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Characterization of rice traditional varieties (*Oryza sativa* L.) based on DUS descriptors

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Abstract
One hundred and eighty seven traditional varieties/landraces of rice (*Oryza sativa* L.,) were characterized following the 62 DUS descriptors. The data was recorded on 44 qualitative and 18 quantitative characters. The rice landraces under study recorded a wide range of variability for most of the morphological traits studied. Out of 62 characters studied, five characteristics were found monomorphic *viz*., leaf ligule, shape of ligule, leaf collar, male sterility and Endosperm: Presence of amylose, remaining characters registered variations among the landraces. Spikelet: Colour of tip of lemma, Panicle: Colour of awns (late observation) and decorticated grain: Shape recorded six states of expression. The descriptors registered maximum variation were decorticated grain: Colour [7] and Lemma and Palea: Colour [9]. Wide variation among the DUS characters indicated wide genetic variation among the landraces under the study, which may be utilized for crop improvement programmes.

Keywords: Characterization, DUS, traditional varieties, morphological, PPV & FR act

Introduction
Rice (*Oryza sativa* L.) is one of the most important staple food crop grown in India, it is grown in an area of 43.79 million ha^{-1} with a total production of 112.91 million tones and an average productivity of 2578 kg ha^{-1} (Anonymous, 2018) [1, 2]. Rice has the largest germplasm collections in the world, landraces are traditionally cultivated, evolved over generations with proven special features over wild relatives and serve as a treasure of useful genes and they played a very important role in the local food security and sustainable development of agriculture, in addition to their significance as genetic resource for rice genetic improvement (Tang *et al.*, 2002) [19]. Characterization of such germplasm is important for utilizing the appropriate attribute based donors and also essential in the present era for protecting the uniqueness of rice (L.V Subba Rao *et al*., 2015) [9, 17, 20]. Characterization should eventually lead to a system of recording and storing useful data that can be readily retrieved and made available to others and help in planning breeding programmes (Tommasini. L *et al*., 2003) [8].
The Government of India has enacted its Sui generis system, Protection of Plant Varieties and Farmers' Right Act (PPV & FRA), 2001 [2] for providing protection to plant varieties based on Distinctiveness, Uniformity and Stability (DUS) tests. DUS testing principles are used for the protection of plant varieties and award of plant breeders and farmers rights, a system of intellectual property protection which is available for all types of crop breeders. The concept of DUS is fundamental to the characterization of a variety as unique and provides an official description of a variety for its identity as it is globally accepted for varietal identification.
The large collection of land races/genetic resources need to be evaluated for their wealth of useful traits which can form as a great source of raw material to the breeders to conduct the varietal improvement programmes. It is thus necessary to characterize varieties especially farmers varieties/traditional varieties/landraces on the basis of DUS criteria and to register them with PPV&FR Authority on behalf of the farmers, otherwise valuable germplasm which was being conserved by the farmers will remain unprotected and anybody can utilize for monetary gains. Thus the present study was undertaken with the objective of characterizing 187 traditional varieties of rice following DUS guidelines.

Material and Methods
The experimental material consisted of 187 traditional varieties of rice collected from various places were sown separately in raised bed nursery, which were evaluated for DUS

Characteristics during Kharif 2015 at IIRR Farm, ICRISAT campus, Patancheru, Hyderabad, India. Experimental farm is situated at 17.53ºN latitude, 78.27ºE longitude and altitude of 545m above mean sea level. Thirty days old seedlings of each landrace were transplanted in a plot comprising 11 rows of 6m length at spacing of 30cm between rows and 20cm between plants in Randomized Block Design replicated thrice. Recommended agronomic and plant protection measures for raising a healthy nursery and main crop were taken up during the experiment. Observations were recorded on five randomly chosen plants of each genotype for all the traits under study, at different stages of growth with appropriate procedures as per the "Guidelines for the Conduct of Test for Distinctness Uniformity Stability (DUS) on Rice" (PPV & FRA, 2007) [2] (Anonymous, 2007) [1, 2]. List of landraces used in present investigation is tabulated in Table.1.

Table 1: List of traditional varieties/landraces of rice used for DUS characterization

S. No.	Landrace name	Passport data
1	NUAPADA-SINAPALI-MAHIPAL	Orissa
2	KALAMDANI	Jharkhand
3	CHARKA DHAN	Jharkhand
4	PANI DHAN	Jharkhand
5	RAJESH	Bihar
6	GANDHA DHAN	Jharkhand
7	NANHIYA	Jharkhand
8	DUBRAJ	Jharkhand
9	BHETLU	Jharkhand
10	JAGARNATH	Jharkhand
11	RANI KAJAR	Jharkhand
12	KHIJUR JHOPA	Jharkhand
13	CHINA BHALI	Jharkhand
14	BANDGODA	Jharkhand
15	BIRAHI	West Bengal
16	Langal Mura	West Bengal
17	BADAN SARU	West Bengal
18	DHARANSAL	West Bengal
19	JAMAYNADU	West Bengal
20	KHAJURCHARI	West Bengal
21	MARICH SAL	West Bengal
22	SINDURMUKHI	West Bengal
23	SUAKALMA	West Bengal
24	FULKHAR	West Bengal
25	AMAR	Bihar
26	SITASAL	West Bengal
27	VUTMURI	West Bengal
28	MUGEM(BARO)	West Bengal
29	NONA BOGRA	West Bengal
30	LIKE-KAKUA	West Bengal
31	Lemont	IRRI
32	Him-Chhortu	Himachal Pradesh
33	BASKAMINI	West Bengal
34	BOMBAI MUGI	West Bengal
35	CHOTODIDI	West Bengal
36	PATMAI-23	West Bengal
37	KASIPHUL	West Bengal
38	Surjeet Basmati	Haryana
39	ChittiMutyalu	Telangana
40	DUDHERSWAR	West Bengal
41	KANKCHUR	West Bengal
42	CHINA KAMINI	West Bengal
43	DUDH KALMA	West Bengal
44	Jeeraka Samba	Tamil Nadu
45	ASAN LAYA	West Bengal
46	GOKUL SAL	West Bengal
47	GOWARDHAN KALIKAMOD	Chhattisgarh
48	Radhatilak	West Bengal
49	JHILIK	West Bengal
50	CHARKA DHUSRI	Jharkhand
51	Neta	Jharkhand
52	ASISH	West Bengal
53	AYAN	West Bengal
54	NIRJHARA	West Bengal
55	ARKA	West Bengal
56	Karad	Himachal Pradesh

