Collection and Characterization of Paddy Germplasm in High Altitude and Tribal Area Zone of Visakhapatnam

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A study was conducted on characterization of paddy germplasm of high altitude and tribal area zone of Visakhapatnam district during the year 2000-2001. 81 germplasm entries collected from the tribal areas of the district were characterized for 18 growth and yield attributing characters. Among the eleven characters, green leaf sheath, glabrous leaf moderately exerted panicle, with short and partly awned grain, straw-coloured hull having easy threshability were noticed to have higher absolute frequency. Aroma was present in 32per cent of the entries. Correlation studies have revealed a significant and positive correlation of grain yield per plant with days to flowering, days to maturity, leaf length and aroma.

Key Words : Characterization, Correlation, Exploration, Frequency, High Altitude and Tribal Area Zone (HAT), Paddy germplasm

Paddy is the major food crop of the tribals in the Visakhapatnam district of Andhra Pradesh. It is the staple food of all the sects of tribal people in this area. The crop is grown in upland, direct seeded and transplanted conditions. The crop is cultivated to the largest extent amongst all the field crops. Tribals usually grow local/ primitive cultivars of paddy that are long statured, long duration, low yielding, having aroma and other desirable traits carefully conserved through generations of domestication, *in situ* conservation, natural selection and evolution methods. The genetic erosion of this valuable germplasm material initiated and accelerated through the introduction of short-statured, early duration, high yielding paddy cultivars is on constant rise in this area. This area being in proximity with the secondary centre of paddy origin, a huge wealth of paddy biodiversity exists which needs to be collected, conserved, documented, characterized and evaluated for all the desirable traits and as useful base material for different breeding programme. Germplasm resources not only helps in avoiding genetic vulnerability to pests and diseases, but will also help to use the advances in transferring genes across sexual barriers (Swaminathan, 1988). Presence of a wide pool of plant genetic diversity is the pre-requisite for crop improvement. Occurrence of scented rice germplasm to a higher frequency has been observed in this area on par with the new aromatic paddy landraces.

Materials and Methods

Exploration trips were undertaken in the Tribal Area of Madhya Pradesh, Orissa and in the high altitude and tribal area of Visakhapatnam district of Andhra Pradesh. Eighty-one germplasm accessions of paddy collected from the different areas of the district (Fig. 1) were sown during the *kharif* 2000 and 2001 for characterization of 18 morpho-agronomic growth and yield attributing characters. The mean value of five observations for each character was taken for further statistical analysis. As any particular landrace is rarely homogenous in genetic composition, random samples of panicles were collected from fields grown for a particular variety. Attempts were made to avoid duplicates during collection. The passport characters were also recorded at the collecting site. Each collection has been assigned a collector number and later a unique IC number were assigned by National Bureau of Plant Genetic Resources (NBPGR), New Delhi.

Each entry was sown in 2m x 1m plots in the red sandy loam soils of the main block of Regional Agricultural Research Station, Chintapalle. It is located at an altitude of 780 m, soils are slightly acidic, low in organic carbon content, low in nitrogen and phosphorus and medium in potash availability. The rainfall during the years 2000 and 2001 was 976.2 mm and 911.9 mm respectively and was less than normal. The crop was grown under rainfed conditions in 20 cm solid rows. The entries were fertilized with 60-20-40 kg NPK/ha. Split application of nitrogen in the form of urea was given at active tillering and panicle initiation stages. The crop was weeded twice at 30 and 45 days after sowing. Observations on the characters *viz.*, leaf sheath colour, leaf blade colour, leaf

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pubescence, leaf length, leaf width, days to flowering, panicle exertion, stigma colour, apicule colour, plant height, panicle length, panicle type, awning, days to maturity, hull colour, threshability, aroma and grain yield per plants were recorded for characterization of these germplasm. Characterization was done using the minimal descriptors (Mahajan *et al.*, 2000).

The range, mean, standard error of mean, coefficient of variation of some important morph-agronomic traits were recorded.

