

## COLLECTING COTTON GERMPLASM FROM TRIPURÁ AND MEGHALAYA

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Seventy six germplasm samples of cotton were collected from tribal areas of Tripura state and west Garo hills in Meghalaya during December, 1993. Sixty one samples (55 white linted and 6 brown linted types) with long, medium and small bolls represented diversity in annual diploid cotton (*Gossypium arboreum* L.) from *Jhums* and exhibited great variability in boll weight, boll length, seed number/loculus/boll, ginning out-turn, seed index and lint index and resistance to biotic and abiotic stresses. Fifteen samples, 8 in kidney cottons (*G. barbadense* var. *brasiliense*) with fused naked seeds and 7 in other type with separate seeds, represented diversity in perennial allotetraploid cotton (*Gossypium barbadense* L.) from valley and plain areas. Some of the accessions having extra long boll (15 cm) with high retentivity, high boll weight (6.0 g), high seed numbers/loculus (20) seeds per boll (59), high ginning out-turn (55%), high lint index and field resistance to jassids and bollworms were found to be most useful genetic resources to be exploited directly and indirectly in cotton improvement programme. The brown linted types are rarely seen.

**Key words :** Cotton, *Gossypium* sp., variability, diversity

North-eastern hill region in India is considered to be the important centre of *Gossypium* variability wherefrom races *cernuum*, *sinense* and *bengalense* are supposed to have been derived from *Gossypium arboreum* race *burmanicum* (Paranjpe and Panigrahi, 1961). The *cernuum* cottons are highly suitable for upholstery, high absorbant cotton and mixing with wood and have a great export potential. These cottons have also been reported to be good donors for high boll weight, high ginning out-turn, high seed number per loculus and per boll and resistance to jassids and bollworms (Duhoon and Singh, 1980; Duhoon, 1981). Perennial kidney cottons belonging to *G. barbadense* var. *brasiliense* have also been reported to occur in this region. The annual cottons from this region have been utilized in the breeding programme and are conserved in the National Gene Bank. Cotton cultivation in *jhums* is going down due to lack of improved varieties and organized markets, the worst affected being the khaki cottons which are now rarely available. Consequently these valuable genetic resources are diminishing continuously. Therefore, the

present exploration was undertaken to collect and study the local variability in annual diploid cotton (*Gossypium arboreum* L.) and perennial tetraploid cotton *G. barbadense* var. *brasiliense* in parts of Tripura and Meghalaya.

### REGIONS SURVEYED AND SAMPLING STRATEGIES

The materials consisted of randomly drawn 76 samples of seed cotton representing annual (*Gossypium arboreum* L.) and perennial (*G. barbadense* L.) cottons. The samples were collected from 69 sites (Fig. 1) in two distinct habitats. Fifty four sites were surveyed in *jhums* on hill slopes and 15 sites in valleys and plains in North Tripura, West Tripura and South Tripura districts of Tripura state and West Garo Hills district of Meghalaya. The explored areas lie between 23° to 26° latitude and 90°5' to 92°5' longitude. The altitude varies from 150 to 2000 m above msl. The population samples of annual cotton were collected from *jhums* on hills and 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. The samples of perennial tree cotton were collected from homesteads/courtyards/backyards in plains and 15-20 bolls from single or 2 trees per site (as per availability) were picked up to represent a sample. The passport data were recorded alongwith specific features of each sample. The observations on useful post harvest traits like boll weight, number of seeds per loculus and per boll, locule length, fibre length, ginning out-turn, seed index and lint index were recorded on each sample.

### DIVERSITY PATTERN

North-eastern hill region, comprising states of Assam, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Meghalaya, is very important for diversity in many crops including cotton. Tripura, and Garo hills in Meghalaya are the specific areas where different races of annual diploid cotton (*Gossypium arboreum*) are supposed to have originated. The species-wise variability for important traits is presented in Table 1.

