

# CHARACTERIZATION AND EVALUATION OF RED SORGHUM (*SORGHUM BICOLOR*) GERMPLASM AND LAND RACES

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## ABSTRACT

Fourteen local land races of sorghum collected and farmer's field of Krishnagiri and Dharmapuri districts and sixteen germplasm accessions for Department of Plant Genetic Resources, TNAU, Coimbatore along with two promising sorghum varieties Paiyur 1 and Paiyur2 were and characterization was done for 11 qualitative characters, 22 quantitative characters and 6 drought tolerant traits. Among the 32 land races evaluated, Sorghum land races 16-05 (RS), 2457, 16-01 (RS), 2657, 4269 were found to be early in (82-85 days), high yielding (28 to 29.3g/plant), having high photosynthetic rate, ( $38.6 \mu\text{molm}^{-2}\text{s}^{-1}$ ), high Proline content ( $394 \mu\text{gg}^{-1}$ ) and high soluble protein content ( $14.4 \text{mgg}^{-1}$ ) and hence found to be tolerant to drought. These land races can be used as one of the parents in crossing programme for developing short duration, high yielding drought tolerant varieties in sorghum.

**Key words:** Sorghum land races, germplasm accessions, photosynthetic rate, proline, soluble protein, qualitative, drought and quantitative traits.

## Introduction:

Sorghum is staple crop for the developing and under developed countries. It is tolerant to drought and other abiotic stresses like cold, salinity. Collection of land races and evaluation for useful agronomic traits is foremost important in any of the economically grown field crops. Collection, characterization and evaluation of sorghum genotypes are being done extensively throughout the world (Henley et al. 2010). Germplasm lines were studied extensively for nutritive value, yield and other agronomic traits by phenotypic evaluation as well as by SSR molecular markers (Richard E. Boyles 2016). Twenty nine local land races of sorghum were collected, evaluated and conserved for crop improvement purpose in the district of Adilabad of Andhra Pradesh. Tribal communities have been growing these land races from time immemorial (Sivaraj et al. 2016). There were 128 exotic germplasm lines and 21 adapted varieties in a germplasm evaluation project of Kansas State University and they were evaluated for drought and disease resistance (Kampani gowda et al. 2013). Germplasm lines were evaluated for agronomic traits under rainfed

and irrigated conditions in Tanzania. Several useful lines were identified and documented (Ringo et al. 2014). Genotypic variation was studied in late sown genotypes of sorghum for nutritive value in terms of minerals and protein content under semi drought conditions in Dharwad (Badigannavar et al. 2018).

Sorghum is cultivated in an area of 2000 ha in Krishnagiri and 10000 ha in Dharmapuri districts for the purpose of grains as well as for fodder purposes. Two local land races have been grown during onset of monsoons. Thalaivirichan cholam (open ear head resembling tail) with pearly white grains is being cultivated during onset of south west monsoon and it is relatively longer duration (160 days) and it is photo sensitive. During onset of North West monsoon, local land races of red sorghum is being grown for the purpose of fodder. They are short, photo insensitive and ear heads are closed types. Grains are red in colour.

There were two varieties being released from RRS, Paiyur viz., Paiyur-1 (Thalai virichan cholam), Paiyur-2 (Sencholam; Red sorghum). Farmers grow the locally adapted land races every year by preserving portion of seeds. Though red sorghum genotypes are rich in nutrients like Iron, flavanoids and proteins, and are usually grown for fodder purposes.

#### Objectives:

- i. Collection of red sorghum genotypes from farmer's field of Krishnagiri and Dharmapuri districts and germplasm accessions for Department of Plant Genetic Resources, TNAU, Coimbatore and
- ii. Characterization of red sorghum genotypes based on descriptors provided by ICRISAT for quantitative, Qualitative and Drought tolerant traits and identifying the drought tolerant high yielding red sorghum genotypes for utilizing them in the future breeding work

#### Materials and Methods:

Sorghum germplasm accessions and local land races (RS types-27 nos. & TV types-5 nos) were sown on 06.09.2018 in G5. Characterization of red sorghum local races and TV types and sorghum germplasm accessions were done based on descriptors provided by ICRISAT for Quantitative, Qualitative and Drought tolerant traits. The following local land races of red sorghum collected from Krishnagiri and Dharmapuri districts and Irungu Cholam from Theni districts were evaluated and characterized.

