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STABILITY FOR FIBRE AND MORPHOLOGICAL CHARACTERS IN UPLAND COTTON

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ABSTRACT

Sixteen varieties of upland cotton were evaluated for stability at 6 locations, viz., Jullundur, Ludhiana, Faridkot, Abohar, Sirsa and Hissar. The results indicated significant regression for number of monopods and deviation from regression for number of sympods, plant height and fibre length indicating importance of deviations. The most stable varieties were LH37, H 642 C, 4–1 and D 40 for number of monopods, number of sympods, plant height and halo length respectively. None of the varieties was stable for all the traits. Correlations between means and regressions were significant for plant height and sympod number indicating lines having high mean performance were having below average stability and vice versa.

To exploit the genotype-environment interaction, Abou-El-Fittouh, Rawlings and Miller (1969) suggested breeding of varieties for various regions. But this is applicable only for predictable changes in environmental conditions like climate, soil type, day length, etc. An alternative is to identify varieties which are stable over environments, i.e., show less genotype environment interactions. Eberhart and Russell (1966) suggested an approach to screen germplasm for stable genotypes. The model provides three statistics namely mean performance, linear response (regression) of a variety to the environments and deviations from linear response. A stable variety according to the model is characterised by average linear response (unit regression) and least deviations accompanied by high mean performance.

Information regarding the stability parameters of morphological and fibre characters in upland cotton is scanty. The present study was designed to obtain information on this aspect in upland cotton.

MATERIALS AND METHODS

Sixteen varieties (Table 2) of upland cotton (*Gossypium hirsutum* L.) were grown at six locations, Ludhiana, Jullundur, Faridkot, and Abohar in Punjab and Hissar and Sirsa in Haryana during *kharif*, 1974. The varieties were sown in mid-May at all the locations mentioned above in a randomized block design with four replications at each location. The row to row and plant to plant distance was 60 cm and 30 cm, respectively. Recommended agronomical practices were carried out. The data were recorded on ten competitive plants for number of monopods, number of sympods, plant height and halo length. The method outlined by Eberhart and Russell (1966) was used to analyse the data.

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TABLE 1

Analysis of variance (mean squares) for stability in upland cotton

Source	D.F.	Number of monopods	Number of sympods	Plant height	Halo length
Varieties (G)	15	0.62**	40.74**	1012.78**	21.57**
Environments (E) + G × E	80	2.23**	30.29**	657.19**	3.87**
G × E (Linear)	15	1.00**	3.66	49.74	1.44
Pooled deviations	64	0.17	2.48*	54.71*	1.29**
Pooled error	270	0.21	1.74	40.21	0.36

*, **—Significant at 5 and 1 per cent levels, respectively.

RESULTS

It was seen that genotype-environment interaction (linear) was significant for number of monopods and deviations from regression for this trait was non-significant (Table 1). In respect of plant height, number of sympods and a halo length, only the deviations from regression were significant.

The estimates of mean (u_i), regression (b_i) and deviation from the regression (S^2d_i) for four characters, have been given in Table 2.

The values of rank correlations between two stability parameters (means and regression coefficient) are presented in Table 3. The correlation values for number of sympods and plant height were highly significant, whereas for number of monopods and halo length the values were non-significant.

DISCUSSION

Stability analysis in the present study revealed that GE interaction (linear) was significant only for number of monopods and the deviations were non-significant. However, only deviations from the regression were significant for number of sympods, plant height and halo length. These results suggest a considerable role of non-linear component of G × E interaction for these traits. Similar results were also reported by Malhi (1975) in *G. arboreum* and Eberhart and Russell (1966) in maize.