The *Gossypium arboreum* cottons are grown in *jhums*, a method of shifting cultivation practised by the tribals in NEH region in India, on hill ranges varying in height from 330 to 2000 m above msl. These cottons popularly known as *Jhum Kapas* are grown as a mixed crop with paddy, sesame, chillies, okra, sunhemp and cucurbits under rainfed conditions, without any plant protection and fertilizer application. Sixty one samples representing white and brown lint types were collected. The white coloured types, represented by 55 samples are more common and known to the trade as Comilla cottons or Garo hill cottons. The Comillas are the only cotton of commercial importance in NEH region and called as dollar earner. Apart from the small quantities utilized for domestic uses in filling and mixing wool, the bulk of the produce

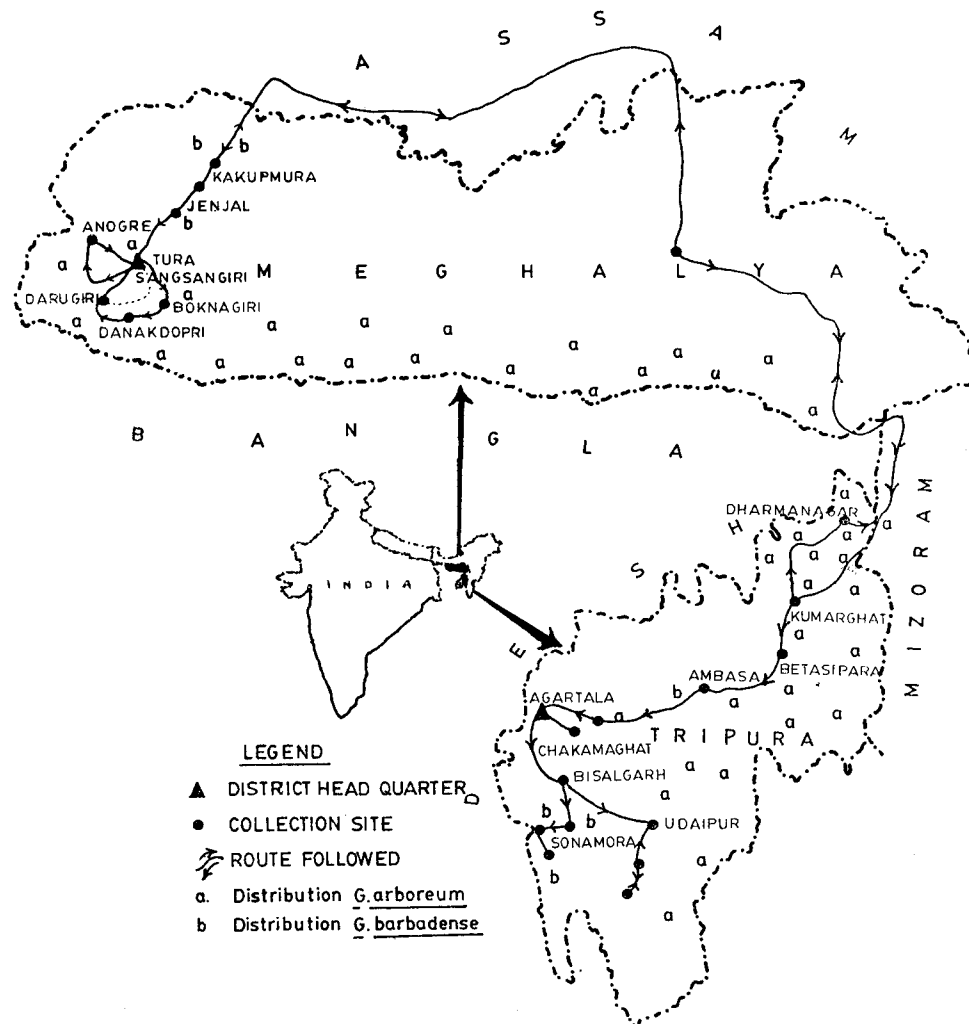


Fig. 1. Route map for cotton germplasm collection in Tripura and Meghalaya

**Table 1 : Range of variability for important traits in cotton samples from Tripura and Meghalaya**

Characteristics	Species	
	<i>Gossypium arboreum</i> L.	<i>Gossypium barbadense</i> L.
Ploidy	Diploid	Allotetraploid
Popular name	<i>Jhum</i> cotton	Tree cotton
Trade name(s)	(a) Comilla cotton (White coloured) (b) Chittagong cotton (Brown coloured)	
Nature	Annual	Perennial
Crop duration (days)	180-210	350-365
Plant height (cm)	70-145	200-600
Bolls/Plant	2-8	25-1500
Boll weight (g)	3.0-6.0	2.0-3.5
Seeds/locule	12-20	5-7
Seeds/boll	35-69	16-21
Ginning out-turn (%)	38-55	20-25
Fibre length (mm)	13-19	20-25
Seed index (g)	3.5-4.5	6.5-8.0
Lint index	2.8-3.5	—
Loculus length (cm)	5.0-15.0	2.5-3.5

is exported at a price equivalent to superior long staple cottons. Of the 55 white coloured *G. arboreum* samples, 32 represented diversity in long boll types belonging to *G. arboreum* race *cernuum*, 5 in small boll types belonging to race *burmanicum* as suggested by Silov (1944). The remaining 18 intermediates may be introgressed types.