1	PYR-(TV)-16-01	Palacode local
2	PYR-(TV)-16-02	Papparapatti local
3	PYR-(TV)-16-03	Kambainallur local
4	PYR-(TV)-16-04	Karimangalam local
5	PYR-(RS)-16-01	Palacode local
6	PYR-(RS)-16-02	Papparapatti local
7	PYR-(RS)-16-03	Kambainallur local
8	PYR-(RS)-16-04	Karimangalam local

9	PYR-(RS)-16-05	Kochamalai local
10	PYR-(RS)-16-06	Kochamalai local
11	PYR-(RS)-16-07	Puliyambatti local
12	PYR-(RS)-16-08	Irumathur local
13	PYR-(RS)-16-09	Kochamalai local
14	PYR-(RS)-16-10	Govindhapuram local

The sorghum germplasms collected were also characterized based on descriptors obtained.

1	TNAUR0040-2448	IS 4092
2	TNAUR0040-2457	IS 30536
3	TNAUR0040-2482	IS 8012
4	TNAUR0040-2488	IS 9113
5	TNAUR0040-2493	IS 1233
6	TNAUR0040-2504	IS 12804
7	TNAUR0040-2508	IS 12965
8	TNAUR0040-2519	IS 14861
9	TNAUR0040-2657	IS 30536
10	TNAUR0040-4263	PGR Red cholam
11	TNAUR0040-4266	PGR Red cholam 63
12	TNAUR0040-4267	PGR Red cholam 92
13	TNAUR0040-4269	PGR Red cholam 82
14	TNAUR0040-4416	TKSV 1008
15	TNAUR0040-4418	TKSV 1023
16	TNAUR0040-4720	PGR Red cholam 108

Observations on quantitative, qualitative and drought associated characters were taken and are as follows

TABLE 1. CHARACTERIZATION OF SORGHUM LAND RACES AND GERMPLASM ACCESSIONS FOR QUANTITATIVE CHARACTERS

S. No.	Sorghum land races	50% flowering	Days to maturity	Plant ht (cm)	No.of tillers/pl	Inflo length	Inflo width	Stem thickness	100 seed wt	Grain yield/pl	Fodder yield/pl (Wet wt.)	Fodder yield/pl (Dry wt.)
		1	2	3	4	5	6	7	8	9	10	11
1.	PYR-(RS)-16-01-Palacode local	48	85	211.2	2.2	15.0	4.6	2.5	2.75	27.50	296.5	254.3
2.	PYR-(RS)-16-02-Papparapatti local	49	85	203.8	2.2	12.8	4.0	1.0	2.51	22.30	281.2	231.1
3.	PYR-(RS)-16-04-Karimangalam local	48	85	297.9	1.2	17.2	3.5	2.8	2.20	19.20	263.7	210.5
4.	PYR-(RS)-16-05-Kochamalai local	47	82	205.6	2.0	11.9	3.6	2.7	2.70	29.30	190.1	141.2
5.	PYR-(RS)-16-06-Kochamalai local	46	83	212.5	2.0	12.4	4.6	1.5	3.21	22.00	170.2	125.3
6.	PYR-(RS)-16-07-Puliyambatti local	49	85	217.5	1.8	12.2	3.8	2.7	2.13	12.00	180.0	141.4
7.	PYR-(RS)-16-08-Irumathur local	53	95	196.6	1.6	10.7	3.7	1.9	3.91	21.00	169.2	126.2
8.	PYR-(RS)-16-09-Kochamalai local	47	82	211.4	1.8	15.8	5.8	2.1	2.00	23.12	185.1	142.1
9.	PYR-2 (RS)	46	83	198.4	2.2	25.7	8.3	2.6	2.63	19.00	361.3	312.2
10.	TNAU-R0040-2457-IS 30536	55	95	164.2	1.6	17.6	6.4	2.1	2.53	29.20	316.0	273.3
11.	TNAU-R0040-2482-IS 8012	53	95	135.1	1.4	25.3	4.9	2.3	2.72	13.60	360.2	311.5
12.	TNAU-R0040-2488-IS 9113	75	110	261.2	1.4	27.2	2.8	2.1	2.00	15.20	189.1	143.50
13.	TNAU-R0040-2493-IS 1233	51	93	216.3	2.0	36.9	8.9	0.9	2.51	21.40	192.6	151.2
14.	TNAU-R0040-2504-IS 12804	75	110	239.8	1.4	23.2	2.6	1.8	2.87	26.00	211.2	168.5