Primary branches or number of monopods had negative correlation with yield (Gill, 1975). So, varieties (LH 37, HSB 2 & H 642C) with fewer monopods and average stability should be preferred in yield improvement. 'SH 169-1-70' recorded high number of sympods accompanied with above average regression

TABLE 2

Stability parameters of sixteen varieties of upland cotton

Variety	Number of monopods			Number of sympods			Plant height			Halo length		
	u_i	b_i	S^2_{di}	u_i	b_i	S^2_{di}	u_i	b_i	S^2_{di}	u_i	b_i	S^2_{di}
LH 37	1·10	0·82	0·002	18·58	0·99	0·05	128·83	1·06	151·79**	26·05	1·26	0·23
LH 33	1·64	1·56**	0·084	17·38	0·91	2·09	131·29	1·07	25·34	25·42	0·68	1·27**
HSB 2	1·28	1·05	0·084	18·88	1·02	1·77	138·21	1·27	0·50	25·68	1·02	1·21**
H 392	1·85	0·99	0·403	16·17	0·97	1·52	129·58	1·04	16·45	28·47	1·29**	1·79
H 509	1·43	1·31	0·013	17·67	0·99	1·50	131·04	0·94	13·99	24·91	1·48	0·93*
H 642 C	1·35	0·80	0·015	20·08	0·96	0·81	130·79	1·06	21·79	28·96	1·03	2·45**
D 33	1·86	0·97	0·010	18·08	1·06	0·64	122·92	1·15	2·39	27·42	0·28	2·11**
D 40	1·81	0·45**	0·003	17·33	0·85	1·65	121·29	1·00	73·48	26·94	0·67	0·41
4–1	1·47	1·04	0·184	17·46	0·85	3·76*	104·00	1·01	31·58	25·57	1·34	2·07**
MCU 5–21	1·63	1·25	0·195	18·08	0·89	3·66*	104·42	0·84	30·03	27·17	1·38	1·07*
SH 169–1–70	2·15	1·54**	0·612*	20·54	1·41**	9·95**	126·50	0·88	6·13	29·25	0·47	1·20**
MU2	1·53	1·12	0·086	18·79	1·15	3·16	125·58	0·91	136·93**	24·66	1·51	0·12
RS 221	1·93	0·69	0·291	16·29	0·98	1·16	97·71	0·72	84·03*	29·05	0·90	3·10**
RS 209	1·99	1·10	0·063	17·21	0·78*	0·36	106·08	0·92	58·98	26·08	0·84	0·30
J205	1·35	0·61*	0·182	20·50	1·21*	0·29	136·96	1·10	2·61	26·46	1·07	0·11
BN	2·18	0·69	0·142	17·96	0·98	1·58	136·46	1·03	73·90	22·03	0·78	0·34
Mean	1·66	1·00	—	18·25	1·00	—	123·23	1·00	—	26·51	1·00	—
C.D. at 5%	0·47	0·36	—	1·78	0·18	—	8·37	0·37	—	1·28	0·88	—

**, *—Significant at 1 and 5 per cent, respectively.

TABLE 3

Rank correlation between means and regressions for four characters in upland cotton

Character	Correlation
Number of monopods	0.03
Number of sympods	0.67**
Plant height	0.67**
Halo length	–0.34

**Significant at 1 per cent level.

and significant deviation. The variety 'J 205' also had high regression which indicated its poor stability for number of sympods. 'H 642C' 'BN', 'HSB 2' and 'LH 37' had above average mean performance for number of sympods with average stability. Plant height had no correlation in this group of varieties with yield, so varieties with small height should be preferred due to ease in picking and cultural practices in addition to the possibility of accommodating more plants/ unit area. The varieties '4–1', 'RS 209' and 'D 40' showed average stability and below average mean performance for height.

Significant deviations from regression were observed for all varieties except 'LH 37', 'D 40', 'MU 2', 'RS 209', 'BN', and 'J 205' for halo length which showed that deviations accounted for more variation for this character in most of the varieties.

The varieties 'SH 169–1–70', 'RS 221', 'H 642 C' and 'H 392' had significantly higher mean fibre length with significant deviations. So, on the basis of high mean and regression (nearly equal to unity), these four varieties were considered more stable.

Rank correlations between mean and regression for number of sympods and plant height were observed to be highly significant. This indicated that, in general, lines with poor mean performance had above average stability ($b<1\cdot0$). Varieties with an average mean performance were expected to show average stability. There was no association between means and regressions for halo length.

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