STABILITY OF YIELD AND OTHER QUANTITATIVE TRAITS IN *GOSSYPIUM HERBACEUM* L.COTTON

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Abstract: The present study was undertaken to study the genotype x environment interaction affecting grain yield and its component traits and to identify stable genotype for these traits under saline soil situation. Eleven genotypes of *Gossypium herbaceum* L. cotton were tested over three environments under NATP CES *Herbaceum* project in saline soils during Kharif 2002-2003 at farmer's field in Konanki (E_1) and Uppugundur (E_2) of Prakasham district and Regional Agricultural Research Station, Lam (E_3), Guntur district in Andhra Pradesh. The observations were recorded on eight important yield and its component characters. Both linear and non linear components were found significant for majority of the characters studied. In general linear was higher in magnitude than non linear component for most of the traits studied. Among three locations, Lam (E3) was best suited for *herbaceum* cultivation. Regression analysis indicated that desi hybrid GCot DH 9 is found suitable under favourable environments while RAHS 14 for unfavourable environments for seed cotton yield and its component traits.

Key words: Stability, genotype x environment, regression, *Gossypium herbaceum.*

Introduction: **N**Andhra Pradesh is endowed with dubious distinction of cultivating all the four species of cotton. *Gossypium herbaceum* cottons are better known for drought, pest and disease tolerance inherently. But in general their productivity levels are low as compared to other species. Since the *herbaceum* cottons are successfully grown in coastal saline soils of Gujarat, an attempt has been made to assess the yield potential of eleven genotypes in multiple environments under NATP CES herbaceum project to exploit potential of herbaceum cottons in coastal saline soils of Andhra Pradesh.

Materials and methods: Eleven diverse cotton genotypes which were developed at different agro-climatic zones of India were tested during *Kharif 2002-03* at farmers field in Konanki (E_1) and Uppugunduru (E_2) villages of Prakasham district and at Regional Agricultural Research Station, Lam, Guntur district. (E_3). The experiment was laid out in randomized block design with three replications. Each entry was sown in four rows of four meters length spaced at 60cm between rows and 30cm within the rows, between plant to plant. Data was recorded on five randomly selected plants in each replication on plant height (cm), number of monopodia per plant, number of sympodia per plant, number of bolls per plant, boll weight (g), seed index (g), lint index (g), ginning out turn (%), mean halo length (mm), lint yield (kg/ha) and seed cotton yield (kg/ha). nStability parameters were worked out as per the models outlined by Eberhet and Russell (1966). The significance of stability parameter (bi) and its deviation from unity wee determined by 't' test.

Results and discussion: On the basis of mean values, clear cut differences wee noted for al the characters studied over thee replications. Highest number of bolls per plant, plant height and seed cotton yield were recorded at E_3 (lam) while highest seed index, lint index, ginning out turn and mean halo length were observed at E_1 (Konanki).

From pooled analysis of variance for eight characters (table1), it was evident that mean square for environments (linear) was highly significant for all the characters except seed index and ginning outturn, which indicates that the genotypes tested under different environments are highly significantly different. Mean square for pooled deviation was highly significant for all the traits except boll weight and mean halo length suggesting that variation in performance of eleven cotton genotypes over three locations was due to unpredictable factors. Genotypes x environments (linear) was higher in magnitude than non linear component for all the traits except seed index, ginning out turn and mean halo length. These results are in broad agreement with Tuteja *et al* (1999), Modi *et al* (1999) and Yadav *et al* (2001). The linear and non linear portions of genotype x environment interaction for various traits are presented in table 2. Variation contributed by linear component for number of bolls per plant, mean halo length, boll weight, lint index, seed cotton yield and plant height, while non linear component was predominant for rest of the traits. It appears Lam environment (E_3) where cotton is grown in heavy black cotton soils under rainfed situation is the best suited environment. Environmental index was high and positive confirming the prediction. Whereas E_1

(Konanki) is also showing encouraging performance for important fibre related characters (table 3).