57	NABANNA	West Bengal
58	KABI RAJ	West Bengal
59	KALAMKHARI-2	West Bengal
60	BADSWARNA-II	West Bengal
61	BADSHA-B	West Bengal
62	KANDAGIRI-I	West Bengal
63	Sagara Mutyalu	Andhra Pradesh
64	Manipur Black Rice	Manipur
65	MOTI-1	West Bengal
66	MEDI-WB	West Bengal
67	Annapurna	Uttar Pradesh
68	Dular	Chhattisgarh
69	JAJADHI	West Bengal
70	GANGAJALI	West Bengal
71	BADSHABHOG	West Bengal
72	KAKSAL	West Bengal
73	Kuruka (Kuruna)	Kerala
74	Azucena	IRRI
75	Atharav	Uttar Pradesh
76	Nipponbare	IRRI
77	Ganjarangwala	Central India
78	Darbariroodbar	Central India
79	NERICA-L-45	IRRI
80	JAL-DHEEPA	West Bengal
81	KALO NUNIA	West Bengal
82	KARTIK SAL	West Bengal
83	GOBINDABHOG-B2	West Bengal
84	KATARIBHOG	West Bengal
85	KALO JIRA-81	West Bengal
86	KALAMKATI	West Bengal
87	AGNIBAN-B1	West Bengal
88	LANGAL MUTHI	West Bengal
89	MUKTA	West Bengal
90	NETA	West Bengal
91	MALABATI-RAN	West Bengal
92	Nun-Bovel	Jammu & Kashmir
93	CHANDRAKATI-B1	West Bengal
94	PANATI	West Bengal
95	KELESH-1981	West Bengal
96	KALODHOPA	West Bengal
97	TAL MUGUR DHAN-1	West Bengal
98	BARANI	West Bengal
99	LAL BADSHABHOG-RAN	West Bengal
100	NIKUNJA	West Bengal
101	NARKEL JHOPA	West Bengal
102	Tolen	Manipur
103	RUPSAL	West Bengal
104	BHAGWANTPHOOLPUR	Uttar Pradesh
105	KALA BHAT	West Bengal
106	BLACK BURMA	Andaman & Nicobar
107	KHUDHBAYYA	Andaman & Nicobar
108	Mahadi	Maharashtra
109	WHITE BURMA	Andaman& Nicobar
110	MUSHLEY	Andaman & Nicobar
111	NYAW-IN	Andaman & Nicobar
112	RED BURMA	Andaman & Nicobar
113	SITA SHAWL/SETA SHAL	West Bengal
114	NONA ASKUL	West Bengal
115	Bhramarmali	West Bengal
116	GITANJALI	West Bengal
117	CHAMOR MONI/CHAMAN MANI	West Bengal
118	BARSHA	West Bengal
119	BHURA SILATE/BHURE SILATE	West Bengal
120	PAN BOAT	West Bengal
121	PAKHI	West Bengal
122	Kamad	Jammu & Kashmir
123	JHULUR	West Bengal
124	MORISHAL/MARIS SWAL	West Bengal

125	OLKOCHURI	West Bengal
126	Kalahitta	
127	MOTOR MALA	West Bengal
128	MORISALI	West Bengal
129	KERALA SUNDARI	West Bengal
130	ECO	West Bengal
131	BYAMA JHUPI	West Bengal
132	PAL BARI	West Bengal
133	Gelei Dhan	Orissa
134	AHIRMAN/AHIRBAN	West Bengal
135	Nagrasal	West Bengal
136	Mushk Budgi	Jammu & Kashmir
137	DULPI	West Bengal
138	MUCHISHAL	West Bengal
139	GOVARDHAN VISHNU BHOG	Chhattisgarh
140	KANTA RANGI	West Bengal
141	DADSHAL	West Bengal
142	CHINI KAMINI	West Bengal
143	N22	Uttar Pradesh
144	CHENGA RANGI/CHENGA RANI	West Bengal
145	ASH PHOL	West Bengal
146	PATHARKUCHI	West Bengal
147	HOGLA	West Bengal
148	SADA MOTA	West Bengal
149	China Goda	Jharkhand
150	GHEUSH/HEUSH	West Bengal
151	RANI AKANDA	West Bengal
152	Sadhu Bhog	Jharkhand
153	MOULEY/MOULE	West Bengal
154	KARPURKANTI	West Bengal
155	NANGAL HANRA/LANGULE HARA	West Bengal
156	HAMAI	West Bengal
157	BHASA KALMA	West Bengal
158	Ajay	Uttar Pradesh
159	KATRAI BHOG/KATARI BHOG	West Bengal
160	MARCHAL	West Bengal
161	GOVARDHAN BADSHAH BHOG	Chhattisgarh
162	NICO-SPECIAL	West Bengal
163	ARGIR BAN	West Bengal
164	GAVERE SARU	West Bengal
165	Heitupphou	Manipur
166	LILABATI	West Bengal
167	Kakirekkalu	Andhra Pradesh
168	URE BANYA(URE BANYA)	West Bengal
169	RAM SHAL	West Bengal
170	KALO PATNAI	West Bengal
171	Ambemohar	Maharashtra
172	SADA PATNAI	West Bengal
173	DURGA	West Bengal
174	RAJ BHOJH/RAJ BHOJ	West Bengal
175	JHULI	Orissa
176	KANAKCHUR	West Bengal
177	Red Rice (Zag)	Jammu & Kashmir
178	MUGEI	Orissa
179	MAHAMAIYA	Chhattisgarh
180	DANARGURI	West Bengal
181	Him-Begmi	Himachal Pradesh
182	CHAMPAISALI	Orissa
183	GHEEAS/GHEEYAS	West Bengal
184	MIRKIMALA	West Bengal
185	TEWA (CHOTA)	Jharkhand
186	VALKI	West Bengal
187	Neta Shawl/ Neta Shal	West Bengal

Results and Discussion

In the present study, 187 traditional varieties were characterized by using 62 DUS descriptors. Among the investigated 62 characters, 44 characters were qualitative. Qualitative characters are important in respect to the characterization/identification of landraces of rice, because they are less influenced by environmental changes (L.V. Subba Rao *et al*., 2013 and Kalyan *et al*., 2017) [9, 17, 20]. The

rice traditional varieties/landraces under study showed a wide range of variability for all the morphological traits studied. Frequency distribution for all the characters under study were computed (Table 2).

