

SUITABILITY OF *GOSSYPIUM ARBOREUM* COTTON TO DEEP SOIL AND HIGH RAINFALL SITUATION IN ANDHRA PRADESH.

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Abstract: A field experiment was conducted at Regional Agricultural Research station, Lamfarm, Guntur, Andhra Pradesh with different *Gossypium* cotton species viz., *G.arboreum*, *G.herbaceum*, *G.hirsutum*, and intra *hirsutum* hybrids to know their suitability for deep soil and physiological and quality parameters of different genotypes were studied. Of all the species tested the performance of *arboreum* cottons are good with high yield, less pest infestation and with desired fibre qualities.

Keywords: Cotton- *G.arboreum*, *G.herbaceum*, *G.hirsutum*, and intra *hirsutum* hybrids- yield, yield attributing characters- physiological characters- fibre parameters.

Introduction: Cotton is one of the most important commercial crops grown in Andhra Pradesh. In Andhra Pradesh, all the four cultivated cotton species viz., *G.hirsutum*, *G.barbadense* ($2n=4x=52$, tetraploids), and *G.arboreum*, *G.herbaceum* ($2n=2x=26$, diploids) are grown in different proportions and they are confined to different areas. In Andhra Pradesh cotton is grown in different agro ecological situations viz., deep soil + high rainfall, deep soil + low rainfall, medium soil + high rainfall, medium soil + low rainfall, shallow soil + high rainfall, shallow soil + low rainfall. In deep soil + high rainfall situation, even though the performance of *hirsutum*s and *hirsutum* hybrids are good, they are prone to biotic stresses viz., sucking and boll worm complex. The chief merit of diploid cottons over American cottons is that they are fairly tolerant to pests and diseases. Moreover, the demand for short-stapled *arboreum* cottons is increasing due to the

introduction of pen end spinning, day by day (Amolk *et al.*, 1996). Hence the present study is taken up with different species of cotton to identify the suitable species/genotypes to deep soil and high rainfall situation and also to study the yield attributing for getting maximum yield under the situation.

Materials And Methods: A field experiment was carried out at Regional Agricultural Research Station, Lamfarm, Guntur during Kharif 2002 in black cotton soil (Deep soil) under high rainfall conditions. Two genotypes in each group viz., MDL 2450 and Aravinda (*G.arboreum*); Jayadher and Gcot 23 (*G.herbaceum*), Sahana, L 603 (*G.hirsutum* varieties), DHH 11 and Bunny (Intra *hirsutum* hybrids) were taken for the study. The experiment was laid out in a completely randomized block design with 3 replications. Spacings and fertilizer applications were followed as per the recommendations.

Species	Spacing	Fertilizer (Kg/ ha)		
		N	P	K
<i>G.arboreum</i>		60	30	30
<i>G.herbaceum</i>	60 x15 cm	60	30	30
<i>G.hirsutum</i> varieties	60 x30 cm	60	45	45
Intra <i>hirsutum</i> hybrids	60 x 90 cm	120	60	60

The data were recorded on five randomly selected plants for the characters viz., plant height at maturity

(cm), number of monopodia per plant at harvest, number of sympodia per plant at harvest, sympodial

length at 50% height of the plant, specific leaf weight (3^{rd} fully opened leaf from the top) at 90 and 120 days after sowing. The data on plant population at harvest, single boll weight, number of bolls per plant, seed index, lint index, ginning out turn (GOT%), seed cotton yield per plant (g), seed cotton yield (Kg/ha) at 150 DAS and at harvest were also recorded. Cotton lint was analysed for all the fibre quality parameters viz., 2.5% span length, micronaire value (10^{-6} g/ inch), uniformity ratio and maturity coefficient. Data on pest infestation (Thrips, aphids, jassids, heliothis) and the percent damage was calculated and grading was given as per the standard procedures. The data collected for different characters was statistically analyzed by following Fisher's analysis of variance technique.

Results And Discussion: Significant differences were observed among the genotypes for seed cotton yield at harvest and the yield attributing characters viz., sympodial length at 50% height of the plant, number of bolls per plant, boll weight and ginning out turn (%). The *arboreum* entries viz., MDL 2450 (36.76q/ha) and Aravinda (29.47q/ha) recorded significantly higher yield followed by *G.hirsutum* varieties and *hirsutum* hybrids. Very poor yields were recorded from the *herbaceum* entries indicating their unsuitability for the deep soil and high rainfall situation. The highest can be attributed to the highest number of bolls per plant (60.66/plant) and highest plant population per unit area (156.77) in *arboreum* entries. The same thing was emphasized by Singh and Singh (1980) in cotton. The higher yields in *hirsutum* and *hirsutum* hybrids are associated with more number of sympodia, boll weight and boll number. These findings are in agreement with Mohan specific leaf weight may serve as an alternative to increase in leaf area index for increasing boll number (Bhardwaj, 1988). With the above characters the *arboreums* fared well under rainfed conditions in deep soil, high rainfall areas, having drought tolerance characters, which is needed for rainfed situation where the intermittent dry spells are most

et al. (1992), who reported significant association for Asiatic and American cottons for seed cotton yield. The less boll weight in *arboreums* was compensated by the more population per unit area, because of which the yields are comparable to *hirsutums* and *hirsutum* hybrids. (Plant population levels 156.17, 36.67 and 39.33 respectively).

