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VARIABILITY AND INTERRELATIONSHIP STUDIES FOR YIELD COMPONENTS IN *G. arboreum* COLLECTED FROM NORTH-EASTERN HILL REGION AND GUJARAT

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Twenty three single plant selections (twenty of *G. arboreum* race *cernuum* and three of *G. arboreum)* made from the collections done in North-East region of the country and Gujarat were evaluated for analysis of seed cotton yield, boll number per plant, boll weight, ginning outturn percentage and 2.5% span length. Seed cotton yield showed positive correlation with all the component traits. The analysis confirmed that plant type with high boll weight, high number of bolls per plant and long fibres have high seed cotton yield.

Key words : *G. arboreum*, variability, interrelationship, yield components

The National Bureau of Plant Genetic Resources, New Delhi in collaboration with Central Institute for Cotton Research, Nagpur has a joint mandate to collect genetic diversity in cotton from India by exploration and exotic collections through exchange programme. During 1990-1994, CICR, Regional Station, Sirsa, Haryana participated in four explorations conducted in various regions of India. One hundred eight collections of *G. arboreum* race *cernuum* characterized by big long bolls, high boll weight, high ginning out turn, high seed number and high locule retentivity were made from N. E. region of the country. In *G. arboreum*, variability in *mathio* types with open, relatively small bolls, red and green plants, long fibre, greater strength and high ginning percent was collected from Saurashtra and Kachchh regions of Gujarat. The population sample consisted of single boll per plant from 20-25 random plants (as per availability) was picked up to represent diversity and to study variability within and between populations. To exploit variability present in a population sample collected, single plant selections were made and their progeny were raised. With the help of certain parameters like coefficient of variability, heritability and genetic advance and the interrelationship among different yield component traits from single plant selection and other land races collections efficient breeding programme for yield improvement would be possible.

MATERIALS AND METHODS

Twenty single plant selections for yield and yield contributing traits were made from the collections of *G. arboreum* race *cernuum* types (CSA types) done from North East regions during 1992. Similarly, three single plant selections were made (CSG types from the *mathio* type *G. arboreum* collection made from Gujarat). These 23 single plant selections were selfed and multiplied and evaluated in a Randomized Block Design with three replications during Kharif 1995 alongwith 2 local cultivars i.e., RG 8 and LD 327. Each strain was allotted a three rows plot

Table 1. Mean performance of *G. arboreum* collections

Sr. No.	Variety	Yield kg/ha	Yield/plant	Boll no.	Boll wt.	G.O.T.	2.5% span length
1	CSA 5-92	1938.72	64.07	36.43	3.03	38.00	24.3
2	CSA 5-92-1	2121.62	66.50	34.77	2.67	39.00	15.3
3	CSA 5-92-2	2322.81	83.47	33.33	3.00	39.00	19.3
4	CSA 5-92-3	2487.42	86.30	35.00	3.13	40.00	15.0
5	CSA 4-93-1	3072.69	88.57	34.53	3.50	39.50	18.0
6	CSA 8-93-1	2633.74	82.57	26.20	3.83	41.00	15.3
7	CSA 12-93-1	3145.85	92.03	33.23	3.37	39.50	18.3
8	CSA12-93-2	1200.29	50.80	27.10	3.90	42.50	17.7
9	CSA 13-93-1	2999.50	103.97	30.57	3.93	40.50	16.7
10	CSA 17A-93-1	2597.16	77.10	32.13	2.70	36.50	15.3
11	CSA 23-93-1	1774.11	81.10	36.67	4.23	40.00	16.3
12	CSA 5-93-4	2472.79	84.97	35.20	3.33	36.50	24.3
13	CSA-17A	1682.67	121.80	33.13	4.27	41.50	17.7
14	CSA-8	1646.09	113.37	35.80	3.73	40.00	20.7
15	CSA-11	987.65	135.00	30.57	4.40	42.00	17.7
16	CSA-13	2286.52	126.83	33.43	3.87	42.00	18.2
17	CSA-11-1	2085.04	95.53	33.47	3.40	42.00	17.8
18	CSA-13-1	2176.49	93.83	36.80	3.37	36.33	15.0
19	CSA 22-327	1810.69	105.60	33.00	3.37	39.50	19.0
20	CSA9A-13	1470.50	71.93	29.10	2.27	36.00	20.7
21	CSG-24	1975.30	65.73	32.67	2.27	31.00	17.0
22	CSG-18	2030.17	64.30	29.10	3.07	34.00	15.3
23	CSG-27	2121.62	84.67	35.87	1.83	38.00	16.3
24	RG-8	2090.98	90.07	33.63	2.47	36.00	16.2
25	LD327	1969.08	71.00	32.67	2.27	37.00	15.7
	$\bar{X}$	2167.18	88.04	32.98	3.25	38.69	17.72
	CV (%)	27.64	24.08	13.60	4.93	2.70	1.48
	S.E (d)	489.09	17.31	3.66	0.13	0.85	0.21

Table 2. Analysis of variance for yield and its component traits in *G. arboreum*

Source of variation	d.f.	Yield (kg/ha) (1)	Yield/plant (2)	Boll no. (3)	Boll wt. (4)	G.O.T. (5)	2.5% span length (6)
Replication	2	316792.0	6362.00	93.62	0.69	0.39	0.15
Genotypes	24	9462449.0*	1305.30*	24.38	1.45**	0.42**	19.93**
Error	48	358809.5	449.42	20.14	0.26	0.06	0.07
h^2 (%)		35.31	38.83	6.56	94.89	87.08	98.98
G.A.		541.64	21.68	0.63	1.38	5.22	5.27
G.C.V. (%)		20.42	19.18	3.61	21.23	7.02	14.52
P.C.V. (%)		34.36	30.79	14.08	21.80	7.52	14.59

of 5.4 m length with a spacing of 67.5 × 30 cm. The data was recorded on 10 random competitive plants in each treatment for seed cotton yield per plant and number of bolls per plant. Seed cotton yield kg per hectare was obtained by weighing the plot yield. G.O.T. (%) was recorded by weighing per cent of amount of lint obtained from 100 gm seed cotton. 2.5% span length in mm was measured by CIRCOT unit at CICR RS Sirsa. The genotypic coefficient of variation (Burton and Devane, 1953), heritability in broad sense (Lush, 1940), correlations (Robinson *et al.*, 1951), direct and indirect effects (Dewey and Lu, 1959) were calculated as per standard statistical methods.

