

## RANGE OF VARIABILITY FOR ECONOMIC CHARACTERS IN COTTON GERMPLASM (*G. hirsutum* L)

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Three hundred germplasm lines of *Gossypium hirsutum* L. were evaluated during 1996-97 and 1997-98 crop seasons. An assessment of range of variability present in respect of various economic characters has been made. Promising germplasm lines with high yield (55 gm and above per plant), mean boll weight (4.00 gm and above), boll number per plant, monopods, sympods, ginning out turn (35.0% and above) and mean halo length (26 mm and above) have been listed. Fifteen germplasm lines combining moderate to high yields with other economic characters have been identified which may be included in the hybridization programme of crop improvement. Two germplasm lines namely, MEX 121 and 51.041 (V 1508) have outyielded for almost all the characters studied.

The contribution of germplasm of *Gossypium hirsutum* L. in the genetic improvement of cotton has been significant. The programme of varietal improvement is specifically oriented towards evolving better yielding varieties/hybrids in the various quality groups to meet the demands of the textile industry (Srinivasan *et al.*, 1977). In this programme, multiple selection criteria for economic attributes, contributing to yield like boll number per plant, boll weight etc. have been utilised. Increasing emphasis is being laid in recent years on the choice of divergent parents in hybridization programmes to get superior hybrids and segregates for selection. Over 8000 genetic stocks pooled from different sources in the world have to be evaluated at Central Institute for Cotton Research, Nagpur and its regional stations, Sirsa and Coimbatore. In order to evaluate them systemically, initially 300 lines were taken for irrigated field evaluation at Sirsa.

### MATERIALS AND METHODS

Three hundred germplasm lines of *G. hirsutum* L. were raised in 1996-97 and 97-98

seasons at a spacing of 67.5 x 30 cm and all standard agronomic and plant protection measures for irrigated conditions were adopted. One plant was retained per hill. From the 10 representative plants grown for each germplasm line, five plants were randomly selected and data were recorded on single plant basis for economic characters like seed cotton yield per plant, boll number, monopods, sympods, boll weight, Ginning out turn (G.O.T.) and mean halo length. The mean for each line and for the characters was calculated and ranges recorded. In the present investigation, an assessment of variability in the genetic stocks in respect of the above mentioned characters was made and outyielding germplasm lines were identified.

### RESULTS AND DISCUSSION

The range of variability available in the genetic stocks for various economic characters studied is given in Table 1. It is seen that considerable amount of variability exists in all the characters studied and offers scope for selection and utilization in the further hybridization

programme. The utility of each character is discussed below.

**Table 1. Range of variability of different characters in *Gossypium hirsutum* L. germplasm**

S. No.	Characters	Range (1996-97)	Range (1997-98)
1.	Seed cotton yield/plant (g)	2.3 - 100.4	0.5 - 50.0
2.	Boll weight (g)	3.0 - 4.5	3.2 - 4.0
3.	Number of bolls/plant	1.5 - 24.0	-1.2 - 23.6
4.	Number of monopods/plant	0.2 - 6.5	0.2 - 9.0
5.	Number of sympods/plant	0.8 - 14.3	2.0 - 18.2
6.	Ginning out turn (%)	20.0 - 36.0	14.5 - 37.0
7.	Mean halo length (mm)	12.0 - 29.4	15.0 - 31.5

#### a) Yield of seed cotton (Kapas)

Yield of seed cotton is a major factor which governs the cash return per hectare. The general yield level in 1996-97 and 1997-98 was moderate

Hence, accessions which yielded above 55 gm were listed (Table 2). Twenty four germplasm lines recorded more than 55 gm per plant yield and among these eight lines viz. SA-70, SA-76, SA-125, SA-369, SA-629, SA-839, SA-1052 and SA-1053 have yielded more than 80 g per plant yield. Srinivasan *et al.* (1977) reported germplasm lines have given the yield more than 40g per plant.

#### b) Mean boll weight

Big boll size is recognized as one of the characters which directly contributes to increased production of seed cotton per unit area. In the present investigation, the variability for means boll weight was not so wide but it was of moderate value. Three lines namely SA-159, SA298 and SA-429 have shown the boll weight more than 4.0g and other 10 lines had boll weight of about 4.0 g. Similar results have also been reported by Singh (1985) for boll weight and other characters in *Gossypium hirsutum*.

#### c) Mean bolls per plant

Bolls per plant along with high boll weight

is reckoned as the best combination of characters for higher yields in cotton. They have direct effect on kapas yield. The mean bolls per plant ranged from 1.5 to 24.0. during 1996-97 and 1.2 to 23.6 during 1997-98 respectively. However, two lines (SA-831 and SA-1053) having high yield mainly due to more number of bolls per plant were observed.

#### d) Monopodia

Many number of monopodia per plant is not a desired character. However, one or few monopodia is desirable with a large number of sympodia. The range observed for this character during 1996-97 is 0.2 to 6.5. and 0.2 to 9.0 1997-98, respectively.