Even though the significant variation was noticed in the seed index and lint index, the ginning out turn was on par with the *hirsutums*. (38.35%) and *hirsutum* hybrids (36.1%). The yield variation was less for seed cotton yield at 150 DAS and at harvest in case of *arboreums* (33.12-29.42=3.7 ha) when compared to *hirsutum* varieties (29.08-22.65=6.43q/ha) and intra *hirsutum* hybrids (27.05-22.69=4.36q/ha) which indicates the earliness of *arboreums* even under deep soil and high rainfall conditions. In case of physiological and biometrical characters, highest plant height was recorded in *arboreums* (20.75 cm) with significantly more number of nodes (32.16) and less monopodia when compared to other species of cotton. Significantly highest specific leaf weight was recorded in *hirsutum* hybrids (7.955 mg/cm²) and *hirsutum* varieties (7.238 mg/cm²) at 90 DAS 7.33 mg/cm² and 7.38 mg/cm² at 120 DAS after sowing when compared to the *arboreums* and *herbcaeums*. Specific leaf weight indicated the photosynthetic efficiency and drought tolerance in cotton. In *arboreums* and *herbcaeums*, the leaves are narrow; thereby compensating the water loss through transpiration, perform well even under rainfed conditions. Within the desi species, the *arboreums* recorded significantly high specific leaf weight (5.62 and 5.89 mg/cm²) at 90 and 120 DAS when compared to *herbcaeums* (5.1 and 5.24 mg/cm²). Increase in common. Fibre quality parameters viz., 2.5% span length, micronaire value (10^{-6} g/inch), uniformity ratio and maturity coefficient were recorded for all the genotypes of different species (Table 2). Highest fibre length was recorded by the American cottons (*Hirsutum* hybrids and *hirsutum* varieties) (28.52 mm and 27.09 mm respectively) compared to *herbcaeums*

and *arboreums* (25.7 mm and 26.25 mm respectively). No significant variation was noticed in uniformity ratio and maturity coefficient and micronaire value. Due to the introduction of open end spinning, the demand for short stapled cotton is also increasing day by day. In *arboreum*, the entry MDL₂₄₅₀ recorded 27.67 mm staple with which is par with the *hirsutum* hybrid DHH₁₁ (27.53 mm) and significantly superior to the *hirsutum* entries, L 603 and Sahana.

The infestation of sucking pests viz., thrips, aphids and jassids and boll worms were recorded at squaring, flowering and boll development stage in different species of cotton (table 3). The data indicated that significantly less infestation was recorded in desi cottons, significant variation was observed. In *arboreums* both the sucking pests and boll worm complex incidence was less leading to less damage to

the fruiting bodies. The findings were noticed by many *arboreum* research workers. At present, less pesticide usage is recommended keeping the environmental safety and production of organic cotton for the export purpose as the primary issue. Desi cottons with less infestation of pest are very well suited and they can be grown with less chemical spray. From the above study it can be concluded that in addition to the *hirsutums* and *hirsutum* hybrids *arboreums* can be recommended to small and marginal farmers who cannot afford high cost of cultivation and risk. So in deep soil-high rainfall situation in Andhra Pradesh, *arboreums* which are high yielders with less infestation and desired fibre quality are recommended and the results of the study clearly emphasized the reorientation of cultivar preference to the deep soil and high rainfall situation.

Table 1: Yield and yield attributing characters of *Gossypium* genotypes under deep soil + high rainfall situation

