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YIELD AND ITS COMPONENTS STABILITY OF COTTON (*Gossypium hirsutum* L.) GENOTYPES

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ABSTRACT

The present investigation was undertaken to study phenotypic stability of parents and hybrids. The experimental material consisted of nine parents (seven females and two males) and their fourteen resultant crosses that were made in conventional method grown in kharif 2002 at three locations viz., Surat, Hansot and Bharuch. The Eberhart and Russell model of stability analysis was carried out to study the genotype x environment interaction for seed cotton yield and its component traits. The analysis revealed that environment component was considerably higher than genotypes and genotypes x environment component for all the characters. Looking to the overall performance the parental lines LH-900, LRK-516, G(B) 20 were the most stable parent in seed cotton yield and the crosses LH-900 x G.Cot.10, PH-93 x G.Cot.10, LRK-516 x DHY 286-1, G(B) 20 x G.Cot.10 with desirable stability.

Key words : *Gossypium hirsutum, genotype x environments, stability analysis*

A variety having good adaptability is one that consistently gives stable performance over wide range of environments (1). Thus stability depends upon the relative sensitivity of a genotype to varied environments. An individual may react to variable environments in such a way that its development is buffered against environmental variation and the same adaptive phenotype being produced in varying environments. Therefore, the analysis of genotype x environment interaction becomes an important tool employed by breeders for evaluating varietal adaptation. Hence stability analysis was carried out to identify stable accessions so as to develop high yielding hybrids and superior crosses. In the present investigation when these parameters were studied for each genotype separately, none of the parents/hybrids exhibited average stability for all the characters. Thus any generalization regarding stability of genotype for all the characters is too difficult since the genotype may not simultaneously exhibit uniform responsiveness and stability patterns for these characters (2, 3, 4). It is therefore suggested that in order to produce stable hybrid actual testing of hybrids over a range of environments would be necessary.

MATERIALS AND METHODS

The study includes 24 entries comprising of 14 F_1s, 7 females and 2 males and 1 check were evaluated during *kharif* 2002 at three locations *viz*., Surat, Bharuch and Hansot. The trials were conducted in a Randomised Block design (RBD), replicated thrice in the three different locations. The parents and F_1s with standard checks were represented by a single row plot of 14 plants, placed at 120 cm x 45 cm. All the agronomical practices and plant protection measures were followed as and when required to raise a good crop of cotton. Five random competitive plants excluding border ones were selected from each row in each replication to record observations on seed cotton yield per plant, number of bolls per plant, boll weight, ginning per centage, 2.5 per cent span length and fibre strength. The 8 characters were recorded in the field and laboratory and the mean values were subjected for statistical analysis.

RESULTS AND DISCUSSON

Genotype x environment (G x E) interaction measures the differential response of genotypes to changes in the environments. This interaction plays an important role in theefficiency of selection programme. The magnitude of G x E interactions and stability parameters for various traits were estimated as per the procedure outlined by (5). The mean squares for phenotypic stability for different traits are presented in Table-1.

The mean squares due to genotypes were found to be significant for all the characters when tested against pooled error except the mean squares for conventional hybrids of fibre strength. However, these were significant when tested against pooled deviation. The mean SS due to environments were significant for all the characters except ginning percentage. However, fibre strength was significant when tested against pooled deviation. Similarly genotype x environment interactions were significant for all the characters except fibre length and fibre strength. The mean squares due to environments (linear) were significantfor all the characters in conventional hybrids. On the other hand, the mean squares due to genotype x environments (linear) were significant for all the characters except ginning percentage, fibre length and fibre strength. Pooled deviation were significant for the characters viz., number of bolls per plant, boll weight.

