short (<16 cm)	Short (16-20 cm)	Medium (21-25 cm)	Long (26-30 cm)	-
Panicle: number per plant	Few (<11)	Medium (11-20)	Many (>20)	-	-
Time of harvest (days)	Early (101-120)	Medium (121-140)	Late (141-160)	Very late (>160)	-

races were colourless, 2 (Barmablack & Nazarbad) land races were purple (7%) and one (Karigajavale) land race was light purple (3%) and it was similar with earlier reports by Sakthi Avinash *et al.* (2019). Among the 311 and racestwo (Karijiddu & Karigajavale) land races had anthocyanin colouration at collar of leaf (6%) and 29 (94%) had no anthocyanin colouration at collar of leaf. All the land races were having split shape of ligule (100%). Two (Barmablack & Nazarbad) land race posses purple colour of ligule (7%), 24 (77%) were membranous white and 5 (16%) were of light purple. With respect to length of leaf blade, the 31 land races classified 3 (19%) were short, 22 (71%) were medium and 6 (10%) were long, whereas, for width of leaf blade, 26 (84%) were narrow, 4 (13%) were medium and 1 (3%) was broad (Table 3A, 4 & Plate 5 & 6). Culm attitude of land races, five (16%) were erect, 8 (26%) were semi erect, 10 (32%) were open type and 8 (26%) were spreading. For time of 50 per cent heading two (6%) land races were very early, 15 (48%) land races early, 11 (36%) land races were medium and three (10%) land races were late. Flag leaf attitude of blade (early), 18 (58%) land races were erect, 12 (39%) land races were semi erect and one (Ambemohari) land race was deflexed (3%). However, flag leaf attitude of blade (late), 16 (51%) land races were erect, 8 (26%) land races were semi erect, four (13%) land races were horizontal and three (10%) (Ambemohari, Puttabhatta & Rajamudi) landraces weredeflexed (Table 3A & 4). Similar results were notified by (Kalyan *et al.,* 2017 and Keerthivarman *et al.,* 2019). Spikelet sterility was absent in all 31 land races.

For anthocyanin colouration of lemma keel was absent for 22 (71%) land races while present in nine (29%) land races, out of nine, seven (23%) had medium anthocyanin colouration and two (6%) (Karigajavale & Barmablack) had strong intensity. Anthocyanin colouration of area below apex of lemma was absent in twenty land races (65%), while nine (29%) land races were medium coloured and two (6%) (Karigajavale and Barmablack) land races showed strong colour. Anthocyanin colouration of apex was absent in 19 (61%) land races, whereas, ten (32%) had medium, two (7%) (Karigajavale & Barmablack)

TABLE 3

Per cent distribution in selected land races of rice for various morphological characters

Characters	Status	No. of rice landraces	Contribution ofnumber of land races (%)
Coleoptile colour	Colour less	29	94
	Purple	2	6
Basal leaf: Sheath colour	Green	23	74
	Light purple	2	7
	Purple lines	5	16
	Uniform purple	1	3
Leaf: Intensity of green colour	Light	20	64
	Medium	7	23
	Dark	4	13
Leaf: Anthocyanin Coloration	Absent	26	84
	Present	5	16
Leaf: Distribution of anthocyanin coloration	On margins only	4	80
	Uniform	1	20
Leaf Sheath: Anthocyanin colouration	Absent	22	71
	Present	9	29
Leaf: Pubescence of blade surface	Weak	15	48
	Medium	16	52
Leaf: Auricles	Absent	0	0
	Present	31	100
Leaf: Anthocyanin colouration of auricles	Colourless	28	90
	Light purple	1	3
	Purple	2	7

Colourless Purple

Coleoptile colour

Green Light Purple Purple lines Uniform purple

Basal leaf sheath colour

Light Medium Dark

Plate 4: Coleoptile colour, basal leaf sheath colour and intensity of green colour of land races of rice

TABLE 3A

Per cent distribution in selected land races of rice for various morphological characters