The estimates of stability parameters i.e per se performance (X), regression coefficient (bi) and deviation from egression are presented in table 4. None of the genotypes were found to be stable for all the characters studied. Paroda and Hayes (1971) explained that linear regression should simply be regarded as a measure of response of a particular genotype while deviation from regression line is a measure of stability. Thus a genotype is considered to be stable in performance if it has high mean performance, unit regression coefficient (b=1) and less deviation from regression. From the present study it was observed that genotypes with relatively high yield exhibited low stability indicating that the mean performance and stability were two different components genetically controlled in different manner.

When the parameters were studied the highest mean seed cotton yield was recorded by GCot DH 7 (1016.19kg/ha) followed by GCot DH9 (834.11kg/ha). The regression value of GSHV 820/91 was nearer to unity (0.9222). While least deviation from regression was manifested by RAHS 14 followed by GCot DH9. From the regression analysis it can be predicted that desi hybrid GCot DH 9 for favourable environments is the most stable one followed by RAHS 14 for unfavourable environments.

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Table 1: Analysis of variance for stability of different characters

Source	Degrees of freedom	Plant height (cm)	No. of bolls per plant	Boll weight (g)	Seed index (g)	Lint index (g)	Ginning out turn (%)	Mean halo length (mm)	Seed cotton yield (kg/ha)
Replications with environment	6	20.117	0.390	0.001	0.029	0.003	0.83	0.08	129.88
Varieties	10	374.964	102.71	0.019**	0.70**	0.274*	0.34	3.42**	180030.65**
Environment + (Varieties x environment)	22	288.755	111.35**	0.009**	0.155	0.162**	0.40	0.27	94543.32*
Environments	2	1524.58**	606.02**	0.060**	0.312	0.929**	0.62	2.05**	571142.00
Varieties x environment	20	165.172	61.889**	0.004	0.139	0.085*	0.38	0.09	46883.42
Environments (Linear)	1	3049.16**	1212.04**	0.12**	0.624	1.859**	1.25	4.10**	1142284.00**

Varieties x environment (Linear)	10	206.225	117.68**	0.007*	0.039	0.143**	0.29	0.016	66227.97
Pooled deviation	11	112.84**	5.54**	0.001	0.217**	0.024**	0.42	0.15	25035.39**
Pooled error	60	23.517	0.490	0.002	0.015	0.006	0.12	0.22	1130.58
Total	32	315.695	108.65	0.012	0.326	0.197	0.38	1.23	121258.11

* Significant at 5% level ** significant at 1% level

Table 2: Magnitude of linear and non linear portion of genotype environment interaction

S.No	Character	Linear component	Non linear component (%)
1	Plant height (cm)	64.6	35.4
2	No. of bolls per plant	95.5	4.5
3	Boll weight (g)	87.5	12.5
4	Seed index (g)	15.2	84.8
5	Lint index (g)	85.6	14.4
6	Ginning out turn (%)	41.5	58.5
7	Mean halo length (mm)	91.0	9.0
8	Seed cotton yield (kg/ha)	72.6	27.4

Table 3: Environmental index of different characterS

S.No	Character	Environment 1 (Konanki)	Environment 2 (Uppugunduru)	Environment 3 (Lam)
1	Plant height (cm)	**-0.490**	-11.520	12.010
2	No. of bolls per plant	-3.002	-5.451	8.453
3	Boll weight (g)	-0.061	-0.021	0.082
4	Seed index (g)	0.123	-0.192	0.069
5	Lint index (g)	0.233	0.093	-0.326
6	Ginning out turn (%)	0.234	-0.241	0.007
7	Mean halo length (mm)	0.391	-0.464	0.073
8	Seed cotton yield (kg/ha)	-29.457	-211.703	241.160

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Table 4: Estimation of yield and stability parameters for different characters