Based on leaf characteristics majority of traditional varieties were found to possess green basal leaf sheath colour [78.61%], Medium intensity of green colour (65%), absence of leaf anthocyanin & leaf sheath anthocyanin colouration (89% & 88% respectively) and medium leaf senescence (49%). Pubescence of leaf surface exhibited higher variability where 47% varieties showed weak pubescence, 37% medium, 7% strong and 2% varieties showed very strong pubescence. The high diversity for the leaf pubescence can be of great help in developing the varieties possessing tolerance to sucking pests (L.V Subba Rao *et al*., 2015) [9, 17, 20]. For the character leaf auricle, leaf collar, Anthocyanin colouration of collar and leaf ligule two alternative forms of characters were observed. All the landraces recorded for its presence with the split shape of leaf ligule, Rawte *et al*., (2017) [14, 18] in their study had also reported 95% of landraces with split shape of ligule. Maximum number of landraces recorded short length of leaf blade (60%), narrow width of blade (57%) and semi-erect flag leaf attitude in both early and late observations. 95% of the total varieties exhibited colourless coleoptiles.

Table 2: Frequency distribution of traditional varieties/landraces of rice for 62 DUS characters

Sl. No.	Characteristics	States	Note	No. of landraces	Unique landraces	Frequency %
1 (+)	Coleoptile: Colour	Colourless	1	177		94.65
		Green	2	8	51, 68, 98, 118, 157, 178, 179, 187	4.28
		Purple	3	2	137, 143	1.07
2 (*)	Basal leaf: Sheath colour	Green	1	147		78.61
		Light purple	2	18	19, 25, 34, 45, 47, 80, 83, 85, 88, 90, 114, 125, 144, 155, 159, 164, 168, 170	9.63
		Purple lines	3	7	11, 68, 143, 153, 157, 178, 179	3.74
		Uniform purple	4	15	6, 16, 51, 64, 91, 98, 106, 115, 126, 137, 145, 169, 181, 184, 187	8.02
3	Leaf: Intensity of green colour	Light	3	16	15, 21, 31, 42, 56, 59, 70, 76, 78, 100, 103, 111, 116, 143, 151, 154	8.56
		Medium	5	121		64.71
		Dark	7	50	1, 6, 11, 12, 18, 20, 22, 24, 35, 38, 47, 52, 55, 57, 61, 62, 64, 65, 71, 73, 80, 81, 85, 88, 89, 91, 98, 101, 102, 110, 112, 114, 115, 119, 125, 134, 142, 144, 145, 153, 165, 169, 170, 172, 177, 178, 179,182, 184, 185	26.74
4	Leaf: Anthocyanin colouration	Absent	1	167		89.30
		Present	9	20	6, 16, 20, 25, 47, 64, 85, 96, 106, 114, 115, 125, 126, 137, 144, 145, 159, 170, 181, 184	10.70
5	Leaf: Distribution of anthocyanin colouration	On tips only	1	7	16, 20, 85, 114, 137, 144, 145	3.74
		On margins only	2	13	6, 25, 47, 64, 96, 106, 115, 125, 126, 159, 170, 181, 184	6.95
		In blotches only	3	*		*
		Uniform	4	*		*
6 (+)	Leaf sheath: Anthocyanin colouration	Absent	1	165		88.24
		Present	9	22	6, 16, 19, 25, 47, 64, 68, 106, 114, 115, 125, 126, 137, 143, 144, 145, 155, 159, 169, 178, 181, 184	11.76
7	Leaf sheath: intensity of anthocyanin colouration	Very weak	1	*		*
		Weak	3	5	19, 47, 114, 145, 155	2.67
		Medium	5	11	16, 25, 64, 115, 125, 144, 159, 169, 178, 181, 184	5.88
		Strong	7	5	6, 68, 126, 137, 143	2.67
		Very strong	9	1	106	0.53
8 (*)	Leaf: Pubescence of blade surface	Absent	1	14	3, 38, 51, 56, 57, 65, 68, 71, 89, 119, 128, 136, 171, 177	7.49
		Weak	3	87		46.52
		Medium	5	69		36.90
		Strong	7	14	29, 43, 64, 76, 79, 93, 102, 114, 129, 156, 157, 180, 183, 184	7.49
		Very strong	9	3	73, 91, 97	1.60
9(*)(+)	Leaf: Auricles	Absent	1	1	108	0.53
		Present	9	186		99.47
10 (*) (+)	Leaf: Anthocyanin colouration of auricles	Colourless	1	159		85.03
		Light purple	2	14	6, 11, 19, 47, 81, 96, 98, 115, 125, 126, 169, 170, 179, 184	7.49
		Purple	3	14	25, 34, 64, 106, 114, 127, 137, 144, 145, 157, 159, 160, 164, 168	7.49
11 (+)	Leaf: Collar	Absent	1	*		*
		Present	9	187		100.00
12	Leaf: Anthocyanin colouration of collar	Absent	1	162		86.63
		Present	9	25	6, 11, 25, 34, 47, 64, 81, 96, 98, 99, 106, 115, 125, 126, 127, 137, 140, 144, 145, 157, 160, 168, 169, 179, 184	13.37
13 (+)	Leaf: Ligule	Absent	1	*		*
		Present	9	187		100.00
14 (*) (+)	Leaf: Shape of ligule	Truncate	1	*		*
		Acute	2	*		*
		Split	3	187		100.00
15 (*)	Leaf: Colour of ligule	White	1	160		85.56
		Light purple	2	21	6, 11, 25, 47, 81, 96, 98, 114, 115, 125, 126, 137, 140, 145, 157, 160, 164,	11.23