15.	TNAU-R0040-2508-IS 12965	75	110	221.5	1.8	21.6	3.6	1.4	2.68	23.00	193.1	150.1
16.	TNAU-R0040-2519-IS 14861	46	85	236.2	1.0	24.8	5.2	2.3	1.78	12.83	160.4	215.1
17.	TNAU-R0040-2520-IS 14862	75	107	226.6	2.0	21.2	3.2	2.1	2.15	15.26	233.4	190.3
18.	TNAU-R0040-2657-IS 30536	45	83	191.4	1.2	22.5	6.3	2.7	2.11	28.13	187.2	135.5
19.	TNAU-R0040-4263-PGR Red cholam	75	110	234.6	1.8	25.7	2.4	2.8	1.91	22.31	165.5	121.3
20.	TNAU-R0040-4266-PGR Red cholam 63	44	84	186.5	1.6	12.8	3.6	2.2	2.88	27.75	235.6	191.2
21.	TNAU-R0040-4267-PGR Red cholam 92	45	85	192.3	1.2	11.8	3.8	1.9	2.79	18.23	241.8	197.1
22.	TNAU-R0040-4269-PGR Red cholam 82	45	83	204.0	1.2	10.8	3.9	1.4	2.70	29.00	275.4	231.3
23.	TNAU-R0040-4416-TKSV 1008	75	108	255.0	1.6	22.0	4.0	1.7	2.20	18.21	223.4	171.5
24.	TNAU-R0040-4418-TKSV 1023	45	85	223.6	1.2	25.8	4.6	2.6	2.71	22.00	274.5	232.2
25.	TNAU-R0040-4720-PGR Red cholam 108	46	85	193.8	1.0	12.6	4.2	1.6	2.73	17.30	253.1	181.2
26.	PYR-(TV)-16-01-Palacode local	75	110	274.8	1.8	30.5	3.4	2.6	1.40	15.13	340.4	301.5
27.	PYR-(TV)-16-02-Papparapatti local	73	110	259.2	1.6	29.8	3.8	2.3	1.92	14.5	372.3	323.1
28.	PYR-(TV)-16-03-Kambainallur local	78	113	330.8	1.8	26.5	3.6	2.1	1.87	19.30	348.2	298.3
29.	PYR-(TV)-16-04-Karimangalam local	77	110	33.6	2.4	34.4	3.2	2.4	2.35	18.50	341.1	291.5
30.	PYR-1 (TV)	58	98	335.1	2.0	32.0	5.3	1.8	2.40	22.40	330.3	286.1

TABLE 2. CHARACTERIZATION OF SORGHUM LAND RACES AND GERMPLASM ACCESSIONS FOR QUALITATIVE CHARACTERS

S. No.	Sorghum land races	Waxiness	Glume colour	Glume cover	Awns	Grain colour	Lustre	Grain plumpness	Grain form	Shattering	Inflo shape	Inflo Compactness
		12	13	14	15	16	17	18	19	20	21	22
1.	PYR-(RS)-16-01-Palacode local	Non Waxy	Red	75%	Absent	Brownish red	Non Lustrous	Dimple	Single	Low	Elliptic	Semi compact
2.	PYR-(RS)-16-02-Papparapatti local	Non Waxy	Red	75%	Present	Dull red	Lustrous	Plumpy	Single	Low	Elliptic	Semi compact
3.	PYR-(RS)-16-04-Karimangalam local	Non Waxy	Light Red	Glumes longer than grains	Absent	Red	Non Lustrous	Dimple	Single	Low	Loose	Very lax panicle
4.	PYR-(RS)-16-05-Kochamalai local	Non Waxy	Dull yellowish red	50%	Absent	Dull red	Non Lustrous	Plumpy	Single	Low	Oval	Compact
5.	PYR-(RS)-16-06-Kochamalai local	Non Waxy	Red	50%	Absent	Dull red	Lustrous	Plumpy	Single	Low	Erect	Compact
6.	PYR-(RS)-16-07-Puliyambatti local	Non Waxy	Dull yellowish red	50%	Absent	Dull red	Non Lustrous	Plumpy	Single	Low	Oval	Compact
7.	PYR-(RS)-16-08-Irumathur local	Non Waxy	Light Red	25%	Absent	Dull red	Non Lustrous	Plumpy	Single	Low	Oval	Compact
8.	PYR-(RS)-16-09-Kochamalai local	Non Waxy	Light Red	75%	Absent	Dull red	Lustrous	Plumpy	Single	Low	Erect	Semi Compact
9.	PYR-2 (RS)	Non Waxy	Light Red	25%	Absent	Dull red	Non Lustrous	Plumpy	Single	Low	Erect	Semi loose
10.	TNAU-R0040-2457-IS 30536	Waxy	Dull Red	25%	Absent	Dull red	Non Lustrous	Plumpy	Single	Low	Erect	Compact
11.	TNAU-R0040-2482-IS 8012	Waxy	Red	Glumes longer than grains	Present	Red	Lustrous	Plumpy	Single	Low	Erect	Semi loose
12.	TNAU-R0040-2488-IS 9113	Non Waxy	Red	-Do-	Present	Dark Red	Lustrous	Plumpy	Single	Low	Erect	Loose
13.	TNAU-R0040-2493-	Waxy	Red	-Do-	Present	Red	Lustrous	Plumpy	Single	Low	Erect	Very lax