#### e) Sympodia

Large number of sympodia per plant is a desirable character as it directly contributes to higher kapas yield provided the boll weight and the boll numbers are high. Accessions with over seven sympodia are listed. The range falls 0.8 to 14.3 and 2.0 to 18.2 for *kharif* 1996 and 1997 respectively. The accessions which excelled for almost all the traits also had more number of sympods per plant. The importance of fruit bearing branches has also been reported by Seth and Singh (1984).

#### f) Ginning out turn (G.O.T.)

Ginning out turn is the ratio of weight of lint to that of kapas (seed cotton) expressed as percentage. Genetic stocks which have recorded more than 35 per cent G.O.T. have been listed in Table 2. It is observed that the germplasm lines do not have much variability for ginning out turn. However, few lines (SA-1088 and SA-1104) had more than 6 per cent ginning out turn which could be utilized in the breeding programme. Higher ginning out turn upto 49.2 per cent has however, been reported in *G. herbaceum* (Singh, 1984).

Table 2. List of selected genetic stocks with their important characters of *Gossypium hirsutum* L.

SA No. Name of genetic stock	Yield (g)	Boll weight (g)	Number of bolls	No. of monopods	No. of sympods	Ginning out turn (%)	Mean halo length (mm)
<b>a) Yield of seed cotton ( 55 gm/plant &amp; above)</b>							
SA-67 Mcnamarna clean, high lint	58.6	3.80	17.2	4.2	7.8	34.0	19.8
SA-70 Batson Cluster	83.3	3.70	17.0	5.6	3.6	34.0	19.8
SA-73 H.A. 1	60.0	3.70	13.8	2.6	4.8	34.0	24.1
SA-76 H.A. 4	88.0	3.12	13.0	2.0	10.0	31.5	19.1
SA-99 Decidious Original	65.2	3.00	14.2	4.0	8.4	32.5	22.0
SA-125 Brown 3-6-15 1	82.0	3.47	21.0	2.0	10.0	30.0	18.3
SA-130 Chaco	78.0	3.30	13.0	5.0	10.0	32.0	19.3
SA-159 Tipo chaco UA4-4	61.0	4.08	9.2	1.4	7.2	26.0	18.5
SA-186 Felistana UA-7-18	60.0	3.42	9.0	5.5	7.5	35.2	12.4
SA-188 UA 7-20	57.5	3.70	18.0	3.0	10.0	28.0	20.2
SA-369 D and PL 10-1	84.3	4.0	7.5	2.4	7.8	28.0	21.3
SA-380 Stoneville xHop 1-12-1-2-1	64.0	3.70	16.6	4.0	7.2	30.0	20.8
SA-516 Mebane, walson	66.0	3.60	14.5	4.0	8.0	31.2	20.1
SA-591 Sealand whiteflower	60.8	3.00	12.0	2.8	9.6	31.0	26.3
SA-629 CB 2555	81.0	4.00	18.0	1.5	10.5	31.0	21.0
SA-688 Smooth Boll 1	65.0	3.60	17.0	4.6	7.6	31.0	23.0
SA-744 Frego Cluster	78.2	3.90	14.2	2.2	11.0	30.0	23.0
SA-831 Mex. 121	84.0	3.40	20.4	4.2	10.0	33.5	28.0
SA-1052 51.041 (V 1508)	91.0	3.60	11.8	4.7	11.7	33.9	28.0
SA-1053 108F	100.4	3.70	18.6	2.8	11.2	32.6	22.0
SA-1058 Delfos 8274	57.6	3.10	15.7	2.3	12.6	34.4	20.8
SA-1072 Bobshaw high linter	64.0	3.60	13.5	3.6	9.2	34.6	24.7
SA-1080 942	71.7	3.40	16.5	3.0	11.2	30.0	21.2
SA-1088 CB 3106 A	74.0	3.65	12.5	2.5	4.5	36.0	17.0
<b>b) Lines with mean halo length ( 26mm &amp; above )</b>							
SA-391 Missdel 6 PL. 1	22.5	3.50	6.5	2.5	5.2	34.6	27.8
SA-470 Miller	20.6	3.10	9.3	2.0	9.3	30.7	26.2
SA-56 Acala (Mex.) bud abort.	8.0	3.40	4.4	1.2	7.8	30.5	28.7
SA-588 Sealand 1	33.2	3.40	6.0	1.2	7.6	32.0	29.4
SA-631 CB 2540	21.6	30.0	8.0	1.0	6.0	28.5	31.6
SA-743 Frego upland Cr. Dw. Meade	51.3	3.70	14.4	2.2	9.8	36.0	29.0
SA-831 Mex. 121	84.0	3.40	20.4	4.2	10.0	33.5	28.0
SA-1052 51.041(VI508)	91.0	3.60	11.8	4.7	11.7	33.9	28.0
SA-1084 182	36.6	3.70	6.0	1.0	6.0	35.0	26.1
<b>c) Lines with boll weight (4.0 &amp; above)</b>							
SA-7 Original winesap	20.0	4.00	16.2	6.5	7.8	30.2	19.5
SA-9 Intense red okra cl	6.7	4.00	12.2	2.2	7.8	30.5	19.0
SA-151 U 4	bulk W7	UA8-4	12.0	4.00	10.0	1.0	4.0
SA-159 Tipo chaco ua 4-4	61.0	4.10	9.2	1.4	7.2	26.0	18.0

Table 2. (Contd.)