					168, 169, 170, 179	
		Purple	3	6	27, 34, 64, 82, 90, 106	3.21
16	Leaf: Length of blade	Short (<30 cm)	3	112		59.89
		Medium (30-45 cm)	5	68	11, 12, 15, 20, 22, 28, 31, 32, 43, 44, 46, 52, 61, 62, 66, 69, 72, 73, 77, 78, 79, 84, 87, 92, 93, 100, 102, 104, 108, 111, 112, 117, 119, 120, 122, 124, 125, 126, 127, 128, 129, 130, 131, 136, 141, 142, 143,146, 147, 149, 150, 154, 155, 156, 157, 160, 161, 162, 163, 164, 167, 169, 176, 177, 181, 184, 185, 186	36.36
		Long (>45 cm)	7	7	38, 39, 41, 63, 64, 165, 171	3.74
17	Leaf: Width of blade	Narrow (< 1 cm)	3	106		56.68
		Medium (1-2 cm)	5	81	1, 4, 11, 12, 13, 15, 20, 23, 24, 25, 31, 32, 35, 36, 37, 38, 43, 44, 46, 52, 55, 56, 57, 58, 61, 62, 63, 64, 68, 69, 73, 76, 77, 78, 79, 82, 87, 91, 98, 99, 101, 102, 107, 108, 109, 111, 112, 115, 117, 119, 122, 123, 125, 126, 127, 129, 131, 133, 134, 136, 143, 145, 148, 150, 151, 152, 155, 156, 157, 158, 160, 163, 165, 167, 169, 175, 177, 179, 181, 184, 186	43.32
		Broad (> 2cm)	7	*		*
18	Culm: Attitude (for floating rice only)	Non-procumbent	1	*		*
		Procumbent	9	*		*
19 (+)	Culm: Attitude	Erect	1	47	1, 5, 7, 8, 9, 13, 17, 20, 36, 37, 42, 47, 50, 53, 57, 60, 70, 72, 74, 75, 76, 81, 82, 83, 92, 103, 109, 113, 118, 122, 131, 136, 138, 139, 142, 148, 150, 154, 156, 160, 162, 166, 171, 176, 178, 179, 185	25.13
		Semi-erect	3	127		67.91
		Open	5	9	39, 44, 63, 64, 68, 143, 165, 167, 181	4.81
		Spreading	7	4	22, 29, 34, 107	2.14
20 (*)	Time of heading (50% of plants with panicles)	Very early (<71 days)	1	1	122	0.53
		Early (71-90 days)	3	16	32, 40, 56, 58, 64, 68, 75, 77, 108, 126, 136, 143, 144, 146, 153, 161	8.56
		Medium (91-110 days)	5	109		58.29
		Late (111-130 days)	7	61	1, 4, 5, 7, 12, 13, 14, 23, 24, 25, 33, 35, 45, 48, 51, 52, 53, 55, 59, 62, 66, 69, 70, 72, 80, 83, 87, 89, 95, 97, 98, 99, 100, 104, 105, 112, 113, 117, 120, 123, 124, 132, 134, 147, 149, 150, 151, 152, 162, 163, 166, 168, 169, 172, 174, 178, 179, 180, 183, 184, 187	32.62
		Very late (> 131 days)	9	*		*
21 (+) (*)	Flag leaf: Attitude of blade (early observation)	Erect	1	79	1, 5, 7, 9, 10, 11, 12, 13, 15, 20, 24, 25, 27, 29, 30, 37, 41, 42, 43, 46, 50, 51, 52, 53, 54, 57, 58, 59, 60, 61, 62, 65, 66, 69, 73, 74, 76, 80, 86, 87, 88, 89, 93, 94, 96, 97, 99, 100, 101, 102, 103, 105, 109, 110, 111, 117, 118, 119, 120, 121, 123, 133, 134, 138, 150, 152, 155, 156, 157, 160, 164, 165, 168, 169, 178, 179, 181, 185, 186	42.25
		Semi-erect	3	101		54.01
		Horizontal	5	7	22, 68, 82, 92, 107, 124, 166	3.74
		Drooping	7	*		*
22 (*)	Spikelet: Density of pubescence of lemma	Absent	1	5	66, 70, 103, 163, 164	2.67
		Weak	3	34	2, 5, 8, 29, 31, 38, 48, 53, 54, 57, 65, 71, 74, 75, 76, 78, 84, 95, 100, 108, 109, 111, 114, 118, 119, 132, 133, 139, 146, 161, 171, 175, 182	18.18
		Medium	5	83		44.39
		Strong	7	61	9, 11, 12, 15, 20, 21, 22, 24, 25, 30, 32, 35, 41, 43, 45, 46, 47, 50, 52, 55, 61, 62, 69, 72, 73, 81, 85, 88, 89, 91, 96, 97, 99, 102, 104, 105, 106, 112, 117, 125, 128, 130, 134, 137, 140 145, 147, 152, 154, 156, 159, 160, 162, 168, 170, 174, 176, 179, 187	32.62
		Very strong	9	4	92, 122, 136, 177	2.14
23	Male sterility	Absent	1	187		100.00
		Present	9	*		*
24	Lemma: Anthocyanin colouration of keel	Absent / Very weak	1	173		92.51
		Weak	3	1	108	0.53
		Medium	5	*		*
		Strong	7	4	20, 68, 71, 106	2.14
		Very strong	9	9	11, 19, 37, 64, 85, 96, 98, 183, 186	4.81
25 (+)	Lemma: Anthocyanin colouration of area below apex	Absent	1	168		89.84
		Weak	3	1	83	0.53
		Medium	5	5	25, 56, 98, 143, 183	2.67
		Strong	7	9	19, 20, 37, 69, 71, 96, 106, 115, 186	4.81
		Very strong	9	4	6, 11, 64, 85	2.14
26 (*)	Lemma:	Absent	1	143		76.47

