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Stability of Cotton Varieties

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Coordinated varietal trials were conducted during 1970-71 and 1971-72, under the All India Coordinated Cotton Improvement Project, using improved strains of *G. hirstum*, *G. arboreum* and *G. barbadense*, in Northern, Central and Southern Zones, under irrigated and rainfed conditions. For the yield character, 'Variety x Env. linear' and 'Pooled deviations' effects were significant for *G. hirsutum* (irrigated) varieties in Central Zone whereas the former effect alone was significant in Southern Zone. For *G. arboreum* and *G. hirsutum* (rainfed) varieties, and for *G. barbadense* (irrigated) varieties the interaction i.e., 'Variety x Env. linear' effect was significant, while 'Pooled deviations' effect was not significant. Under *G. hirsutum* (irrigated) group, 'J 205' and 'J 127' varieties from Northern Zone, '66 BH 5/55' and 'DHY-82' varieties from Central Zone, 'MCU 5', 'ELS 117' and 'A 179' varieties from Southern Zone, and under *G. arboreum* (rainfed) group 'CJ 2164' and 'AKH 2' varieties, and under *G. barbadense* (irrigated) 'N 28' and 'ERB 4488' varieties from Central and Southern Zones were found more stable in the respective Zones.

Evaluation of varieties for their suitability in performance over a range of environmental conditions is being emphasised for different crops with diverse breeding systems. Such a proposition has been the basic criterion for multilocation testing of varieties under the coordinated schemes for crop improvement (Jawahar Ram, 1970). In order to determine the adaptive potential and relative stability of different improved strains, tests developed by Finley and Wilkinson (1963) and Eberhart and Russel (1966) have been used extensively. Using cluster analysis Abu-El-Fittouh *et al* (1969) have classified localities for growing different cotton varieties. Present study is to identify suitable improved varieties of cotton for Northern, Central and Southern zones, which have shown consistent kapas yield in different tracts and less variation in their ginning percentage and mean fibre length values.

MATERIALS AND METHODS

Coordinated varietal trials were conducted under the All India Coordinated Cotton Improvement Project in Northern, Central and Southern zones during the 1970-71 and 1971-72, to determine the adaptive potential of various improved strains of *G. hirsutum*, *G. arboreum* and *G. barbadense* under irrigated and rainfed conditions. Randomised block design was used in

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conducting the trials. Due to the difference in plot sizes *kapas* yield in kg. per ha, ginning percentage and mean fibre length (mm) values were considered for the present analysis. Data from seven varieties of *G.hirsutum* (irrigated) (Table II) in seven locations of Northern zone namely Hissar, Jullender, Ludhiana, Faridkot, Sirsa, Delhi and Abohar; nine varieties of *G. hirsutum* tested in six locations of Central Zone namely Surat, Junagadh, Talod, Achal pur, Jalgaon and Nanded and ten varieties of *G.hirsutum* (irrigated) tested in six locations of Southern Zone namely Coimbatore, Arabhavi, Siruguppa, Amaravathi, Nandyal and Srivilliputhur were used. The data also included from the results of 11 varieties of *G. arboreum* and *G. hirsutum* (rainfed) (Table III) tested in ten locations of Central and Southern Zones namely Nanded, Akola, Buldhana, Badnapur, Washim, Somnathpur, Nagpur, Jalgaon, Kovilpatti and Coimbatore and ten varieties of *G. barbadense* (irrigated) tested in nine locations of Central and Southern Zones at Surat, Talod, Nanded, Junagadh, Khandwa, Nandyal, Yemmiganur, Arasikere and Coimbatore.

The analysis was performed accord ing to the procedures suggested by Eberhart and Russel (1966). Only kapas yield in kg per ha. was analysed for the coordinated varietal trials of *G. hirsutum* cottons for Northern and Central Zones. The characters analysed in *G. hirsutum* trials in Southern Zone, *G. arboreum* and *G. hirsutum* (rainfed) trails and *G. barbadense* trails In Central and Southern Zones were kapas yield in kg. per ha. ginning percentage and mean fibre length values.

RESULTS AND DISCUSSION

Significant results of the analysis of variance are shown in Table I. In Northern Zone 'Pooled deviation' effect was not significant and rest of the three effects were significant, which showed that the variations due to external factors like weather were least from location to location. Stability as defined by Eberhart and Russel (1966) is $b = 1$ and $Sd^2 = 0$, where 'b' corresponds to the regression coefficient of the varietal yield over the mean yield of the environment and Sd^2 corresponds to the square of the standard deviation. Varieties approaching unity in their regression coefficient and zero or minimum value in their standard deviation values may be considered as stable varieties in the respective zones. Thus, in the Northern Zone 'J 205' ($b = 1.099$, $Sd = 97.8$) and 'J 127' ($b = 1.019$. $Sd = 112.8$) may be considered as more stable compared to other varieties (Table II).