Characters	Status	No. of rice land races	Contribution of number of land races (%)
Leaf: Collar	Absent	0	0
	Present	31	100
Leaf: Anthocyanin colouration of collar	Absent	29	94
	Present	2	6
Leaf: Ligule	Absent	0	0
	Present	31	100
Leaf: Shape of Ligule	Split	31	100
Leaf: Colour of ligule	White	24	77
	Light purple	5	16
	Purple	2	7
Leaf: Length of blade	Short (<30 cm)	3	19
	Medium(30-45 cm)	22	71
	Long (>45 cm)	6	10
Leaf: Width of blade	Narrow (<1 cm)	26	84
	Medium (1-1.5 cm)	4	13
	Broad(>1.5cm)	1	3
Flag leaf: Attitude of blade (early observation)	Erect	18	58
	Semi-erect	12	39
	Horizontal	0	0
	Deflexed	1	3
Flag leaf: Attitude of blade(late observation)	Erect	16	51
	Semi-erect	8	26
	Horizontal	4	13
	Deflexed	3	10
Culm: attitude	Erect	5	16
	Semi-erect	8	26
	Open	10	32
	Spreading	8	26

Characters	Status	No. of rice land races	Contribution of number of land races (%)
Time of heading (50% of plants with panicles)	Very early(<71 days)	2	6
	Early(71-90 days)	15	48
	Medium(91-110 days)	11	36
	Late(111-130 days)	3	10
Spikelet sterility	Absent	31	100
	Present	0	0

TABLE 3B

Per cent distribution in selected land races of rice for various morphological characters

Characters	Status	No. of rice Land races	Contribution of number of land races (%)
Lemma anthocyanin coloration of keel	Absent	22	71
	Weak	0	0
	Medium	7	23
	Strong	2	6
Lemma anthocyanin coloration of area below apex	Absent	20	65
	Weak	0	0
	Medium	9	29
	Strong	2	6
Lemma anthocyanin coloration of area apex	Absent	19	61
	Weak	0	0
	Medium	10	32
	Strong	2	7
Spikelet: Colour of stigma	White	25	81
	Purple	6	19
Stem: Thickness	Thin (<0.45 cm)	16	52
	Medium (0.45-0.60 cm)	9	29
	Thick (>0.60 cm)	6	19
Stem: Length(excluding panicle)	Very short (<91 cm)	17	55
	Short (91-110 cm)	12	39
	Medium (111-130 cm)	2	6
Stem: Anthocyanin colouration of nodes	Absent	29	94
	Present	2	6
Stem: Anthocyanin colouration of inter- nodes	Absent	24	77
	Present	7	23
Panicle: Length of main axis	Very short(<16 cm)	6	19
	Short(16-20 cm)	6	19
	Medium(21-25 cm)	12	39
	Long (26-30 cm)	7	23

Characters	Status	No. of rice Land races	Contribution of number of land races (%)
Panicle: Curvature of main axis	Straight	2	6
	Semi-straight	4	13
	Dropping	13	42
	Deflexed	12	39
Panicle: Number per plant	Few (<11)	14	45
	Medium (11-20)	16	52
	Many (>20)	1	3