Results and Dicussion

Characterization of the germplasm indicated (Table 1) that out of the eleven qualitative characters, the absolute frequency was very high for green leaf sheath colour (74.1), glabrous type of leaf pubescence (82.7) and intermediate type of panicle (71.6). Among the various entries short and partly awned grains, easy threshability of straw and non-aromatic grains showed moderately high frequency. Entries with the characters of light purple margins on leaf sheath, purple margin on leaf, purple coloured apiculus compact type of panicle and purple type of hull colour were found to show very less distribution. Most of the entries were had brown apiculus, white stigma in flowers and straw-coloured hull. Aroma was present in 32% of the entries. The results are in conformity with the findings of Patra (2000).

Correlation studies (Table 2) of grain yield per plant with different plant characters revealed that days to flowering, days to maturity and aroma in grains are positively and significantly correlated with grain yield at 5% level of significance. Among the individual characters, leaf length (cm) and leaf colour are significantly and negatively correlated with each other. Similar is the case with plant height (cm).

Leaf colour and days to flowering, leaf length (cm) and apiculus colour, leaf length and plant height, awn and leaf colour, days to flowering and days to maturity, leaf sheath colour and threshability, days to maturity and threshability, days to maturity and aroma were found to be significantly and positively correlated with each other. The results are in corroboration with Sharma and Hore (1989). The study shows that in the germplasm studied, wide variation exists with respect to days to flowering, days to maturity and aroma. This enables the rice breeders to tailor high yielding varieties suitable to the zone.

Table 1. Frequency distribution of accessions for different descriptors

Sl. No.	Descriptor state	Colour Code	Absolute frequency	Relative percentage (%)
	Basal			
1	**Leaf sheath colour**			
	Green	1	60	74.1
	Purple lines	2	8	9.9
	Light purple	3	1	1.2
	Purple	4	12	14.8
2	**Leaf blade colour**			
	Light green	1	40	49.4
	Green	2	40	49.4
	Purple margin	5	1	1.2
3	**Leaf pubescence**			
	Glabrous	1	67	82.7
	Intermediate	2	9	11.1
	Pubescent	3	5	6.2
4	**Panicle exertion**			
	Well exerted	1	23	28.4
	Moderate exerted	3	38	46.9
	Just exerted	5	14	17.3
	Partly exerted	7	6	7.4
	Enclosed	9	–	
	Others	99	–	
5	**Stigma colour**			
	White	1	31	38.3
	Light Green	2	19	23.4
	Yellow	3	5	6.2
	Purple	5	20	24.7
	Others	99	6	7.4
6	**Apiculus colour**			
	White	1	7	8.7
	Brown	3	35	43.2
	Red apex	5	15	18.5
	Purple	6	6	7.4
	Purple apex	7	17	21.0
	Others	99	1	1.2
7	**Panicle type**			
	Compact	1	5	6.2
	Intermediate	5	58	71.6
	Open	9	17	21.0
	Others	99	1	1.2
8	**Awning**			
	Short and partly awned	1	51	63.0
	Short and fully awned	5	1	1.2
	Long and fully awned	7	16	19.7
	Others	9	2	2.5
		99	11	13.6
9	**Hull colour**			
	Straw	1	28	34.6
	Golden	2	–	0.0
	Golden Brown	3	21	25.9
	Brown ferrous on straw	4	10	12.4
	Purple	5	2	2.5
	Purple furrows on straw	6	4	4.9
	Brown (fanny)	7	8	9.8
	Black	8	7	8.6
	Others	99	1	1.2
10	**Threshability**			
	Easy	1	54	66.7
	Intermediate	2	27	33.3
	Difficult	3	–	–
	Others	99	—	—
11	**Aroma**			
	Absent	0	55	67.9
	Present	1	26	32.1