The estimates of stability parameters computed to

Table-1 : Analysis of variance (mean sqares) for phenotypic stability for Seed cotton yield per plant (g), number of bolls per plant, boll weight, Ginning percentage (%), 2.5 per cent span length (mm) and Fibre strength (g/tex)

Source of variation	DF	Seed cotton yield per plant (g)	Number of bolls per plant	Boll weight (g)	Ginning percentage (%)	2.5 per cent span length (mm)	Fibre strength (g/tex)
Genotypes (G)	22	1652.77**	210.78**	0.59**	28.74**	6.44**	2.82
Environment (E)	2	18595.41**	340.58**	5.64**	5.65	45.00**	7.46**
G × E	44	332.21**	338.78**	0.24**	7.49**	2.32	1.49
Environments (linear)	1	37191.13**	681.17**	11.28**	11.27	90.02**	49.91**
G ×E (linear)	22	455.52**	35.52**	0.37**	6.75	1.66	1.64
Pooled devation	23	199.81**	30.64**	0.11**	7.88	2.85	1.27
Pooled error	132	73.66	7.80	0.04	5.84	3.05	2.02

*,** Significant at 5 and 1 per cent probability levels against pooled error

Table-2 : Stability parameters of different genotypes for seed cotton yield per plant (g), number of bolls per plant and boll weight (g)

Genotypes	Seed cotton yield per plant (g)			Number of bolls per plant			Boll weight (g)		
	Mean	b_i	S^2d_i	Mean	b_i	S^2d_i	Mean	b_i	S^2d_i
76 IH 20	93.49	0.32	437.71**	30.00	0.67	21.87**	3.58	0.34	0.36**
LH 900	86.50	1.16	-16.39	27.90	1.07	7.06	3.10	1.43	-0.01
PH 93	75.89	0.33	22.34	29.76	-0.46	-0.06	3.07	1.60	0.02
LRA 5166	81.27	0.30	520.13**	31.67	-0.35	51.94**	2.86	1.07	0.04
LRK 516	96.40	0.77	-18.01	26.33	0.81	-2.58	4.00	0.84	-0.01
G(B) 20	104.78	0.84	129.46**	31.38	1.70	53.94**	3.78	0.17	0.02
G.Cot. 100	84.03	0.83	48.30	28.36	1.49	30.23**	3.32	0.40	-0.01
G.Cot. 10	104.15	0.77	-24.22	33.40	1.09	2.98	3.30	0.22	-0.01
DHY 286-1	90.93	0.88	10.32	26.09	0.94	11.02*	3.60	0.28	0.27**
76 IH 20 x G.Cot.10	113.08	1.37	506.66**	43.00	0.96	70.58**	3.44	1.57	0.34**
76 IH 20 x DHY 286-1	118.01	1.80	721.76**	45.36	1.23	103.49**	3.75	2.73	-0.01
LH 900 x G.Cot.10	115.52	0.80	26.50	43.11	1.13	36.11**	3.88	0.15	0.49**
LH 900 x DHY 286-1	135.04	2.12	23.58	40.80	3.03	53.23**	4.18	1.61	0.02
PH 93 x G.Cot.10	112.37	1.12	-18.27	45.71	-0.79	10.76*	3.55	2.57	0.05
PH 93 x DHY 286-1	101.68	0.28	-13.67	44.91	-1.53	-0.17	3.05	1.23	0.00
LRA 5166 x G.Cot.10	140.39	2.11	-3.30	48.22	2.45	0.48	3.64	1.42	0.20**
LRA 5166 x DHY 286-1	126.07	1.29	49.51	53.40	1.76	10.11*	3.20	1.19	0.03
LRK 516 x G.Cot.10	119.14	0.34	133.37**	36.70	-0.17	66.51**	4.23	-0.16	0.00
LRK 516 x DHY 286-1	141.82	0.97	466.90**	46.64	1.49	-1.05	4.03	1.39	0.13**
G(B) 20 x G.Cot.10	161.36	1.17	109.52**	47.16	1.23	-0.28	5.30	0.26	0.18**
G(B) 20 x DHY 286-1	158.44	1.07	116.02**	46.76	1.09	30.58**	5.22	1.24	0.10**
G.Cot.100 x G.Cot.10	127.89	0.99	55.06	43.69	2.81	10.41*	4.34	-0.71	0.21**
G.Cot.100 x DHY 286-1	121.21	1.47	747.58**	42.44	1.36	79.43**	3.78	2.17	0.01
Mean	113.35	-	-	38.81	-	-	3.66	-	-
S.E. ±	9.99	0.35	-	3.91	1.01	-	0.24	0.49	-

evaluate relative stability of different genotypes over a range of environments are presented in Table-2 and 3. The results are described below :