In Central Zone for *G. hirsutum* varieties (irrigated) all the four effects were significant (Table I) which showed that along with soil, irrigation and fertilizer effects (Env. linear) climatic factors (Pooled deviations) influenced considerably the yield potential of the the different varieties. Thus, in this Zone '66 BH 5/55' ($b = 0.952$, $Sd = 127.9$), 'DHY 82' ($b = 1.082$, $Sd = 218.9$) and 'MCU 5' ($b = 0.952$, $Sd = 193.7$) may be conside red as more stable than the rest of the varieties (Table II).

In Southern Zone for *G. hirsutum* varieties (irrigated), for the yield character only 'Variety x Env. linear' effect was not significant and the

TABLE I. Results of the analysis of variance of the Coordinated Varietal trials in Northern, Central and Southern Zones

Source	Northern Zone	Central Zone	Southern Zone	Central and Southern Zones				Central and Southern Zones		
	G. hirsutum (irrigated)	G. hirsutum (irrigated)	G. hirsutum (irrigated)	G. hirsutum & G. arboreum (Rainfed)				G. barbadence (irrigated)		
	Kapas yield Kg/ha	Kapas yield kg/ha	Kapas yield kg/ha	Ginning percentage	Mean Fibre length (mm)	Kapas yield kg/ha	Ginning percentage	Mean fibre length (mm)	Kapas yield kg/ha	Ginning percentage	Mean fibre length (mm)
Varieties	**	**	**	**	**	**	**	**	**	**	**
Environmental linear	**	**	**	NS	**	**	NS	**	**	**	**
Variety Env. linear	**	**	NS	**	NS	**	NS	NS	**	NS	NS
Pooled deviations	NS	**	**	NS	NS	NS	NS	NS	NS	NS	NS

** Significant at 1% level NS: Not Significant.

other three effects were significant, which indicated that the varietal behaviour depended on the climatic factors rather than on the linear constraints of the environment. Similar type of results have been reported by Eberhart and Russel (1966) for maize yields. In ginning percentage values 'Variety x Env. linear effect and 'Varieties' effect were significant, whereas for mean fibre length values 'Varieties' and linear effect of the environment were significant, which indicated that ginning percentage values varied according to the varietal behaviour and the corresponding linear constraints of the place, whereas mean fibre length values were least affected by the linear constraints of the environment and the climatic factors of the location (Table I). Thus in this zone 'MCU 5' (b = 0.975, Sd = 211.2), 'ELS 117' (b = 1.106, Sd = 102.7) and 'A 179' (b = 0.942, Sd = 183.4) varieties may be considered as more stable than the other varieties (Table II).

In Central and Southern Zones, varieties of *G. arboreum* and *G. hirsutum* (rainfed) did not show any significant difference in the 'Pooled deviations' effect whereas the other three effects were significant, which showed

that the linear constraints of the environment influenced considerably the yield potential of the different varieties, and the climatic factors showed little effect. In ginning percentage values except 'Varieties' other three effects were not significant, whereas in mean fibre length values 'Varieties' as well as the linear effect of the environment were significant. Thus, combined with varietal differences, linear costraints of the environ-

TABLE II Mean values of the characters, regression coefficient (b) and the corresponding standard deviation values (Sd) of *G. hirsutum* cotton varieties tested in Northern, Central and Southern Zones (irrigated)

Northern Zone				Central Zone			
Variety	Kapas yield kg/ha			Variety	Kapas yield kg/ha		
	Mean	b	Sd		Mean	b	Sd
J. 34	1260	1.293	381.6	MCU. 5	1476	0.952	193.7
J. 127	1063	1.019	112.8	66 BH 5/91	1601	0.803	180.3
A. 218	684	0.837	88.6	I AN 579 (188)	1726	1.194	279.2
R. S. 83	786	0.694	116.9	DHY 82	1620	1.032	218.9
R. S. 89	859	0.903	143.7	SRT. 3087	1578	0.723	132.1
J. 205	1075	1.099	97.8	DHY. 286	1722	0.990	350.8
H. 297	1035	1.155	132.8	66 BH 5/55	1613	0.954	127.9
				I AN 579 (1456)	1351	0.535	505.5
				Hybrid 4	1905	1.438	529.3

