Cotton Germplasm Evaluation and Utilization in India

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Central Institute for Cotton Research, Nagpur has built up comprehensive collection in different Gossypium *species which have been evaluated, characterized and useful genetic stocks identified. Elite strains evolved through breeding are tested for performance.*

The last one decade has been very unique in the history of cotton germplasm collection, conservation and evaluation in India. With the establishment of the Central Institute for Cotton Research (CICR) at Nagpur in 1976, over 6,000 accessions of germplasm in all the four cultivated *Gossypium* species have been assembled. Systematic evaluation was carried out (1980 to 1986) for initial screening and grouping of elite accessions for various morpho-agronomical characters based on IBPGR list of descriptors, providing basis for their utilisation in relation to current agricultural and industrial requirements.

MATERIALS AND METHODS

The germplasm accessions available at various research centres in India were assembled and consolidated at CICR (1977 to 1980). Exotic accessions were added through the efforts of NBPGR, New Delhi particularly from USA, USSR, West Indies, China, Pakistan, Egypt, France, Sudan, Peru, Bangladesh, Turkey, etc. Some indigenous accessions were added through explorations within India mainly from North Eastern hill region, western and southern peninsular India. The total collections in the four cultivated species count to 6,056 accessions representing wide geographical diversity. Accessions evaluated upto 1986 included 3,700 in *G. hirsutum*, 289 in *G. barbadense*, 1455 in *G. arboreum* and 390 in *G. herbaceum*.

The germplasm collections were grown under rainfed conditions in single row plots of 20 plants per accession in augmented block design using local checks at regular intervals under recommended spacing of 75 × 30 cm and normal cultivation and plant protection practices. Based on preliminary evaluation, elite lines were grouped into working collections for important economic characters of immediate breeding value. The trials were carried out between 1981 to 1987 as per the CICR, Nagpur germplasm index card (Bhale and Narayanan, 1987). The data on range of variability in elite germplasm as compared with standard cultivar in each species for quantitative characters and other attributes like leaf and bolls were collected. The values for major economic attributes which are of immediate

relevance, namely, number of bolls per plant, boll weight, seed cotton yield per plant, ginning out turn, spun length, uniformity ratio, micronaire value, fibre strength, fibre maturity and NMR value of oil in the seed, were recorded for elite working collection.

RESULTS AND DISCUSSION

Wide spectrum of variability for various morphological characters particularly leaf size and shape, petal and calyx pattern, boll size, locule angle and boll opening was observed. These are important for breeding especially for higher boll production, high yield, resistance to insect, pests and diseases, marker characters and picking qualities.

The data on variation in the elite accessions (working collections) in each of the four cultivated species and the respective standard cultivars are presented in Table 1. The values recorded in germplasm indicate that there is vast untapped

TABLE 1. HIGHEST VALUES FOR VARIOUS CHARACTERS IN ELITE GERMPLASM

Characters	G. hirsutum		G. barbadense		G. arboreum		G. herbaceum	
	Germ-plasm	Check SRT 1	Germ-plasm	Check Suvin	Germ-plasm	Check AKH 4	Germ-plasm	Check G. cot. 13
Bolls per plant	82	26	29	18	59	32	69	21
Boll weight (g)	6.9	3.9	3.5	3.0	5555	22.7	2.8	2.0
Yield of seed cotton (g/plant)	180	56	106	48	96	444	109	40
Ginning %	43	35	33	29	50	40	43	36
Spun length (mm)	36	26	40	34	28.0	22.5	26.9	23.0
Uniformity ratio %	54	46	52	45	55	47	52	49
Fineness (mv)*	3.0–5.6	4.1	2.5–4.2	3.2	2.5–8.2	4.9	2.4–6.2	3.4
Tensil strength (g/tex)	58.4	46.1	58	49	58.2	44.0	59	44
Fibre maturity (%)	97	71	88	79	93	84	95	69
NMR value of seed oil (%)	27.3	18.5	30	26	22.8	17.0	20.4	16.5

*lowest and highest values are required for breeding finer and coarse cottons used in textiles and hence indicated.

potential for improving the agronomic attributes like number of bolls per plant, boll weight and seed cotton yield per plant as compared to what has been achieved so far in cotton breeding. Similarly, the fibre quality and oil content of cotton seed which represent the important industrial attributes, could also be improved further for meeting the modern processing needs of the textile and oil crushing mills. By and large the collections evaluated represent wide genetic and geographical diversity.

As a result of the utilization of the elite accessions possessing the highest expression for ten characters mentioned in Table 1 in breeding programmes, over 2,000 cross combinations were produced. Out of these, 20 elite F_1 combinations, 40 segregating lines, 8 high yielding intra-*hirsutum* hybrids, 20 advanced cultures of *G. hirsutum* and 2 *G. arboreum* cultures combining superior attributes were identified. These are under multilocation testing in the All India Coordinated Research Project on Cotton at 15 centres all over the country. This is an instance of massive evaluation of the largest number of germplasm collections in all the four cultivated species of *Gossypium* under rainfed conditions using sophisticated instruments for technological attributes and their successful utilisation in cotton improvement programmes directed towards the changing commercial/industrial demands for cotton in India.

REFERENCE

Bhale, N. L. and S. S. Narayanan. 1987. Need for augmenting the genetic resources in cotton—Indian perspective. In R. S. Paroda, R. K. Arora and K. P. S. Chandel, eds., *Plant Genetic Resources—Indian Perspective* pp. 545