SA No. Name of genetic stock	Yield (g)	Boll weight (g)	Number of bolls	No. of Monopods	No. of sympods	Ginning out turn (%)	Mean halo length (mm)
SA-298 Wannmakers wonder wilt	18.5	4.50	5.0	3.0	6.0	33.0	20.4
SA-336 Coker 33-12	26.6	4.00	11.8	2.2	8.8	31.0	19.8
SA-351 Rowden 40-5-3-1-2	22.0	4.00	9.2	0.7	3.3	29.8	20.1
SA-369 D and PL 10-1	84.2	4.00	7.5	2.4	7.8	28.0	25.0
SA-429 Columbia	9.0	4.50	4.0	0.1	5.0	29.5	23.0
SA-509 Locket 140-46	2.0	4.00	2.0	0.1	3.0	31.5	17.4
SA-515 Northern star	5.0	4.00	3.0	0.1	0.1	30.7	20.1
SA-573 CB 2480	43.3	4.00	7.6	0.8	7.8	34.0	20.4
SA-629 CB 2555	81.0	4.00	18.0	1.5	10.5	31.0	21.0
<b>d) Lines with ginning out turn ( 35.0 % and above )</b>							
SA-346 Station C 42	44.3	3.50	10.4	3.5	9.0	35.0	24.1
SA-1063 DPL 5317-42-56-65	46.0	3.30	9.0	3.6	9.2	35.5	24.7
SA-1073 Bobshaw hybrid 82	41.0	3.5	14.0	1.3	6.3	35.0	19.6
SA-1084 182	36.6	3.70	6.0	1.0	6.0	35.0	26.1
SA-1088 CB 3106 A	74.0	3.65	12.5	2.5	4.5	36.0	17.0
SA-1089 CB 3106 B	23.0	3.70	7.5	0.6	4.0	35.7	24.0
SA-1103 Acala 5	36.7	3.40	8.5	1.7	5.7	35.0	21.3
SA-1104 D 2 smooth mutant	36.0	3.30	12.3	1.3	6.3	36.7	22.5
<b>e) Lines with boll number (20.0 and above)</b>							
SA-86 Brown Egyptian	50.0	3.35	23.0	2.5	11.5	31.0	24.7
SA-125 Brown 3-6-15-1	82.0	3.47	21.0	2.0	10.0	0.0	18.3
SA-182 UA-7-6	38.0	3.47	21.0	2.0	12.0	31.7	21.2
SA-210 Laffery brown lint	11.5	3.14	20.5	3.5	6.5	30.7	21.2
SA-818 MEX. 74	50.0	3.56	20.5	2.7	10.7	34.0	25.2
SA-831 MEX. 121	84.0	3.40	20.4	4.2	10.0	33.5	28.0
<b>f) Lines with sympods (12.0 and above)</b>							
SA-182 UA-7-6	38.0	3.10	23.0	2.0	12.0	1.7	21.2
SA-592 Sealand 883	33.3	3.75	14.0	2.0	14.0	31.0	24.2
SA-965 Plains	51.0	3.60	15.0	5.0	12.0	33.0	23.2
SA-1058 Delfos 8274	57.6	3.10	15.7	2.3	12.6	34.4	20.8

### g) Mean halo length

The most important among the fibre properties from the economic point of view is staple length. Most of the genetic stocks fall under the range 22 to 28 mm. The range being 12.0 to 29.4 and 15.0 to 1.5 for 1996-97 and 1997-98 seasons, respectively. Lines with 26.0 mm and above mean halo length were identified.

Only one line had mean halo length more than 30.0 min. The lines with longer staple length may be included in the crop improvement programme for enhancing the staple length of varieties and hybrids. May *et al.*, (1996) reported that ten Pee Dee germplasm lines of upland cotton had high yield potential, variable maturity and excellent fibre and spinning properties.

The success of breeding programme largely depends on the amount of variability present in the germplasm stock. An assessment of range of variability for economic characters in *G. hirsutum* L. was made and promising germplasm lines with good economic characters have been identified, which may be utilised in the breeding programme for the development or improvement of productive commercial varieties and hybrids or may be of use for building up a wide genetic base in practical breeding programmes.

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