	IS 1233											panicle
14.	TNAU-R0040-2504-IS 12804	Waxy	Red	-Do-	Absent	Red	Lustrous	Plumpy	Single	Low	Erect	Very loose
15.	TNAU-R0040-2508-IS 12965	Waxy	Red	-Do-	Present	Red	Lustrous	Plumpy	Single	Low	Erect	Semi Compact
16.	TNAU-R0040-2519-IS 14861	Waxy	Light Red	75%	Present	Dull red	Lustrous	Dimple	Single	Low	Erect	Semi loose
17.	TNAU-R0040-2520-IS 14862	Waxy	Dull Red	25%	Absent	Dull red	Non Lustrous	Plumpy	Single	Low	Erect	Semi Compact
18.	TNAU-R0040-2657-IS 30536	Non Waxy	Dark Red	Glumes longer than grains	Absent	Blackish red	Lustrous	Plumpy	Single	Low	Erect	Semi Compact
19.	TNAU-R0040-4263-PGR Red cholam	Waxy	Dull Red	75%	Absent	Dull red	Lustrous	Plumpy	Single	Low	Erect	Semi Compact
20.	TNAU-R0040-4266-PGR Red cholam 63	Waxy	Brownish red	50%	Present	Brown	Lustrous	Plumpy	Single	Low	Oval	Compact
21.	TNAU-R0040-4267-PGR Red cholam 92	Waxy	Dull Red	50%	Absent	Dull Red	Non Lustrous	Plumpy	Single	Low	Oval	Compact
22.	TNAU-R0040-4269-PGR Red cholam 82	Waxy	Dull Red	50%	Absent	Dull Red	Non Lustrous	Plumpy	Single	Low	Oval	Compact
23.	TNAU-R0040-4416-TKSV 1008	Waxy	Dark Red	Fully covered	Absent	Dull Red	Lustrous	Plumpy	Single	Low	Erect	Semi loose
24.	TNAU-R0040-4418-TKSV 1023	Waxy	Dark Red	Fully covered	Absent	Blackish Red	Lustrous	Plumpy	Single	Low	Erect	Semi loose
25.	TNAU-R0040-4720-PGR Red cholam 108	Non Waxy	Dark Red	Fully covered	Absent	Dark Red	Lustrous	Plumpy	Single	Low	Erect	Semi loose
26.	PYR-(TV)-16-01-Palacode local	Waxy	White	50%	Absent	Dull white	Non Lustrous	Plumpy	Single	Low	Erect	Loose
27.	PYR-(TV)-16-02-Papparapatti local	Waxy	White	50%	Absent	Dull white	Non Lustrous	Plumpy	Single	Low	Erect	Loose
28.	PYR-(TV)-16-03-Kambainallur local	Waxy	White	50%	Absent	Dull white	Non Lustrous	Plumpy	Single	Low	Erect	Loose
29.	PYR-(TV)-16-04-Karimangalam local	Waxy	White	50%	Absent	Dull white	Non Lustrous	Plumpy	Single	Low	Erect	Loose