Table 2. Correlation Matrix

	LFS Clr	LF Clr	LF Pub	LF Lt (Cm)	LF Wd (Cm)	Day Flw	Pan Exe	Stig Clor	Apic Clr	PT HT (Cm)	Pa Nlt (Cm)	Pan Tp	Awn	Day Mat	Hull Clr	Thresh	Aroma	Grainyld
Lfs Clr	1.00000	0.09131	–0.16229	0.02102	0.12529	0.17989	0.04360	0.13149	-0.07853	0.15190	–0.15097	–0.23059	0.01937	0.09693	–0.13569	0.23516	0.00576	–0.17090
Lf Clr		1.00000	–0.04706	–0.30604	–0.04352	0.24742	0.16672	–0.11500	0.00226	-0.37637	–0.24965	–0.03031	0.46175	0.20838	0.07812	–0.02774	–0.04719	0.04370
Lf Pub			1.00000	0.18731	–0.04421	–0.01758	0.13701	–0.06034	0.10196	0.10204	–0.02289	0.10054	–0.18162	–0.04319	0.09397	–0.01586	–0.14887	0.00687
Lf Lt (Cm)				1.00000	0.02836	–0.04111	0.01279	0.08215	0.23717	0.39943	0.08431	–0.13767	–0.43636	–0.07598	–0.10338	–0.09536	–0.08166	–0.04738
Lf Wd (Cm)					1.00000	–0.23267	0.04365	0.00935	–0.12977	0.06216	–0.13537	–0.06219	–0.02645	–0.26802	0.06639	–0.18811	–0.05292	–0.14919
Day Flw						1.00000	0.16328	0.08873	–0.05219	–0.13494	–0.09131	–0.01760	0.19778	0.94374	–0.12659	0.18732	0.11644	0.27938
Pan Exe							1.00000	0.10081	–0.04179	–0.06325	–0.19453	–0.02522	0.22702	0.15812	0.04607	0.06041	0.15363	0.06214
Stig Clor								1.00000	0.08308	0.12803	–0.07402	–0.21270	–0.04880	0.05698	–0.16250	0.06189	0.06725	0.18903
Apic Clor									1.00000	0.08466	0.13065	–0.18932	–0.07520	–0.05530	0.10035	0.01356	0.04413	–0.04881
Pt Ht (Cm)										1.00000	0.23699	0.00867	–0.34646	–0.16537	–0.07340	0.06110	–0.08031	–0.06984
Pan Lt (Cm)											1.00000	0.01947	–0.18404	–0.06528	0.06273	0.10707	0.03252	0.06551
Pan Tp												1.00000	–0.15678	0.10617	0.09399	0.20558	0.11305	0.14561
Awn													1.00000	0.05697	0.20151	–0.20569	–0.19592	0.01263
Day Mat														1.00000	–0.144898	0.33483	0.26187	0.33878
Hull Clr															1.00000	–0.20067	–0.18693	–0.19397
Thresh																1.00000	0.24309	–0.01874
Aroma																	1.00000	0.29276
Grain Yld/Pl																		1.00000

Significance Levels	0.05	0.01	0.005	0.001
LI Correlation =>	0.21852	0.28467	0.30902	0.35892
Y1 = 1.3703 + 0.05878 x 6	Day Flw	2.5862	0.0115	
Y1 = –1.9879 + 0.06464 x 14	Day Mat	3.2004	0.0020	
Y1 = 6.1636 + 2.33636 x 17	Aroma	2.7213	0.0080	

Table 3 shows the range for different plant characters. The mean values indicate that most of the varieties are of medium duration (137 days) with a grain yield of 6.9 grams per plant. Higher coefficient of variation was observed for leaf sheath colour, panicle exertion, hull colour, aroma and grain yield per plant.

In all, germplasm mainly constituted entries with green leaf sheath colour, glabrous type of leaf pubescence and intermediate type of panicle having significant correlation of grain yield per plant with days to flowering, days to maturity and aroma in grains.