(+)	Anthocyanin colouration of apex	Weak	3	3	114, 149, 157	1.60
		Medium	5	6	34, 51, 80, 90, 143, 177	3.21
		Strong	7	25	16, 19, 20, 22, 25, 37, 45, 71, 83, 91, 96, 98, 125, 137, 144, 153, 159, 160, 164, 168, 169, 170, 181, 186, 187	13.37
		Very strong	9	10	6, 47, 56, 64, 73, 81, 85, 106, 108, 115	5.35
27 (*) (+)	Spikelet: Colour of stigma	White	1	148		79.14
		Light green	2	1	96	0.53
		Yellow	3	*		*
		Light purple	4	15	34, 45, 51, 56, 64, 80, 90, 106, 125, 144, 153, 157, 160, 169, 187	8.02
		Purple	5	23	11, 16, 19, 22, 25, 68, 73, 81, 91, 108, 114, 115, 121, 126, 145, 155, 159, 164, 168, 170, 177, 181, 184	12.30
28	Stem: Thickness	Thin (<0.40cm)	3	5	19, 29, 122, 136, 143	2.67
		Medium (0.40-0.55 cm)	5	105		56.15
		Thick (>0.55cm)	7	77	4, 6, 8, 9, 18, 21, 22, 23, 24, 28, 32, 34, 38, 40, 41, 42, 52, 53, 55, 56, 57, 58, 59, 64, 66, 67, 69, 70, 75, 86, 92, 98, 101, 102, 103, 105, 106, 107, 108, 110, 114, 117, 118, 121, 124, 127, 128, 129, 131, 133, 137, 138, 141, 142, 151, 154, 154, 155, 156, 158, 159, 161, 163, 164, 165, 169, 171, 173, 175, 176, 178, 179, 181, 184, 185, 187	41.18
29 (*)	Stem: Length (excluding panicle; excluding floating rice)	Very short (<91cm)	1	174		93.05
		Short (91-110 cm)	3	5	39, 108, 122, 126, 136	2.67
		Medium 111-130 cm)	5	7	32, 44, 63, 64, 68, 165, 167	3.74
		Long (131-150 cm)	7	1	171	0.53
		Very long (>150 cm)	9	*		*
30 (*)	Stem: Anthocyanin colouration of nodes	Absent	1	162		86.63
		Present	9	25	25, 137, 170,45, 51, 56, 68, 96, 125, 126, 153, 157, 159, 164, 184,16, 34, 64, 91, 98, 108, 144, 163, 168, 187	13.37
31	Stem: Intensity of anthocyanin coloration of nodes	Weak	3	3	25, 137, 170	1.60
		Medium	5	12	45, 51, 56, 68, 96, 125, 126, 153, 157, 159, 164, 184	6.42
		Strong	7	10	16, 34, 64, 91, 98, 108, 144, 163, 168, 187	5.35
32	Stem: Anthocyanin colouration of internodes	Absent	1	171		91.44
		Present	9	16	16, 25, 34, 45, 51, 64, 81, 82, 91, 98, 125, 144, 157, 163, 184, 187	8.56
33 (*) (+)	Panicle: Length of main axis	Very short (<16 cm)	1	4	2, 45, 75, 109	2.14
		Short (16-20 cm)	3	126		67.38
		Medium (21-25 cm)	5	52	4, 11, 15, 24, 32, 37, 43, 44, 46, 56, 62, 63, 64, 68, 71, 73, 74, 76, 78, 79, 82, 84, 87, 90, 98, 99, 102, 108, 111, 119, 120, 122, 124, 126, 128, 131, 136, 140, 142, 143, 150, 154, 156, 165, 167, 169, 171, 176, 181, 183, 184, 185	27.81
		Long (26-30 cm)	7	4	31, 38, 39, 186	2.14
		Very long (>30 cm)	9	1	70	0.53
34 (*) (+)	Flag leaf: Attitude of blade (late observation)	Erect	1	23	7, 10, 11, 15, 27, 29, 41, 50, 51, 58, 61, 73, 76, 80, 89, 94, 103, 104, 133, 155, 156, 157, 160	12.30
		Semi-erect	3	119		63.64
		Horizontal	5	40	1, 6, 17, 24, 26, 28, 48, 67, 68, 71, 75, 78, 81, 82, 84, 85, 86, 98, 106, 107, 122, 124, 128, 130, 132, 136, 139, 140, 148, 149, 161, 166, 170, 171, 172, 174, 175, 177, 181, 182	21.39
		Deflexed	7	5	21, 22, 32, 92, 165	2.67
35 (*) (+)	Panicle: Curvature of main axis	Straight	1	7	8, 14, 25, 68, 76, 108, 115	3.74
		Semi-straight	3	56	3, 6, 7, 9, 10, 13, 16, 20, 27, 29, 30, 31, 32, 34, 35, 40, 45, 46, 49, 50, 54, 56, 57, 62, 64, 65, 66, 70, 72, 73, 75, 78, 82, 83, 88, 89, 90, 92, 94, 95, 97, 109, 110, 119, 126, 129, 132, 133, 137, 142, 145, 152, 153, 158, 168, 182	29.95
		Deflexed	5	85		45.45
		Dropping	7	39	5, 21, 22, 38, 39, 44, 51, 58, 63, 67, 71, 74, 77, 79, 84, 91, 102, 120, 122, 123, 124, 125, 128, 131, 135, 136, 139, 143, 148, 154, 161, 165, 166, 167, 171, 177, 178, 184, 187	20.86
36	Panicle: Number per	Few (<11)	3	33	19, 25, 42, 45, 54, 59, 67, 68, 74, 75, 77, 78, 79, 83, 86, 104, 112, 114, 116, 118, 119, 126, 127, 133, 138, 149, 163, 164, 166, 168, 170, 185, 187	17.65