30.	PYR-1 (TV)	Waxy	White	50%	Absent	Dull White	Non Lustrous	Plumpy	Single	Low	Erect	Loose
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TABLE 3. CHARACTERIZATION OF SORGHUM LAND RACES AND GERmplasm ACCESSIONS-QUALITATIVE CHARACTERS

S. No.	Sorghum land races	Threshability	Lodging	Endosperm colour	Endosperm texture	Senescence	Seed size	Seedling vigour	Leaf colour	Leaf pigmentation	Leaf mid rib colour	Inflo. exertion
		23	24	25	26	27	28	29	30	31	32	33
1.	PYR-(RS)-16-01-Palacode local	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Medium	Light green	Non tan	Light Yellow	Well exerted
2.	PYR-(RS)-16-02-Papparapatti local	Easy	Non Lodging	White	Intermediate	Low	Bold	Poor	Dark green	Non tan	Light Yellow	Well exerted
3.	PYR-(RS)-16-04-Karimangalam local	Easy	Non Lodging	White	Complete starchy	Low	Bold	Good	Light green	Non tan	Light Yellow	Well exerted
4.	PYR-(RS)-16-05-Kochamalai local	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Good	Light green	Non tan	Light Yellow	Peduncle recurved
5.	PYR-(RS)-16-06-Kochamalai local	Easy	Non Lodging	White	Intermediate	Low	Bold	Poor	Light green	Non tan	Light Yellow	Well exerted
6.	PYR-(RS)-16-07-Puliyambatti local	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Good	Light green	Non tan	Light Yellow	Peduncle recurved
7.	PYR-(RS)-16-08-Irumathur local	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Poor	Light green	Non tan	Light Yellow	Peduncle recurved
8.	PYR-(RS)-16-09-Kochamalai local	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Poor	Light green	Non tan	Light Yellow	Well exerted
9.	PYR-2 (RS)	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Medium	Light green	Non tan	Light Yellow	Well exerted
10.	TNAU-R0040-2457-IS 30536	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Poor	Light green	Non tan	Light Yellow	Fully exerted
11.	TNAU-R0040-2482-IS 8012	Difficult	Non Lodging	Yellow	Mostly corneous	Low	Bold	Good	Light green	Non tan	Light Yellow	Exerted
12.	TNAU-R0040-2488-IS 9113	Difficult	Non Lodging	White	Complete starchy	Low	Bold	Good	Light green	Non tan	Light Yellow	Exerted
13.	TNAU-R0040-2493-IS 1233	Difficult	Non Lodging	White	Mostly corneous	Low	Bold	Poor	Light green	Non tan	Light Yellow	Well exerted
14.	TNAU-R0040-2504-IS 12804	Difficult	Non Lodging	White	Mostly starchy	Low	Bold	Poor	Light green	Non tan	Light Yellow	Slightly exerted



15.	TNAU-R0040-2508-IS 12965	Difficult	Non Lodging	Yellow	Mostly corneous	Low	Bold	Good	Light green	Non tan	Light Yellow	Well exerted
16.	TNAU-R0040-2519-IS 14861	Difficult	Non Lodging	White	Intermediate	Low	Bold	Medium	Light green	Non tan	Light Yellow	Well exerted
17.	TNAU-R0040-2520-IS 14862	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Poor	Light green	Non tan	Light Yellow	Well exerted
18.	TNAU-R0040-2657-IS 30536	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Poor	Light green	Non tan	Light Yellow	Well exerted
19.	TNAU-R0040-4263-PGR Red cholam	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Medium	Light green	Non tan	Light Yellow	Fully exerted
20.	TNAU-R0040-4266-PGR Red cholam 63	Easy	Non Lodging	White	Intermediate	Low	Bold	Medium	Light green	Non tan	Light Yellow	Peduncle recurved
21.	TNAU-R0040-4267-PGR Red cholam 92	Easy	Non Lodging	White	Intermediate	Low	Bold	Poor	Light green	Non tan	Light Yellow	Peduncle recurved
22.	TNAU-R0040-4269-PGR Red cholam 82	Easy	Non Lodging	White	Mostly starchy	Low	Bold	Poor	Light green	Non tan	Light Yellow	Peduncle recurved
23.	TNAU-R0040-4416-TKSV 1008	Easy	Non Lodging	White	Intermediate	Low	Bold	Poor	Light green	Non tan	Light Yellow	Fully exerted
24.	TNAU-R0040-4418-TKSV 1023	Easy	Non Lodging	White	Complete starchy	Low	Bold	Medium	Light green	Non tan	Light Yellow	Well exerted
25.	TNAU-R0040-4720-PGR Red cholam 108	Easy	Non Lodging	White	Mostly corneous	Low	Bold	Poor	Light green	Non tan	Light Yellow	Slightly exerted
26.	PYR-(TV)-16-01-Palacode local	Easy	Non Lodging	White	Mostly corneous	Low	Medium	Poor	Light green	Non tan	Light Yellow	Fully exerted
27.	PYR-(TV)-16-02-Papparapatti local	Easy	Non Lodging	White	Mostly corneous	Low	Medium	Poor	Light green	Non tan	Light Yellow	Fully exerted
28.	PYR-(TV)-16-03-Kambainallur local	Easy	Non Lodging	White	Mostly corneous	Low	Medium	Poor	Light green	Non tan	Light Yellow	Fully exerted
29.	PYR-(TV)-16-04-Karimangalam local	Easy	Non Lodging	White	Mostly corneous	Low	Medium	Poor	Light green	Non tan	Light Yellow	Fully exerted
30.	PYR-1 (TV)	Easy	Non Lodging	White	Mostly corneous	Low	Medium	Poor	Light green	Non tan	Light Yellow	Fully exerted