Seed cotton yield per plant : Among the parents LH 900, LRK 516, G(B) 20, G.Cot.100, G.Cot.10 and DHY 286-1 recorded high mean values with nearer to one regression coefficient and low and non significant deviation from regression except G(B) 20 which showed significant deviation from regression in conventional method. In conventional crosses, the crosses viz., LH 900 x G.Cot.10, PH 93 x G.Cot.10, LRK 516 x DHY 286-1, G(B) 20 x G.Cot.10, G(B) 20 x DHY 286-1, G.Cot.100 x G.Cot.10 showed high mean values with approximately equal to one regression coefficient and low and non significant deviation from regression except the crosses viz; LRK 516 x DHY 286-1,G(B) 20 x G.CoT10 and G(B)

Table-3 : Stability parameters of different genotypes for ginning percentage (%), 2.5 per cent span length (mm) and fibre strength (g/tex)

Genotypes	ginning percentage (%)			2.5 per cent span length (mm)			fibre strength (g/tex)		
	Mean	b_i	S^2d_i	Mean	b_i	S^2d_i	Mean	b_i	S^2d_i
76 IH 20	31.59	-0.32	-1.83	23.15	1.62	-0.99	17.57	1.87	-0.52
LH 900	34.77	-0.73	-1.81	23.46	1.00	-1.01	16.48	2.92	-0.32
PH 93	41.26	-0.31	3.03	22.28	1.33	-0.72	17.89	0.33	2.05
LRA 5166	35.38	-2.57	-1.78	24.56	1.49	2.88	18.18	-0.64	1.85
LRK 516	37.03	-0.48	-1.38	25.62	-0.18	-2.25	19.08	0.84	-0.42
G(B) 20	34.90	-5.69	-0.33	25.14	0.65	-0.52	18.91	-0.93	-0.66
G.Cot. 100	33.67	3.28	-0.15	27.30	1.52	1.04	19.59	-0.17	-0.67
G.Cot. 10	36.08	0.31	-1.19	23.23	0.54	2.35	18.36	0.04	0.06
DHY 286-1	36.33	-0.77	4.46	24.91	0.50	-0.66	20.17	2.00	0.01
76 IH 20 x G.Cot.10	36.86	9.33	16.43**	24.39	0.55	-0.03	18.84	1.71	0.20
76 IH 20 x DHY 286-1	35.82	4.48	19.84**	24.11	1.09	-0.23	17.67	1.42	-0.64
LH 900 x G.Cot.10	34.96	6.76	0.03	23.97	-0.01	-1.00	18.69	0.82	3.07**
LH 900 x DHY 286-1	34.77	-0.19	6.99*	22.54	1.51	-0.66	19.13	1.34	-0.66
lphaPH 93 x G.Cot.10	41.57	1.70	-1.02	23.67	1.09	-0.33	19.08	1.89	-0.67
PH 93 x DHY 286-1	44.50	-0.71	0.83	24.59	1.40	0.18	17.92	4.42	9.42**
LRA 5166 x G.Cot.10	39.14	0.46	-0.79	25.99	-0.56	-0.53	18.84	1.98	2.22
LRA 5166 x DHY 286-1	33.84	3.97	-0.72	25.07	1.20	-0.97	19.99	3.97	-0.61
LRK 516 x G.Cot.10	34.14	5.89	52.21**	26.34	1.53	2.97	20.82	2.88	-0.67
LRK 516 x DHY 286-1	36.20	5.61	4.27	23.36	1.82	1.63	18.68	0.76	-0.64
G(B) 20 x G.Cot.10	34.85	-0.70	-1.82	24.07	0.45	4.62**	19.83	1.45	-0.27
G(B) 20 x DHY 286-1	32.72	1.39	-0.91	22.88	1.18	3.30	19.07	1.11	1.06
G.Cot.100 x G.Cot.10	32.11	-2.22	43.97**	27.27	1.91	10.46**	20.38	0.71	0.05
G.Cot.100 x DHY 286-1	37.48	-1.40	-1.84	26.83	1.37	18.18**	18.90	0.75	0.68
Mean	36.08	-	-	24.55	-	-	18.92	-	-
S.E. +	1.98	4.00	-	1.19	0.85	-	0.79	1.40	-

20 x DHY 286-1 which showed significant deviation from regression.