	plant	Medium (11-20)	5	150		80.21
		Many (>20)	7	4	7, 10, 22, 26	2.14
37 (*)	Spikelet: Colour of tip of lemma	White	1	119		63.64
		Yellowish	2	1	145	0.53
		Brown	3	33	13, 19, 25, 26, 30, 55, 57, 68, 71, 92, 96, 100, 106, 117, 122, 129, 131, 134, 135, 136, 137, 138, 142, 144, 147, 149, 150, 156, 158, 161, 171, 180, 184	17.65
		Red	4	3	114, 146, 181	1.60
		Purple	5	19	5, 6, 20, 22, 41, 47, 48, 51, 73, 81, 85, 95, 98, 108, 120, 159, 162, 177, 187	10.16
		Black	6	12	27, 64, 72, 91, 99, 126, 143, 160, 167, 168, 170, 186	6.42
38 (+)	Lemma and Palea: Colour	Straw	1	113		60.43
		Gold and gold furrows on straw background	2	21	12, 38, 50, 51, 56, 58, 67, 75, 123, 129, 131, 133, 135, 139, 143, 152, 158, 161, 171, 178, 182	11.23
		Brown spots on straw	3	14	11, 21, 119, 122, 124, 134, 138, 140, 142, 149, 156, 159, 168, 180	7.49
		Brown furrows on straw	4	15	5, 13, 19, 26, 55, 73, 98, 100, 113, 114, 117, 137, 144, 146, 150	8.02
		Brown (tawny)	5	2	25, 187	1.07
		Reddish to light purple	6	2	41, 183	1.07
		Purple spots / furrows on straw	7	3	106, 108, 115	1.60
		Purple	8	7	6, 20, 47, 68, 81, 85, 95	3.74
		Black	9	10	27, 64, 72, 91, 99, 126, 160, 167, 170, 186	5.35
39 (*) (+)	Panicle: Awns	Absent	1	165		88.24
		Present	9	22	4, 23, 30, 38, 41, 51, 56, 58, 62, 70, 75, 90, 92, 94, 102, 104, 122, 136, 140, 147, 177, 184	11.76
40 (*)	Panicle: Colour of awns (late observation)	Yellowish White	1	15	4,23,30,38,51,58,62,70,75,90,94,102,104,140,147	8.02
		Yellowish Brown	2	1	41	0.53
		Brown	3	3	9,21,22,136	1.60
		Reddish brown	4	*		*
		Light red	5			0.00
		Red	6	1	184	0.53
		Light purple	7	2	56,177	1.07
		Purple	8	*		*
		Black	9	*		*
41	Panicle: Length of longest awn	Very short	1	4	122, 140, 147, 184	2.14
		Short	3	9	4, 23, 30, 38, 62, 75, 92, 102, 104	4.81
		Medium	5	5	41, 56, 58, 90, 177	2.67
		Long	7	3	51, 70, 136	1.60
		Very long	9	1	94	0.53
42 (*)	Panicle: Distribution of awns	Tip only	1	6	23, 58, 62, 122, 140, 147	3.21
		Upper half only	3	8	4, 38, 41, 75, 92, 102, 104, 184	4.28
		Whole length	5	8	30, 51, 56, 70, 90, 94, 136, 177	4.28
43 (+)	Panicle: Presence of secondary branching	Absent	1	1	27	0.53
		Present	9	186		99.47
44 (+)	Panicle: Secondary branching	Weak	1	60	8, 10, 13, 15, 16, 20, 25, 27, 28, 29, 30, 31, 34, 41, 42, 43, 45, 49, 50, 54, 62, 66, 69, 70, 72, 74, 75, 76, 78, 85, 87, 88, 90, 92, 94, 95, 97, 103, 109, 114, 115, 116, 118, 121, 124, 132, 133, 136, 146, 147, 151, 152, 162, 164, 166, 168, 173, 177, 178, 182	32.09
		Strong	2	125		66.84
		Clustered	3	2	108, 139	1.07
45 (*) (+)	Panicle: Attitude of branches	Erect	1	17	8, 10, 14, 16, 20, 25, 30, 50, 57, 68, 73, 88, 95, 115, 133, 152, 172	9.09
		Erect to semi-Erect	3	82		43.85
		Semi-erect	5	43	3, 7, 12, 13, 19, 29, 32, 35, 45, 46, 53, 54, 60, 62, 64, 66, 69, 70, 72, 77, 90, 92, 96, 97, 109, 110, 122, 126, 127, 130, 132, 136, 138, 143, 145, 168, 177, 178, 180, 182, 183, 184, 186	22.99
		Semi-erect to spreading	7	34	4, 15, 21, 22, 26, 38, 39, 40, 43, 44, 71, 74, 83, 85, 89, 91, 102, 106, 107, 114, 139, 144, 146, 149, 151, 155, 157, 161, 162, 163, 166, 169, 171, 181	18.18
		Spreading	9	11	33, 48, 84, 108, 124, 125, 128, 147, 150, 154, 176	5.88
46 (*) (+)	Panicle: Exertion	Partly exerted	3	42	1, 3, 5, 6, 7, 8, 10, 28, 29, 31, 32, 45, 51, 57, 69, 70, 72, 74, 80, 82, 88, 89, 90, 94, 95, 97, 98, 100, 101, 102, 109, 110, 119, 121, 131, 143, 152, 162, 165, 172, 182, 187	22.46
		Mostly exerted	5	67	2, 4, 9, 12, 13, 14, 16, 18, 20, 23, 27, 30, 34, 36, 37, 39, 42, 46, 49, 50, 52, 53, 54, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 75, 76, 79, 83, 86, 103, 104,	35.83

					105, 106, 107, 112, 114, 115, 122, 123, 129, 132, 133, 138, 139, 141, 145, 149, 151, 153, 157, 158, 163, 169, 173, 175, 178, 179, 186	
		Well exerted	7	78		41.71
47	Time maturity (days)	Very early (<100)	1	1	122	0.53
		Early (101-120)	3	17	32, 40, 56, 58, 64, 68, 75, 77, 108, 126, 133, 136, 143, 144, 146, 153, 161	9.09
		Medium (121-140)	5	111		59.36
		Late (141-160)	7	58	1, 4, 5, 7, 12, 13, 14, 20, 23, 24, 25, 33, 35, 45, 48, 51, 52, 53, 55, 59, 62, 66, 69, 70, 72, 80, 87, 89, 93, 95, 97, 98, 100, 104, 105, 112, 117, 123, 124, 132, 134, 147, 149, 150, 151, 152, 162, 163, 166, 168, 169, 172, 178, 179, 180, 183, 184, 187	31.02
		Very late (>160)	9	*		*
48	Leaf: Senescence	Early	3	44	5, 9, 17, 27, 29, 34, 49, 51, 54, 66, 68, 70, 72, 75, 86, 88, 93, 95, 96, 97, 103, 105, 107, 111, 112, 114, 115, 118, 119, 121, 122, 127, 135, 143, 144, 146, 148, 149, 164, 168, 170, 171, 172, 173	23.53
		Medium	5	92		49.20
		Late	7	51	4, 6, 8, 11, 19, 20, 21, 22, 23, 24, 28, 32, 33, 36, 41, 47, 52, 55, 57, 65, 67, 69, 76, 77, 81, 89, 99, 102, 104, 106, 124, 125, 128, 136, 140, 145, 147, 150, 152, 154, 159, 161, 165, 166, 167, 176, 177, 181, 184, 186, 187	27.27
49 (*) (+)	Sterile lemma: Colour	Straw	1	177		94.65
		Gold	2	1	139	0.53
		Red	3	1	171	0.53
		Purple	4	8	6, 19, 20, 64, 71, 81, 85, 168	4.28
50	Grain: Weight of 1000 fully developed grains	Very low (<15 g)	1	5	100, 110, 117, 170, 171	2.67
		Low (15-20 g)	3	37	9, 11, 16, 19, 22, 24, 27, 28, 29, 35, 36, 39, 44, 45, 49, 64, 73, 81, 84, 90, 98, 99, 116, 134, 142, 143, 145, 149, 151, 152, 156, 159, 161, 173, 180, 181, 185	19.79
		Medium (21-25 g)	5	132		70.59
		High (26-30 g)	7	12	2, 38, 40, 56, 74, 104, 122, 136, 175, 176, 177, 179	6.42
		Very high (>30 g)	9	1	93	0.53
51	Grain: Length	Very short (<6.0 mm)	1	4	39, 146, 149, 180	2.14
		Short (6.1-8.5 mm)	3	124		66.31
		Medium (8.6-10.5 mm)	5	55	1, 2, 4, 13, 16, 18, 23, 24, 32, 33, 37, 49, 54, 57, 58, 59, 62, 64, 65, 66, 68, 69, 76, 79, 86, 88, 90, 98, 102, 103, 104, 105, 111, 115, 116, 117, 118, 119, 123, 131, 132, 137, 139, 145, 147, 154, 158, 167, 170, 172, 178, 179, 182, 183, 187	29.41
		Long (10.6-12.5 mm)	7	4	36, 38, 42, 74	2.14
		Very long (>12.5 mm)	9	*		*
52	Grain: Width	Very narrow (<2.0 mm)	1	20	8, 17, 26, 68, 71, 74, 75, 76, 78, 82, 85, 104, 113, 126, 143, 146, 161, 167, 180, 181	10.70
		Narrow (2.1-2.5)	3	66	2, 3, 4, 9, 10, 13, 15, 18, 23, 33, 36, 37, 38, 39, 40, 42, 44, 46, 47, 48, 49, 50, 52, 54, 55, 57, 58, 59, 61, 62, 63, 66, 69, 70, 79, 83, 86, 89, 90, 93, 96, 101, 102, 103, 108, 111, 115, 117, 118, 123, 131, 132, 139, 149, 151, 153, 158, 166, 169, 170, 171, 172, 174, 175, 178, 186	35.29
		Medium (2.6-3.0 mm)	5	73		39.04
		Broad (3.1-3.5 mm)	7	27	6, 7, 11, 21, 28, 35, 53, 56, 92, 98, 99, 120, 122, 124, 127, 136, 137, 142, 147, 156, 159, 160, 162, 163, 165, 168, 184	14.44
		Very broad (>3.5 mm)	9	1	177	0.53
53 (+)	Grain: Phenol reaction of lemma	Absent	1	19	7, 9, 11, 17, 22, 40, 49, 61, 62, 84, 93, 105, 112, 132, 160, 176, 179, 180, 184	10.16
		Present	9	168		89.84
54 (*) (+)	Decorticated grain: Length	Short	1	37	11, 14, 21, 30, 38, 41, 48, 60, 71, 74, 82, 83,84, 85, 91, 93, 94, 95, 97, 109, 110, 124, 127, 128, 129, 141, 146, 148, 153, 156, 159, 163, 164, 166, 173, 174, 185	19.79
		Medium	3	92		49.20
		Long	5	46	2, 5, 20, 23, 25,33, 42, 49,50, 56, 57, 59, 62, 65, 66, 67,75, 77, 78,90, 92,102, 104, 105,108, 115, 116, 118, 122, 123, 126, 131,135, 136, 139,152, 158, 161, 165,167, 177,178, 179,182, 184, 187	24.60
		Long* (Long for Basmati type)	7	12	31, 36,39, 44, 63,73, 133, 143, 149,171, 172,181	6.42