**TABLE 4. CHARACTERIZATION OF SORGHUM LAND RACES AND GERMPLASM ACCESSIONS-DROUGHT ASSOCIATED CHARACTERS**

S. No.	Sorghum land races	Transpiration Rate (mmol m <sup>-2</sup> s <sup>-1</sup> )	Photosynthetic Rate (μmol m <sup>-2</sup> s <sup>-1</sup> )	Leaf Temperature (°C)	Relative Water Content (%)	Proline content (μg g <sup>-1</sup> )	Soluble Protein (mg g <sup>-1</sup> )
		34	35	36	37	38	39
1.	PYR-(RS)-16-01-Palacode local	15.3	37.5	28.3	80.1	380.0	13.4
2.	PYR-(RS)-16-02-Papparapatti local	12.0	32.8	28.6	74.5	336.2	13.2
3.	PYR-(RS)-16-04-Karimangalam local	12.6	33.1	28.5	75.3	339.5	13.6
4.	PYR-(RS)-16-05-Kochamalai local	16.7	38.6	27.8	81.5	394.5	14.4
5.	PYR-(RS)-16-06-Kochamalai local	14.6	33.7	28.4	76.6	346.0	13.7
6.	PYR-(RS)-16-07-Puliyambatti local	10.4	31.6	29.4	72.4	312.0	12.0
7.	PYR-(RS)-16-08-Irumathur local	13.8	33.5	28.7	75.5	342.3	13.5
8.	PYR-(RS)-16-09-Kochamalai local	14.1	34.3	28.5	74.0	340.8	13.4
9.	PYR-2 (RS)	14.0	34.1	28.5	77.2	355.5	13.4
10.	TNAU-R0040-2457-IS 30536	16.8	38.6	27.9	80.9	388.2	13.9
11.	TNAU-R0040-2482-IS 8012	11.5	32.5	29.0	75.6	328.4	13.0
12.	TNAU-R0040-2488-IS 9113	13.7	33.6	28.6	76.0	367.1	13.9
13.	TNAU-R0040-2493-IS 1233	14.2	34.7	28.4	74.8	338.9	13.7
14.	TNAU-R0040-2504-IS 12804	14.5	35.0	28.4	77.0	355.0	13.0
15.	TNAU-R0040-2508-IS 12965	14.8	35.2	28.3	76.4	345.0	12.9
16.	TNAU-R0040-2519-IS 14861	10.8	31.7	29.3	72.4	319.2	12.3