Absent Margin only Uniform Absent Present

Leaf anthocyanin colouaration Leaf sheath anthocyanin colouration

Weak Medium Strong

Leaf sheath intensity of anthocyanin colouration

Colourless Light purple Purple

Leaf anthocyanin colouaration of auricles

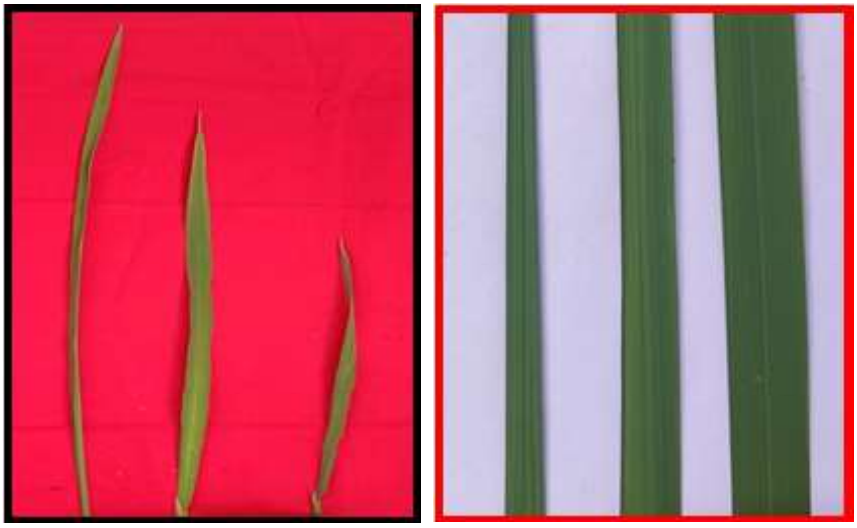
Plate 5 : Anthocyanin colouration of leaf, leaf sheath and auricles of land races of rice

Absent Present

Leaf anthocyanin colouaration of collar

Membranous white Light purple Purple

Leaf colour of ligule



Long Medium Short Narrow Medium Broad

Leaf : length of the bladeLeaf : width of the blade

Plate 6 : Anthocyanin colouration of leaf collar, ligule and length of leaf blade and leaf width of land races of rice

had strong (Table 3B & 6). Similar results were report by Ramesh Channannavar *et al.* (2020). Among the 31 land races 16 (52%) land races were thin, nine (29%) were medium and six (19%) land races had thick stem. Stem length was very short in 17 (55%) land races, short in 12 (39%) and medium in two (6%) land races. For spikelet density of pubescence of lemma, 9 (29%) were weak, 18 (58%) were medium and 4 (13%) were strong. For colour of stigma, 25 (81%) were white and 6 (19%) were purple. The similar results were obtained by Subbu Rao *et al.* (2013).

TABLE 4

Quantitative characters in selected land races of rice

Landraces	Length of leaf blade (cm)	Leaf: Width of blade (cm)	Time of heading (50% of plants with panicles)
Jasmine	63.00	1.00	115.00
Ratnachudi	49.90	0.90	99.00
Nazarbad	35.40	0.80	95.00
Rajabhoga	38.20	1.00	119.00
Gandhasale	24.30	0.60	94.00
Bangarasanna	30.50	0.80	105.00
Champakali	34.00	0.60	83.67
Dappavalya	38.60	1.00	83.00
Raichursanna	32.50	0.90	83.00
Madrassanna	32.50	0.80	90.00
Karigajavale	42.90	0.90	99.00
Karijiddu	44.80	0.80	103.00
Neregulibhatta	55.10	1.00	82.00
Puttabhatta	57.20	0.70	105.00
Jeerigesanna	38.70	0.80	95.00
Gilisale	42.00	0.90	95.00
Mysurumallige	25.00	0.60	78.00
Rajamudi	42.00	0.90	110.00
Gowrisanna	37.50	1.10	95.00
Barmablack	39.50	1.10	115.00
Doddabairunellu	37.40	0.70	79.00
Kempusale	32.50	0.90	78.00
Navara	23.00	0.50	67.00
Kempujiddu	41.60	0.60	83.00
Anekombinabhatta	31.00	1.10	83.67
Kiruvani	38.00	1.00	83.00
Rathnasagara	37.50	1.10	88.00
Misebhatta	46.60	0.90	83.00
Ambemohari	49.00	0.70	75.00
Jyothi	30.50	0.90	68.00
MTU-1001	31.00	1.00	85.00
Mean	38.76	0.86	90.85
SEm±	0.867	0.054	0.761
CD (P=0.05)	2.454	0.153	2.152
CV (%)	3.875	10.890	1.450