		Extra long	9	*		*
55 (*) (+)	Decorticated grain: Width	Narrow (<2.0mm)	3	47	4, 7, 8, 10, 17, 26, 27, 31, 38, 40, 44, 47, 48, 55, 63, 64, 68, 70, 71, 74, 75, 76, 78, 79, 82, 83, 85, 90, 101, 102, 103, 104, 108, 113, 117, 123, 126, 139, 143, 146, 151, 158, 161, 167, 178, 180, 181	25.13
		Medium (2.0-2.5mm)	5	89		47.59
		Broad (>2.5)	7	51	6, 11, 16, 21, 28, 30, 35, 53, 56, 60, 67, 80, 81, 88, 91, 92, 97, 99, 109, 110, 120, 121, 122, 124, 125, 127, 128, 130, 133, 136, 137, 140, 142, 147, 148, 152, 154, 155, 156, 157, 159, 160, 162, 163, 165, 168, 177, 179, 183, 184, 185	27.27
56 (*) (+)	Decorticated grain: Shape (in lateral view)	Short slender	1	13	26, 31, 40, 44, 63, 75, 90, 108, 113, 117, 126, 151, 181	6.95
		Short bold	2	87		46.52
		Medium slender	3	22	8, 9, 10, 12, 34, 37, 43, 50, 52, 61, 82, 83, 85, 87, 89, 93, 101, 143, 173, 178, 180	11.76
		Long bold	4	28	6, 16, 18, 24, 28, 32, 54, 56, 69, 96, 105, 106, 119, 121, 130, 131, 144, 145, 147, 150, 152, 154, 155, 167, 170, 175, 179, 187	14.97
		Long slender Long slender* (For Basmati type)	5	36	2, 3, 4, 15, 17, 23, 27, 33, 36, 42, 49, 55, 57, 58, 59, 62, 64, 65, 66, 68, 70, 74, 76, 78, 79, 86, 102, 103, 104, 111, 116, 118, 123, 158, 161, 172	19.25
		Extra long slender	6	1	38	0.53
57 (*)	Decorticated grain: Colour	White	1	72		38.50
		Light brown	2	59	1, 6, 8, 9, 20, 21, 22, 25, 27, 31, 33, 35, 37, 38, 39, 40, 42, 43, 49, 50, 55, 56, 57, 61, 63, 65, 71, 75, 78, 79, 81, 84, 85, 92, 106, 107, 113, 123, 135, 138, 142, 145, 146, 148, 149, 152, 158, 161, 165, 170, 171, 172, 175, 176, 178, 179, 184, 186, 187	31.55
		Variegated brown	3	16	69, 91, 95, 109, 117, 119, 125, 127, 140, 150, 156, 157, 159, 160, 164, 167	8.56
		Dark brown	4	17	5, 15, 16, 30, 34, 67, 72, 94, 100, 110, 115, 116, 130, 155, 163, 168, 181	9.09
		Light red	5	13	4, 29, 32, 73, 74, 93, 96, 108, 122, 126, 132, 133, 177	6.95
		Red	6	7	26, 54, 60, 88, 112, 136, 182	3.74
		Variegated purple	7	*		*
		Purple	8	*		*
		Dark purple	9	3	64, 105, 131	1.60
58. (+)	Endosperm: Presence of amylose	Absent	1	*		*
		Present	9	187		100.00
59 (*) (+)	Endosperm: Content of amylose	Very low (<10%)	1	3	64, 98, 105	1.60
		Low (10-19%)	3	28	4, 31, 38, 55, 56, 63, 68, 74, 76, 92, 104, 106, 108, 124, 128, 129, 137, 138, 141, 142, 144, 146, 147, 151, 153, 159, 167, 181	14.97
		Medium (20-25%)	5	126		67.38
		High (26-30%)	7	30	1, 7, 10, 14, 15, 24, 25, 30, 45, 46, 51, 52, 58, 59, 67, 69, 73, 87, 93, 94, 119, 121, 123, 133, 171, 178, 179, 182, 184, 186	16.04
		Very high (>30%)	9	*		*
60 (+)	Varieties with endosperm of amylose absent only. Polished grain: Expression of white core	Absent or Very small	1	55	3, 4, 9, 13, 17, 26, 30, 31, 33, 36, 40, 42, 44, 47, 48, 49, 55, 59, 60, 62, 63, 67, 71, 75, 77, 83, 84, 90, 92, 101, 104, 108, 110, 111, 113, 118, 126, 135, 141, 143, 146, 149, 151, 152, 153, 158, 165, 169, 171, 172, 174, 175, 176, 181, 183	29.41
		Small	3	97		51.87
		Medium	5	26	6, 7, 15, 21, 29, 35, 51, 53, 56, 88, 91, 99, 119, 120, 121, 127, 128, 130, 137, 140, 147, 148, 157, 163, 168, 186	13.90
		Large	7	1	64	0.53
		Fully chalky	9	8	28, 41, 98, 105, 106, 142, 159, 162	4.28
61 (+)	Gelatinization temperature through alkali spreading value	Low	1	2	143, 185	1.07
		Medium	3	7	39,64, 79, 92, 108, 179, 186	3.74
		High medium	5	165		88.24
		High	7	13	4,38, 47,56, 101,104,106,110,129,146,167,171,184	
62 (*) (+)	Decorticated grain: Aroma	Absent	1	152		81.28
		Present	9	35	4, 11, 17, 18, 24, 29, 32, 33, 38, 40, 41, 43, 64, 70, 71, 75, 82, 85, 104, 105, 107, 112, 129, 134, 137, 141, 146, 149, 150, 153, 161, 165, 166, 174, 180	18.72