Number of bolls per plant : In conventional method, the parents viz., LH 900, LRK 516, G.Cot.10 and DHY 286-1 recorded high mean values, approximately unit regression coefficient (bi) and lower deviation from regression values. Among the crosses, 76 IH 20 x G.Cot.10, 76 IH 20 x DHY 286-1, LH 900 x G.Cot.10, G(B) 20 x G.Cot.10 and G(B) 20 x DHY 286-1 recorded high mean values, nearer to unity bi value and high value of S^2di.

Boll weight : The parents viz., LRK 516 and LRA 5166 registered high mean values, regression coefficient equal to approximately unity and low deviation from regression in conventional method. In conventional crosses, PH 93 x DHY 286-1, LRA 5166 x DHY 286-1 and G(B) 20 x DHY 286-1 registered high mean values with nearer to unity bi and low deviation from regression.

Ginning percentage (%) : In conventional method, the parents PH 93 and LRK 516 recorded highest ginning percentage with less than one regression coefficient and low deviation from regression. Among crosses, PH 93 x DHY 286-1 and LRA 5166 x G.Cot.10 showed highest mean with regression coefficient less than one and low deviation from regression.

2.5 per cent span length (mm) : The parent LH 900 showed high mean value with approximately equal to one regression coefficient and low deviation from regression. The parents G.Cot.100 and LRA 5166 recorded highest mean values with bi greater than one and low S^2di value. In conventional crosses, 76 IH 20 x DHY 286-1, PH 93 x G.Cot.10, LRA 5166 x DHY 286-1 and G.Cot.100 x DHY 286-1 registered high mean with nearer to one regression coefficient and low values of deviation from regression.

Fibre strength (g/tex) : The parent LRK 516 recorded high mean value with nearer to one regression coefficient and low deviation from regression, whereas the parents G.Cot.100, G.Cot.10 and DHY 286-1 registered highest mean with less than one bi and low deviation from regression. In conventional crosses, LH 900 x G.Cot.10, LRK 516 x DHY 286-1, G(B) 20 x DHY 286-1 and G.Cot.100 x DHY 286-1 crosses recorded high mean

values with nearer to one regression coefficient and lower values of deviation from regression coefficient.

It was concluded that seed cotton yield and its related traits may be taken into account while selecting/ evaluating genotypes for stability performance across the environments. Taking into account of all the parameters of stability it can be inferred that among the parents LH-900, LRK-516, G(B) 20, G.Cot.100, G.Cot.10 and DHY 286-1 recorded high mean values with nearer to one regression coefficient and low deviation from regression except G(B) 20 which showed significant deviation from regression and LH-900 x G.Cot.10, PH-93 x G.Cot.10, LRK-516 x DHY 286-1, G(B) 20 x G.Cot.10, G(B) 20 x DHY-286-1, G.Cot.100 x G.Cot.10 showed high mean values with approximately equal to one regression coefficient and low deviation from regression. These genotypes can be considered as most stable and can be recommended for wider adaptability.

REFERENCES

1. Frey, K.J. (1964). Adaptation reaction of oat strains selected under stress and non-stress environmental conditions. *Crop Sci*., *4 :* 55-58.
2. Bhandari, D.R. (1980). Studies on stability parameters in parents and hybrids of *G. hirsutum* L. *J. Indian Soc. Cott. Improv*., *5 :* 61-65.
3. Gill, S.S. and Singh, T.H. (1982). Stability for fibre and morphological characters in upland cotton. *Indian J. Genet*., *41 (2) :* 292-296.
4. Pavasia, M.J.; Shukla, P.T. and Patel, R.H. (1997). G x E interaction and stability parameters in upland cotton (*G. hirsutum* L.). Paper presented at National seminar on "Increasing production and productivity of irrigated cotton for 21st century" held at M.P.K.V., Rahuri on 14th and 15th Sep. 1997.
5. Eberhart, S.A. and Russel, W.A. (1966). Stability parameters for comparing varieties. *Crop Sci*., *6* : 357-361.

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