17.	TNAU-R0040-2520-IS 14862	13.6	33.4	28.8	73.9	340.5	13.1
18.	TNAU-R0040-2657-IS 30536	15.5	37.8	28.1	80.6	380.6	13.8
19.	TNAU-R0040-4263-PGR Red cholam	14.1	34.7	28.3	73.8	338.5	13.4
20.	TNAU-R0040-4266-PGR Red cholam 63	13.7	33.5	28.6	78.0	361.1	13.6
21.	TNAUR00404267-PGR Red cholam 92	13.0	32.9	28.9	76.9	348.6	13.7
22.	TNAUR00404269-PGR Red cholam 82	16.0	38.2	28.0	81.0	388.5	14.0
23.	TNAUR00404416-TKSV 1008	14.6	35.0	28.5	75.8	330.7	12.9
24.	TNAUR00404418-TKSV 1023	14.5	35.1	28.5	76.3	340.2	13.5
25.	TNAUR00404720-PGR Red cholam 108	13.9	34.4	28.7	77.0	346.5	13.4
26.	PYR-(TV)-16-01-Palacode local	11.4	32.2	29.1	73.3	327.6	12.7
27.	PYR-(TV)-16-02-Pappalapatti local	11.0	32.0	29.2	72.8	322.0	12.5
28.	PYR-(TV)-16-03-Kambainallur local	13.0	34.0	28.8	75.9	337.7	12.9
29.	PYR-(TV)-16-04-Karimangalam local	13.8	33.8	28.8	73.8	330.0	13.0
30.	PYR-1 (TV)	14.2	34.5	28.5	78.2	363.5	12.8

TABLE 5. QUANTITATIVE, QUALITATIVE AND DROUGHT ASSOCIATED CHARACTERS OF SORGHUM LAND RACES AND GERmplASMS

S.No.	Characters observed		Range	Land races
<b><u>I. Quantitative characters</u></b>				
1.	Days to 50% flowering	:	44 to 78 days	4266, 4267, 4269, 4418, 4720, 16-05 & 16-07
2.	Days to maturity	:	82 to 113 days	16-05, 16-07, 16-06, 4266, 4267, 4269, 4418 & Paiyur 2
3.	Plant height (cm)	:	135 to 335.1 cm	Paiyur 1, 16-04 (RS), 16-03 (TV), 16-01 (TV), 16-02(TV), 4416, 4418, 4263
4.	Inflorescence length (cm)	:	10.7 to 36.9 cm	2493, 16-01 (TV), 16-02(TV), 16-03 (TV), Paiyur 1&2, 4263
5.	Inflorescence width (cm)	:	2.4 to 8.3 cm	2493, Paiyur 2, 2657, 16-09 (RS), Paiyur 1
6.	No. of tillers/plant	:	1.0 to 2.4 nos.	16-04 (TV), 16-01 (RS), 16-02(RS), 16-05(RS), 16-06(RS), 2520, Paiyur 1
7.	Stem thickness (cm)	:	0.9 to 2.8 cm	16-04(RS), 4263, 2657, , 4418, 16-05(RS), 16-07(RS), Paiyur 2, 16-01 (TV)
8.	100 seed weight (g)	:	1.4 to 3.91 g	16-08(RS), 16-06(RS), 2504, 2508, 4266, 4367, 4269, 4418,4720
9.	Grain yield/plant (g)	:	12.0 to 29.3 g	16-05(RS), 2457, 16-01(RS), 2504, 2657, 4266, 4269
10.	Fodder yield/plant (g)	:	121.3 to 323.1 g	16-02(TV), 2482,16-01(TV), Paiyur 2, , 16-03(TV), 16-04(TV), Paiyur 1,
<b><u>II. Qualitative characters</u></b>				
1.	Seedling vigour	:	Poor/Medium/Good	
2.	Inflorescence exertion	:	Exerted/well exerted/ fully exerted/ slightly exerted/ peduncle recurved	
3.	Inflorescence compactness	:	Loose/semi loose/ semi compact/ compact/ very lax/very loose panicles	
4.	Inflorescence shape	:	Elliptic/oval/erect	
5.	Leaf mid rib colour	:	White to light yellow	
6.	Glume colour	:	Yellowish red/light red/dark red/blackish red/dull white	
7.	Grain plumpness	:	Plumpy/dimple	
8.	Glume cover	:	25/50/75%/glumes longer than grain	
9.	Grain form	:	Single/double	
10.	Endosperm texture	:	Mostly corneous/ intermediate/ mostly starchy/ completely starchy	
11.	Endosperm colour	:	Yellow/white	
12.	Lustrousness	:	Non L/ Dull/ Lustrous	