Character culm attitude, 68% varieties shows semi erect, 25% shows erect and 5% varieties shows open and 2% spreading culm attitude respectively. All the traditional varieties were male fertile and only 12% of accessions had awns, while the rest of 88% did not have awns.

With respect to the stem characters, for the stem length

(excluding panicle) 93% of traditional varieties were very short, 3% were short and 4% were medium. With respect to the thickness of the stem, 56% were medium, 41% were thick and 3% were thin. Maximum number of traditional varieties recorded absence of stem anthocyanin colouration of nodes (87%) and internodes (91%).

Based on time of heading, the majority of the genotypes were grouped under medium (58%) followed by late (33%), early (9%) categories and one landrace was categorized as very early type. Similar findings reported with high genetic divergence in days to 50% flowering by Bose and Pradhan (2005).

With respect to panicle characters, 45% landraces were of deflexed, 30% landraces were of semi-straight, 21% landraces were of drooping and 4% of landraces were straight type of panicle curvature of main axis. For the character panicle awns, 12% landraces recorded the presence of awns. Out of which, 15 landraces observed yellowish white, one variety yellowish brown, three varieties brown, one variety with red and 2 varieties were possessed light purple awns. The awns distribution was limited to tip only in 6 varieties, upper half only in 8 landraces, whereas the awn was distributed through the whole length of panicle in case of 8 landraces. 99% landraces have presence of secondary branching, of which, 67% have strong secondary branching 31% landraces were weak and 1% landraces have clustered secondary branching. For the character Panicle Attitude of branches, 44% landraces were of erect to semi-erect, 23 were semi-erect, 18 were semi-erect to spreading and 6% landraces exhibited spreading attitude of panicle branches. For panicle exertion, 22% varieties were exhibited partly exerted panicle, 36% varieties mostly exerted and 42% varieties exhibited well exerted panicles. Panicle length of main axis for 3% cultivars were of very short, 67% were short, 27% were medium, 2% were long and 1 landrace was of very long type. With respect to panicle number per plant, 80% landraces registered a medium number of panicles, 18% of landraces under few and 2% of landraces fall under many panicles per plant category. The diversity for panicle number has got highest economic importance (L.V Subba Rao *et al*., 2015) [9, 17, 20].

With respect to grain characters grain weight of 1000 fully developed grains, highest number of the genotypes (71%) showed medium grain weight. Thousand grain weights have been used for characterizing rice varieties by researchers; Joshi *et al*., (2007) [4, 6, 11]. For the character grain length, 66% accessions were found under short and for grain width 39% of landraces fall under medium followed by 35% with narrow, 14% with broad, 11% with very narrow and one variety recorded very broad grain width. 90% of landraces exhibited grain phenol reaction of lemma. For the character decorticated grain shape, 7% landraces were of short slender type, 46% landraces were of short bold, 12% landraces exhibited medium slender type, 15% landraces were of long bold type, 19% landraces were of long slender and one landrace recorded long slender type. For the character colour of the decorticated grain, majority landraces recorded white (39%) and light brown (32%). Aroma of decorticated grain was not recorded in 81% of the landraces.

With respect to quality, for the amylose content the entire investigated landraces were grouped into four categories *viz*., high (16%), medium (67%), low (15%) and very low (2%). On the basis of Gelatinization temperature through alkali spreading value, the experimental material was grouped into four categories *viz*., low (1%), medium (4%), high-medium (88%) and high (7%).

The rice traditional varieties/landraces undertaken for this study registered wide range of distinctiveness for all most all the Agro-morphological traits studied and similar studies has been reported earlier by Joshi *et al*. 2007 [4, 6, 11]; Chakrabarty *et al*. 2012 [4, 10]; Parikh *et al*. 2012 [12]; Sinha and Mishra 2013 [16]; Rao *et al*. (2013) [7, 9, 13, 21]; Tirkey *et al*. (2013) [20]; Mondal *et al*. (2014) [11]; Kalyan *et al*., (2017) [7]; and Umarani *et al*. (2017) [21]; Manjunatha *et al*., 2018 [5]; Suman Rawte* and Ritu R. Saxena 2018 [14, 18], Islam *et al*., 2018 [10], S. Poudel *et al*., 2020 [15].

Conclusion

The 187 rice traditional varieties/landraces under study showed a wide range of variability for 57 characters of the 62 DUS characters under study. The non-polymorphic traits were the leaf ligule, shape of ligule, leaf collar, male sterility and Endosperm: Presence of amylose, whereas Lemma and Palea: Colour showed maximum (9) number of states of expression. This experimental evaluation throws limelight on kind of material, duration, grain type, stem strength and yielding ability. The information generated on DUS characterization useful for breeders, researchers and farmers to identify the novel genes for varietal improvement.

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