S.	Genotype	Plant height (cm)			No. of bolls per plant			Boll weight (g)			Seed index (g)		
		μ Mean	Bi	S^2di	μ Mean	Bi	S^2di	μ Mean	Bi	S^2di	μ Mean	Bi	S^2di
1	GSHV-384/92	88.833	0.84	67.18	5.022	0.63	2.30*	1.799	2.60	0.00	5.789	0.65	0.39**
2	GSHV-820/91	96.772	1.38	160.02**	6.960	0.76	0.02	1.812	1.19	0.00	5.762	-0.17	0.26**
3	GSHV-531/92	99.333	2.03	243.97*	4.572	0.46	0.00	1.837	1.50	0.00	5.808	1.46	-0.01
4	GCot DH7	120.944	2.18	-5.26	24.728	3.81	19.71	1.964	0.14*	0.00	6.521	0.31	0.18**
5	GCot DH9	121.167	1.23	110.50	13.126	1.73*	-0.46	2.074	0.64	0.00	7.206	1.83	-0.02
6	RAHS 119	120.778	-0.02	188.78**	9.924	0.55	23.01**	1.961	-0.60*	0.00	5.808	0.95	0.17**
7	RAHS 18	109.444	0.73	-2.06	8.428	0.72	1.36	1.900	0.44	0.00	5.509	0.66	0.05*
8	DB-3-12	107.667	-0.51	119.61	6.098	0.21	2.45*	1.858	1.67	0.00	5.610	0.11	0.03
9	Jayadher	95.556	0.49	57.96	6.161	0.36	4.65**	1.885	1.12	0.00	5.934	2.47	0.93**
10	RAHS 131	103.944	2.00	64.30	12.976	1.66	2.61	1.845	1.07	0.00	5.766	0.77	0.04
11	RAHS 14	101.000	0.65	-19.12	6.270	0.40	0.04	1.880	1.21	0.00	5.974	1.96	0.18**
Population mean		105.944			9.479			1.892			5.972		

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S.	Genotype	Lint index (g)			Ginning out tun(%)			Mean halo length (mm)			Seed cotton yield (kg/ha)		
		μ Mean	Bi	S^2di	μ Mean	Bi	S^2di	μ Mean	Bi	S^2di	μ Mean	Bi	S^2di
1	GSHV-384/92	3.660	2.61*	0.00	32.578	1.94	-0.13	21.044	1.09	0.01	263.9	0.77	11461.7***
2	GSHV-820/91	3.716	1.36	0.01	33.267	1.71	1.38**	21.822	1.48	0.00	376.5	0.92	5311.7*
3	GSHV-531/92	3.506	0.57	0.01	33.500	2.90	-0.07	21.800	0.97	-0.19	258.4	0.55	4734.1*
4	GCot DH7	4.071	1.02	0.09**	33.033	-1.30	0.03	23.867	1.01	0.24	1016.2	2.48	23940.8***
5	GCot DH9	4.374	2.09	0.00	32.489	-1.59	-0.11	24.433	0.82	0.03	834.1	1.93	2458.7*
6	RAHS 119	3.629	-0.46	0.01	32.989	1.35	-0.12	22.800	1.20	-0.19	577.2	0.59	82269.9***
7	RAHS 18	3.221	1.81	0.02*	32.878	1.41	0.53	22.133	0.99	-0.15	533.2	0.84	14970.4***
8	DB-3-12	3.526	0.57	0.04**	33.411	1.19	0.59*	21.867	0.73	-0.20	385.8	0.08	29571.9***
9	Jayadher	3.598	0.07	0.01	32.900	3.31	0.40	21.133	1.05	0.05	365.0	0.42	22418.8***
10	RAHS 131	3.759	0.27	0.02*	33.433	1.02	0.13	21.567	0.78	-0.09	728.4	2.10	67840.5***
11	RAHS 14	3.627	1.10	0.02*	32.944	-0.94	-0.01	22.233	0.88	-0.15	411.3	0.32*	-1024.8*
Population mean		3.699						22.245			522.7		