Species / Genotype	SCY at 150DAS (q/ha)	SCY at harvest (Kg/ha)	No of sympodia/plant	Symphodial length at 50% height of the plant	No.of bolls/plant	Boll weight (g)	Seed index	Lint index	Ginning out turn (%)	Plant population at harvest
G.arboreum										
MDL ₂₄₅₀	33.52	36.76	18.11	22.67	31.87	3.47	6.3	3.85	37.98	157.67
Aravinda	25.31	29.47	19.00	25.33	29.45	2.8	6.78	3.92	36.59	154.67
Mean	29.42	33.12	18.55	24.00	30.66	3.13	6.54	3.89	37.29	156.17
G.herbaceum										
Jayadher	2.11	4.42	15.56	29.56	16.56	3.22	7.57	4.58	37.64	74.67
Gcot 23	3.04	6.95	15.11	26.11	18.00	2.38	7.48	3.46	30.83	76.00
Mean	2.57	5.69	15.33	27.83	17.28	2.8	7.53	4.02	34.24	75.34
G.hirsutum										
Sahana	25.48	29.17	18.67	33.11	28.67	3.71	7.9	4.51	38.36	37.00
L 603	9.82	28.99	16.2	32.56	30.11	5.08	8.72	5.52	38.33	36.00
Mean	22.65	29.08	17.44	32.83	29.39	4.39	8.31	5.02	38.35	36.67
Intra hirsutum hybrids										
DHH ₁₁	25.46	28.93	17.89	36.89	34.67	6.22	9.83	6.28	38.98	31.00
Bunny	19.91	26.17	18.89	35.56	29.11	5.88	10.58	5.46	34.03	27.00
Mean	22.69	27.05	18.39	36.22	31.89	6.05	10.21	5.87	36.51	29.33
CD (0.05)	9.64	10.67	3.6	2.06	5.537	0.49	1.138	0.60	3.111	4.71
CV (%)	27.31	20.474	11.78	3.89	11.57	6.83	7.98	7.32	4.89	3.62

Table 2: Physiological, biometrical and fibre characters of *Gossypium* species under deep soil and high rainfall situation

Species/ Genotype	Plant height (cm)	No. of monopodia per plant	Number of nodes per plant	SLW at 90 DAS	SLW at 120 DAS	SCY / plant (g)	2.5% span length	Micronai re value	Unifor mity ratio	Maturity coefficien t
<i>G.arboreum</i>										
MDL 2450	208.9	1.56	31.33	5.433	5.95	33.6	27.67	49.33	3.7	0.61
Aravinda	206.2	2.11	33.0	5.804	5.84	27.5	24.83	50.67	3.4	0.63
Mean	207.5	1.85	32.16	5.619	5.89	30.6	26.35	50.00	3.55	0.615
<i>G.herbaceum</i>										
Jayadher	182.5	2.78	26.45	5.660	5.44	8.5	24.57	50.67	3.40	0.60
Gcot 23	171.9	2.78	26.99	4.544	5.03	13.2	25.93	50.00	3.63	0.61
Mean	171.2	2.78	26.69	5.102	5.24	10.9	25.7	50.34	3.52	0.605
<i>G.hirsutum</i>										
Sahana	172.5	1.67	22.22	7.261	7.49	112.5	27.07	50.67	3.57	0.60
L 603	156.7	1.00	21.89	7.214	7.27	113.6	27.10	48.67	3.53	0.59
Mean	164.6	1.33	22.05	7.238	7.38	113.1	27.09	49.67	3.55	0.595
<i>Intra hirsutum hybrids</i>										
DHH 11	164.4	1.11	21.89	7.93	7.74	134.4	27.53	50.00	3.37	0.59
Bunny	163.1	1.33	24.22	7.98	7.93	134.0	29.50	49.00	3.40	0.60
Mean	163.8	1.22	23.05	7.955	7.83	134.2	28.52	49.5	3.39	0.595
CD (0.05)	9.45	NS	3.19	0.44	0.29		0.401	1.155	0.231	0.01
CV (%)	3.03	36.07	7.00	3.89	2.53		0.85	1.32	3.77	0.94

Table 3: Pest infestation at squaring, flowering and boll development stages in different species of cotton

Species/ Genotype	Thrips	Aphids	Jassids	Heliothis		
				Eggs	Larvae	% damage to fruiting bodies
<i>G.arboreum</i>						
MDL 2450	2.33	1.00	2.00	4.66	1.33	5.92
Aravinda	3.00	0.67	3.33	2.00	2.33	8.00
Mean	2.67	0.84	2.67	2.83	1.83	6.96
<i>G.herbaceum</i>						
Jayadher	7.33	4.66	6.66	3.00	1.33	5.27
Gcot 23	8.00	6.66	11.33	2.33	1.00	5.11
Mean	7.67	5.66	9.00	2.67	1.67	5.19
<i>G.hirsutum</i>						
Sahana	20.66	13.00	13.66	3.33	3.00	10.92
L 603	19.00	16.00	13.00	3.00	2.33	13.85
Mean	19.83	14.5	13.33	3.17	2.67	12.39
<i>Intra hirsutum hybrids</i>						
DHH 11	23.00	15.00	11.66	8.33	3.00	11.99
Bunny	28.33	13.00	12.66	10.33	4.33	13.52
Mean	25.67	14.00	12.16	9.33	3.67	12.76
CD (0.05)	3.703	3.024	2.313	5.294	2.106	2.122
CV (%)	15.15	18.92	0.997	5.99	5.154	5.89

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