Anthocyanin colouration of node was absent in 29 (94%) landraces and present in two (Neregulibhatta & Misebhatta) landraces (6%). Anthocyanin colouration of inter node was present in seven (23%) landraces and absent for in 24 (77%) landraces. The identical results were summarized by (Ramesh Channannavar *et al.,* 2020). For panicle curvature of main axis, two (Doddabirunellu & Navara) were straight (6%), four (13%) were semi straight, 13 (42%) were drooping and 12 (39%) were deflexed. Among 31 land races with respect to length of panicle main axis, six (19%) were very short, six (19%) were short, 12 (39%) were medium and seven (23%) had long panicle. Fourteen (45%) land races were identified with few panicles per plant, 16 (52%) were medium and one (3%) had much number of panicles per plant. Basedon the spikelet colour of tip of lemma, landraces were grouped into 13 (42%) white, five (16%) yellowish, five (16%) brown, three (10%) purple and five (16%) brown tawny (Table 5).

Panicle awns were present only in 5 (16%) land races out of 31 and absent in 26 (84%) land races. Distribution of awns in panicle, two (40%) had awnsin tip only and three (Madrassanna, Kempusale & Misebhatta) had in whole length (60%). Out of the 5 awned landraces, one (20%) had very short, one (20%) had short, one (20%) had medium, one (20%) had long and one (20%) had very long in length of awns. Manjunatha *et al.* (2018) also reported the absence of awns in the landraces taken for the study whereas Chakravorty and Ghosh (2012) reported panicle distribution of awns at tip only in the landraces studied. All 31 land races showed presence of secondary branching of panicle, out of which, 12 (39%) land races were weak, 10 (32%) were clustered and 9 (29%) were strong. For the panicle attitude of branches, three (Doddabirunellu, Navara & Raichursanna) were erect (10%), five (Nazarbad, Rajabhoga, Dappavalya, Gilisale & Kiruvani) were erect to semi erect (16%), 10 (32%) were semi erect, 11 (36%) were semi erect to spreading and two (Bangarasanna & Gandasale) were spreading (6%). Based on the exsertion of panicle, two (Bangarasanna & Kempusale) were mostly exsertion (6%) and 29

TABLE 5

Per cent distribution in selected land races of rice for various morphological characters

Characters	Status	No. of rice Land races	Contribution of number of land races (%)
Spikelet: Density of Pubescence of lemma	Absent	0	0
	Weak	9	29
	Medium	18	58
	Strong	4	13
Spikelet: Colour of tip of lemma	White	13	42
	Yellowish	5	16
	Brown	5	16
	Purple	3	10
	Brown tawny	5	16
Panicle: length of longest awns	Very short	1	20
	Short	1	20
	Medium	1	20
	Long	1	20
	Very long	1	20
Panicle: Awns	Absent	26	84
	Present	5	16
Panicle : Distribution of awns	Tip only	2	40
	Whole length	3	60
Panicle : Presence of secondary branching	Absent	0	0
	Present	31	100
Panicle: Secondary branching	Weak	12	39
	Strong	9	29
	Clustered	10	32
Panicle: Exertion	Partly exerted	0	0
	Mostly exerted	2	6
	Well exerted	29	94
Panicle: Attitude of branches	Erect	3	10
	Erect to semi-Erect	5	16
	Semi-erect	10	32
	Semi-erect to spreading	11	36
	Spreading	2	6
Sterile lemma: Colour	Straw	30	97
	Purple	1	3
Time of harvest (days)	Early (101-120)	1	3
	Medium(121-140)	18	58
	Late (141-160)	11	36
	Very late (>160)	1	3