RESULTS AND DISCUSSION

Significant genotypic differences were obtained for the traits, seed cotton yield kg/ha, seed cotton yield per plant, boll weight, G.O.T. (%) and 2.5% span length (Table 2). This indicated that adequate variability was present among the genotypes for these traits. Heritability value (6.56%) and genetic advance value (0.63) were low for number of bolls per plant. This indicated that the collections made have undergone considerable change during selection pressure and are maintained as small populations. Therefore, improvement through correlated characters could be more effective. Selection for seed cotton yield both on plot basis (35-31, 541.64) and per plant (38.83, 21.68) basis, boll weight (94.84, 1.38) G.O.T.% (87.08, 5.22) and mean fibre length (98.98, 5.27) would be effective and satisfactory for practical purposes as their genetic components (heritability, genetic advance) are of high value. Duhoon (1989), Sambamurthy and Reddy (1995) also observed high heritability and genetic advance for these traits.

The genotypic correlation coefficient (Table 3) of seed cotton yield/ha based on plot basis

Table 3. Correlation coefficients among yield components in *G. arboreum*

Character	Yield (kg/ha) (1)	Yield/ plant (2)	Boll no. (3)	Boll wt. (4)	G.O.T. (5)	2.5% span length (6)
G	1.00	–0.32	0.90**	–0.21	–0.14	–0.23
(1) P	1.00	0.16	–0.16	–0.13	–0.14	–0.14
E	1.00	0.45*	–0.45*	–0.09	–0.20	–0.20
G		1.00	0.60**	0.72**	0.63**	0.08
(2) P		1.00	0.04	0.38	0.37	0.05
E		1.00	–0.07	–0.30	–0.00	–0.01
G			1.00	–0.33	–0.34	0.48*
(3) P			1.00	–0.09	–0.03	0.13
E			1.00	–0.06	0.16	0.16
G				1.00	0.73**	0.08
(4) P				1.00	0.66**	0.08
E				1.00	–0.02	0.18
G					1.00	0.03
(5) P					1.00	0.03
E					1.00	0.14
G						1.00
(6) P						1.00
E						1.00

G = Genotypic correlation, P = Phenotypic correlation,
E = Environmental correlation

Table 4. Direct and indirect effects keeping yield/plant as dependent variable and others characters as independent

Character		Boll no./ plant (1)	Boll wt. (2)	G.O.T. (3)	2.5% span length (4)	Correlation with yield/ plant
Boll no.	G	(1.35)	–0.28	–0.16	0.31	0.60
(1)	P	(0.07)	–0.02	0.00	0.00	0.40
Boll wt.	G	–0.44	(0.87)	–0.34	–0.05	0.72
(2)	P	–0.01	(0.26)	–0.13	–0.00	0.38
G.O.T.	G	–0.45	0.64	(–0.47)	0.02	0.63
(3)	P	–0.01	0.17	(–0.20)	0.00	0.37
2.5% span length	G	0.65	–0.07	–0.01	(0.65)	0.08
(4)	P	–0.01	–0.02	0.00	(0.01)	0.05

In parentheses given values for, direct effects.
Residual effect G = –0.68; P = 0.83

were negative with seed cotton yield per plant,

Table 5. Direct and indirect effects keeping yield kg/ha as dependent variable and others characters as independent

Character		Yield/plant	Boll no./plant	Boll wt.	G.O.T.	2.5% span length	Correlation with yield kg/ha
Yield/plant	G	(–2.69)	–0.999	–1.50	0.56	0.04	–0.32
	P	(–0.29)	–76.38	–0.07	–0.05	–0.01	0.16
Boll no.	G	–1.61	(–1.67)	0.680	0.300	0.27	1.20
	P	–0.01	(–0.18)	0.02	–0.300	0.02	–0.16
Boll wt	G	1.93	–0.55	(–2.09)	0.65	0.044	–0.21
	P	0.11	–0.02	(–0.17)	–0.08	–0.01	–0.14
G.O.T.	G	1.70	–0.56	–1.52	(0.89)	0.02	–0.14
	P	0.11	–0.01	–0.11	(–0.13)	0.00	–0.14
2.5% span length	G	–0.21	–0.81	–0.17	–0.02	(0.56)	–0.23
	P	–0.02	–0.02	–0.01	–0.00	(0.11)	–0.14

In parentheses are given direct effects; Residual effect G = 3.43, P = 0.87

boll weight, ginning outturn and 2.5 per cent span length. Boll number per plant was the only trait which showed significant positive indirect contributor to seed cotton yield. None of the traits studied, showed positive indirect effect with G.O.T. At genotypic and phenotypic level number of bolls per plant showed negative association with boll weight and G.O.T. percentage, but its association was positive with fibre length. Boll weight showed significant positive associations at genotypic (0.73) and phenotypic level (0.66) with ginning outturn. Mean fibre length gave very weak association with traits *viz*; yield per plant, boll weight and G.O.T. percentage. Therefore selection of a plant type possessing high number of bolls per plant, high boll weight and long fibres should be made for increasing the seed cotton yield.

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