Southern Zone

Variety	Kapas yield kg/ha			Ginning percentage			Mean fibre length (mm)		
	Mean	b	Sd	Mean	d	Sd	Mean	b	Sd
AS 6	1648	0.901	186.9	35.4	1.124	0.81	26.2	0.691	0.40
MCU. 5	1858	0.976	211.2	35.1	1.084	1.10	28.6	1.628	0.46
ELS 111	1770	1.226	212.2	36.2	0.669	1.13	26.8	0.882	1.12
ELS 117	1731	1.106	102.7	37.3	0.670	0.75	27.3	1.041	0.00
GS 23	1971	1.159	322.6	36.5	1.462	0.32	24.3	0.796	0.47
ELS 201	1839	0.779	232.0	36.6	0.564	0.62	27.7	1.153	0.00
ELS 031	1711	0.892	196.5	37.0	0.150	0.56	27.2	0.661	0.00
EL 0162	1675	0.919	241.9	34.9	1.440	1.78	28.3	1.226	0.00
1301 DD	1782	1.030	360.3	33.2	1.434	2.01	24.1	1.186	0.64
A 179	1801	0.942	183.4	33.8	1.380	1.16	25.2	0.737	1.25

TABLE III Mean values of the characters, regression coefficient (b) and the corresponding standard deviation (Sd) values of the varieties tested in Central and Southern Zones

Variety	Kapas yield kg/ha			Ginning percentage			Mean Fibre length (mm)		
	Mean	b	Sd	Mean	b	Sd	Mean	b	Sd
G. arboreum and *G. hirsutum* varieties (rainfed)									
CJ 2164	736	0.960	51.0	36.3	0.960	1.85	22.1	1.147	0
S 65-1258	822	1.036	77.7	35.9	1.182	1.76	21.2	1.160	0
CC-1-1-3	718	1.076	133.9	37.3	1.059	0	23.7	0.766	0
AKH.2	800	1.043	103.1	39.4	1.408	0	22.6	1.302	0
AKH.4	820	1.123	136.1	37.4	1.318	0.51	22.6	1.278	0
BH 2x24 A6Y	787	1.100	0	36.3	1.026	0.47	22.6	0.750	0
355 E-6	383	0.610	258.0	29.8	0.348	1.29	21.2	0.309	1.00
GS. 23	1000	1.134	93.2	35.3	0.184	1.52	24.7	1.592	0
Reba B50	841	0.910	257.3	35.1	1.271	0	25.4	0.670	0.84
MCU 6	777	0.939	170.4	34.2	0.758	1.16	25.5	0.698	1.14
KW66-2096	984	1.065	120.9	35.9	1.522	0	24.3	1.308	0
G. barbadense varieties (irrigated)									
IBSI	1555	1.124	215.2	30.8	0.562	1.57	30.2	1.014	0
N 28	1200	0.929	263.9	32.8	1.001	2.25	30.1	1.134	0.52
ERB 4492	1751	1.174	253.1	32.9	0.710	0.52	28.8	1.129	0
ERB 4488	1589	1.069	209.9	32.3	0.900	0.40	28.4	0.700	1.17
4530	1564	1.087	407.5	31.7	1.414	3.41	28.0	1.027	0
SB-1085-6	891	0.765	267.5	33.4	1.274	1.05	31.1	1.251	0.52
SB-101-A6	883	0.873	410.5	31.8	0.856	0.81	30.6	0.892	0
Andrews	1241	1.078	301.4	31.0	1.116	1.01	30.4	0.923	0.39
Sujatha	1122	0.789	263.3	30.7	0.760	0.36	29.8	0.515	0
Giza-7	1821	1.117	244.6	30.2	1.331	1.63	29.0	1.501	0

ment contributed more towards the differences in mean fibre length values, whereas ginning percentage values were least affected by the environmental factors. Thus, in these two zones 'CJ 2164' (b = 0.960, Sd = 51.0), 'S 65-1258' (b = 1.036, Sd = 77.7), 'AKH 2' (b = 1.043, Sd = 103.1) and 'BH 2x24 A6Y' (b = 1.100, Sd = 0) varieties have been identified as more stable than the rest of the varieties (Table III).

In Central and Southern Zones, for varieties of *G. barbadense* (irrigated), for the yield character, except 'Pooled deviations' effect other three effects were significant, which showed that the varietal effect and the linear

constraints of the environment contributed more than the climatic factors towards the yield potential of the different varieties. In ginning percentage and mean fibre length values, varietal effect and the linear effect of the environment were significant, and the other two effects were not significant, which showed that the linear constraints of the environment and the climatic factors affect these two characters to the minimum extent. Under these conditions, two varieties, viz., 'N 28' (b = 0.929, Sd = 263.9) and 'ERB 4488' (b = 1.069, Sd = 209.9) have been identified as more stable than the rest of the varieties (Table III).

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REFERENCES

EBERHART, S. A. and W. A. RUSSEL. 1966. Stability parameters for comparing varieties. *Crop Sci.* 6 : 36-40.

FINLEY, K. W. and G. N. WILKINSON. 1963. Analysis of adaptation in plant breeding programme. *Aust. J. Agric. Res.* 14 : 742-54.

JAWAHAR RAM. 1970. Stability of some strains derived from disruptive selection for flowering time in *Brassica campestris* var. *Brown sarson*. *Indian J. Genet.* 30 : 116-25.