TABLE 6
Quantitative characters in selected land races of rice

Landraces	Stem: Thickness (cm)	Stem: Length (excluding panicle) cm	Panicle: Length of main axis (cm)	Panicle: Number per plant
Jasmine	0.49	70.50	27.20	15.00
Ratnachudi	0.39	92.00	23.00	20.00
Nazarbad	0.56	88.00	17.00	8.00
Rajabhoga	0.57	70.20	23.20	17.00
Gandhasale	0.51	90.00	9.10	13.00
Bangarasanna	0.42	92.00	24.00	12.00
Champakali	0.48	73.00	19.20	10.00
Dappavalya	0.67	104.00	23.00	8.00
Raichursanna	0.60	80.10	23.00	14.00
Madrassanna	0.43	61.00	17.20	7.00
Karigajavale	0.52	105.00	25.20	12.00
Karijiddu	0.10	85.00	22.20	17.00
Neregulibhatta	0.41	104.00	26.00	13.00
Puttabhatta	0.31	94.00	26.00	17.00
Jeerigesanna	0.44	127.00	25.20	11.00
Gilisale	0.61	116.00	26.20	17.00
Mysurumallige	0.41	44.00	20.00	13.00
Rajamudi	0.42	84.20	24.20	15.00
Gowrisanna	0.55	92.20	26.10	11.00
Barmablack	0.70	93.50	25.00	8.00
Doddabairunellu	0.32	70.00	16.00	8.00
Kempusale	0.36	52.00	18.30	11.00
Navara	0.31	65.00	15.00	9.00
Kempujiddu	0.27	77.50	17.20	9.00
Anekombinabhatta	0.63	98.50	24.10	11.00
Kiruvani	0.32	64.00	24.00	15.00
Rathnasagara	0.41	94.50	23.20	12.00
Misebhatta	0.60	100.00	16.00	15.00
Ambemohari	0.65	111.50	27.00	27.00
Jyothi	0.44	50.60	15.00	10.00
MTU-1001	0.62	62.00	23.30	11.00
Mean	0.47	84.24	21.65	12.77
SEm±	0.001	0.759	0.866	0.737
CD (P=0.05)	0.003	2.148	2.451	2.085
CV (%)	0.401	1.561	6.933	9.992

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TABLE 7

Quantitative characters in selected land races of rice

Landraces	Panicle: length of longest awns (cm)	Time of harvest (days)
Jasmine	0.707	163.00
Ratnachudi	0.707	150.00
Nazarbad	1.047	147.00
Rajabhoga	0.707	132.00
Gandhasale	0.707	143.00
Bangarasanna	0.707	153.00
Champakali	0.707	139.00
Dappavalya	0.707	140.00
Raichursanna	0.707	136.00
Madrassanna	2.423	142.00
Karigajavale	0.707	147.00
Karijiddu	0.707	154.00
Neregulibhatta	0.707	136.00
Puttabhatta	0.707	157.00
Jeerigesanna	0.707	135.00
Gilisale	0.707	138.00
Mysurumallige	0.707	134.00
Rajamudi	0.707	159.00
Gowrisanna	0.707	139.00
Barmablack	0.707	161.00
Doddabairunellu	0.707	136.00
Kempusale	1.394	134.00
Navara	0.707	125.00
Kempujiddu	0.707	138.00
Anekombinabhatta	0.947	136.00
Kiruvani	0.707	139.00
Rathnasagara	0.707	139.00
Misebhatta	3.029	132.00
Ambemohari	0.707	142.00
Jyothi	0.707	120.00
MTU-1001	0.707	137.00
Mean	0.88	141.39
SEm±	0.00046	0.955
CD (P=0.05)	0.00131	2.700
CV (%)	0.092	1.169

Note : Square root transformation for the parameter Panicle: length of longest awns (cm)

(94%) were well exsertion of panicle. The correspondent results were recited by Subbu Rao *et al.* (2013). For sterile lemma colour, 30 (97%) had straw colour and one (Ambemohari) hadpurple (3%). For time of harvest, one (3%) landrace was early, 18 (58%) landraces were medium, 11 (36%) land races were late and one (3%) landrace was very late (Table 5 & 7).

The present study was conducted with 31 landraces and they exhibited 43 (9 quantitative & 34 qualitative) distinctive essential characters. Majority of them showed clear cut distinctive characters. Hence, these characters will be useful for developing future Varieties/ hybrids through conventional breeding methods. The information generated on these landraces also supports their registration with the PPV and FRA.

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