Table 3. Range, Standard Deviation and Coefficient of Variation of Different Descriptors

Pooled n=81		Lowest	Highest	Mean	Std Dev.	Std. Error	CV%
LFS CLR	X1	1.00	4.00	1.56	1.08	-0.12	69.08
LF CLR	X2	1.00	5.00	1.54	0.63	0.07	41.04
LF PUB	X3	1.00	3.00	1.23	0.55	0.06	21.85
LFLT (CM)	X4	20.00	58.00	43.19	9.44	1.04	23.94
LFWD (CM)	X5	0.50	1.30	0.85	0.20	0.02	18.89
DAY FLW	X6	65.00	140.00	94.30	17.81	1.98	56.75
STIG CLOR	X8	0.00	99.00	4.71	15.18	1.68	46.01
APIC CLR	X9	0.00	7.00	4.22	1.94	0.21	16.54
PTHT CM)	X10	55.00	144.00	95.60	15.81	1.75	24.54
PAN LT(CM)	X11	0.00	46.00	18.98	4.65	0.51	24.50
PAN TP	X12	0.50	9.00	5.56	2.09	0.23	37.64
DAY MAT	X14	104.00	187.00	137.71	19.64	2.18	14.26
HULL CLR	X15	0.00	8.00	3.41	2.40	0.26	70.40
THRESH	X16	1.00	2.00	1.33	0.47	0.05	35.57
GRAIN YLD/PL	Y1	2.00	20.00	6.91	3.74	0.41	54.22

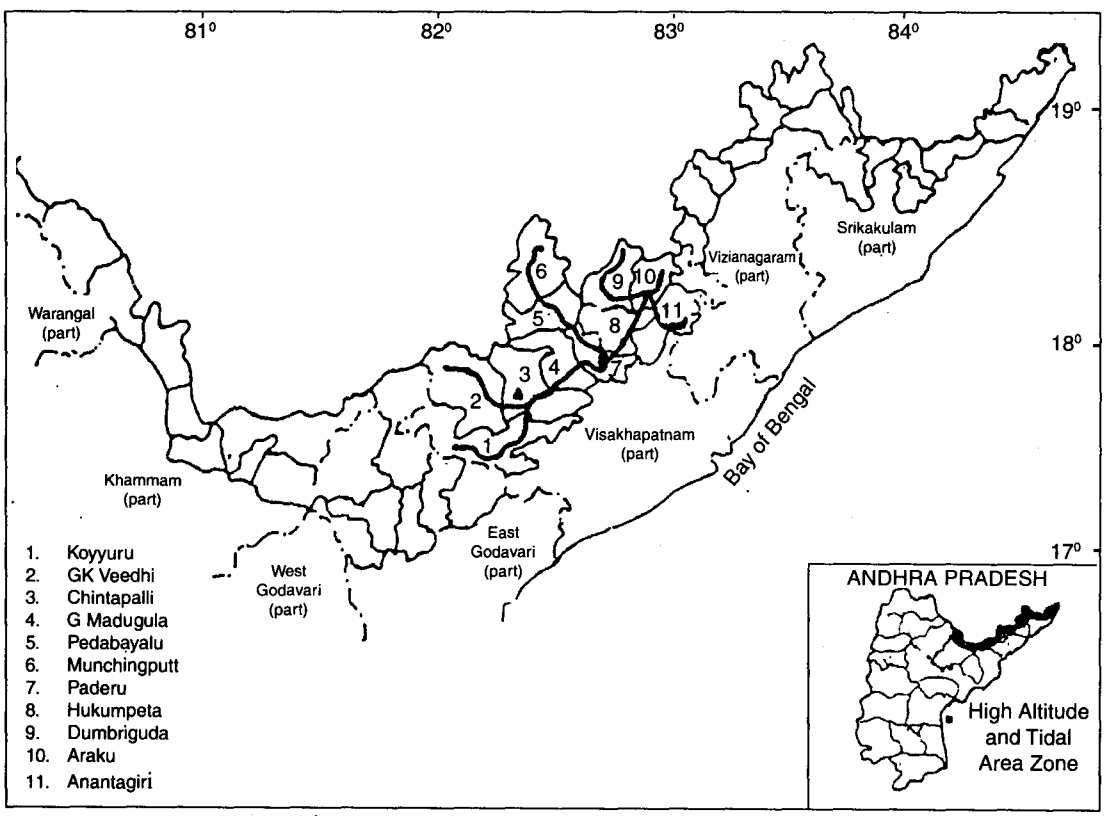

Fig. 1: Route map of paddy germplasm collection

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