13.	Waxiness	:	Waxy/Non waxy	
14.	Awns	:	Present/absent	
15.	Threshability	:	Easy/difficult	
<b>III. Drought associated characters</b>				
1.	Transpiration rate (mmol m <sup>-2</sup> s <sup>-1</sup> )	:	10.8 to 16.8 (mmol m <sup>-2</sup> s <sup>-1</sup> )	2519, 16-07 (RS), 2482, 16-01 (TV), 16-01 (TV),
2.	Photosynthetic rate (mmol m <sup>-2</sup> s <sup>-1</sup> )	:	31.6 to 38.6 (mmol m <sup>-2</sup> s <sup>-1</sup> )	2457, 16-05 (RS), 4269, 16-01 (RS), 2657
3.	Leaf temperature (°C)	:	27.8 to 29.4 °C	16-05 (RS), 2457, 4269, 2657
4.	Relative water content (%)	:	72.4 to 81.5 %	16-05 (RS), 2457, 16-01 (RS), 4269, 2657
5.	Proline content (ugg <sup>-1</sup> )	:	312 to 394.5 ugg <sup>-1</sup>	16-05 (RS), 2457, 16-01 (RS), 2657, 4269
6.	Soluble protein content (mgg <sup>-1</sup> )	:	12 to 14.4 mgg <sup>-1</sup>	16-05 (RS), 4269, 2657, 4267, 2457, 2488


### Results and discussion:

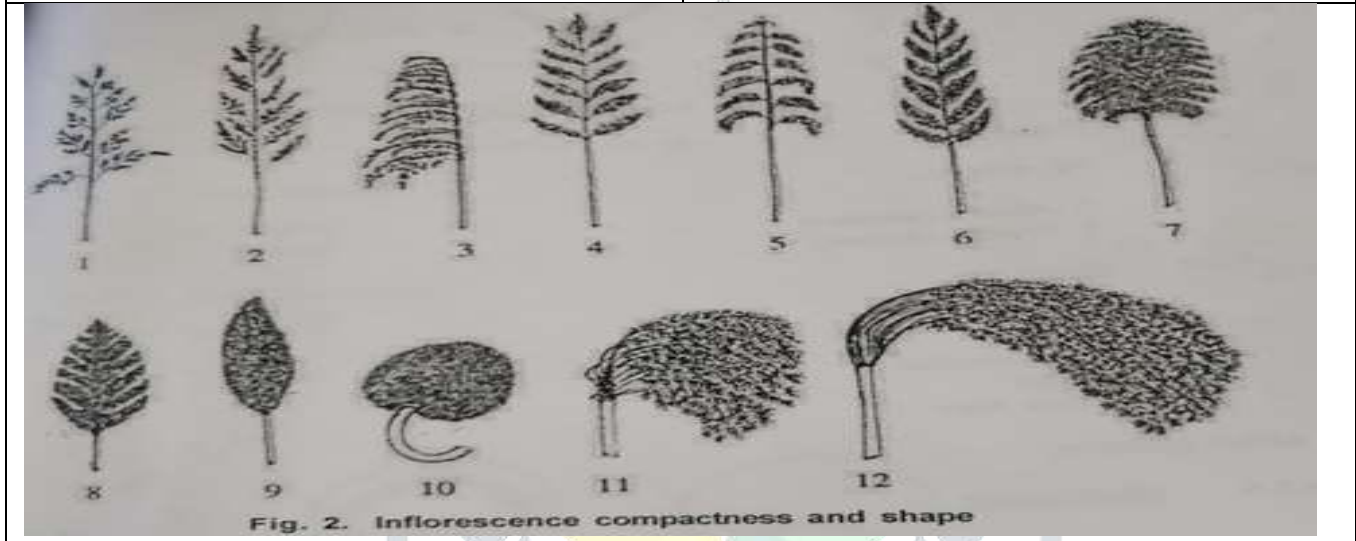
Sorghum land races 16-05 (RS), 2457, 16-01 (RS), 2657, 4269 were found to be early in maturity, high yielding, having high photosynthetic rate, Proline content and soluble protein content (Table 1 to 5) and hence drought tolerant.

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 <p><b>DESCRIPTORS FOR SORGHUM</b> [<i>Sorghum bicolor</i> (L.) Moench]</p> <p><b>SORGHUM DESCRIPTORS</b></p>	
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**TNAUR 0040 2457**

**(compact erect inflorescence)**



**TNAUR 0040 2657**

**(Semi loose erect inflorescence)**



**PYR (RS) 16-01 (Palacode local)**

**(Semicompact elliptic inflorescence)**



**PYR (RS) 16-05 (Kochamalai local)**

**(Compact and oval inflorescence)**