The brown types, represented by six samples are rarely available due to their continuous discrimination by the trade. These cottons, in general, are known as **Manipur Khaki** and to the trade as Chittagong cotton. The cotton populations with narrow lobed leaves and sympodial branching habit exhibited a wide range of variability for plant height (70 to 145 cm), fluffy open bolls

with high retentivity and loculus length (5 to 15 cm), high boll weight (3 to 6 g/boll), number of seeds per loculus (12 to 20), number of seeds per boll (37 to 59), fibre length (13 to 19 mm), small fuzzy seeds with read index from 3.4 to 4.5g, linit index from 2.8 to 3.5, high ginning out-turn from 38 to 55 per cent, lint colour (White, light to dark brown) and fuzz colour (greenish, brownish and grey). The results with similar trends in variability were reported earlier also (Singh *et al.*, 1988).

The perennial allotetraploid cottons (*Gossypium barbadense*) got entry into India in 1790 from Brazil and Peru alongwith another perennial cotton "Bourbon" representing *G. hirsutum* race *punctatum* introduced by East India Company (Singh, 1984). Since then these cottons got established in the analogous climatic conditions in valley and plain areas of north eastern hill region. Normally 1-3 trees are grown in backyard homesteads for domestic consumption. The plants grow upto 5-6 m in height and continue to yield cotton upto 7-8 years. Pruning is done for convenience in harvesting cotton. Fifteen samples of 2 distinct types were collected from backyards in west Tripura around Sonamura. Of these, 7 represented kidney cottons (*Gossypium barbadense* race *brasiliense*) with a characteristic feature of fused seeds forming a typical kidney shaped structure. The fibres are developed only on the other surface of the kidney

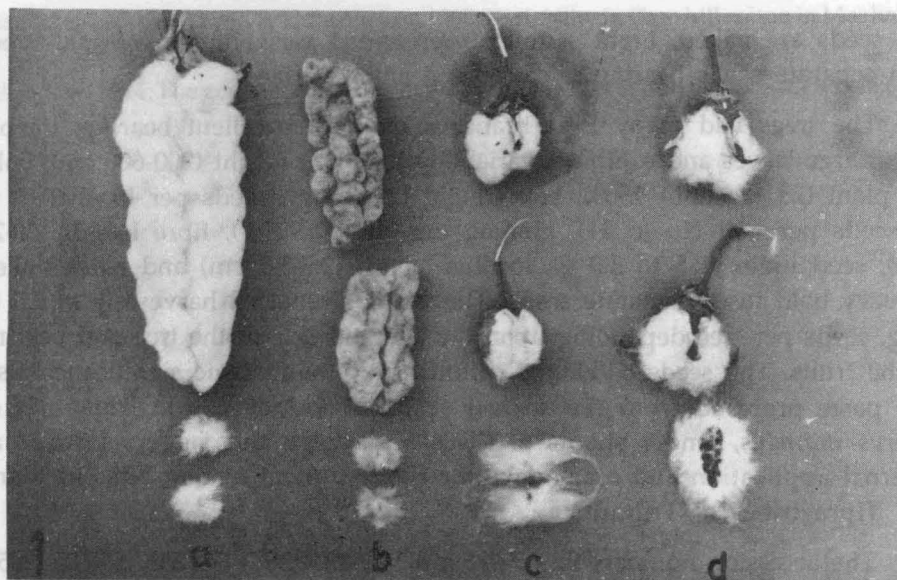


Plate I. Variability in boll size, shape, fibre length and colour in cotton from Tripura and Garo hills

(a) Long boll type Garo Hill Cotton (*G. arboreum* race *cernuum*)

(b) Medium boll brown coloured Khaki cotton (*G. arboreum* L.)

(c) Perennial tree cotton (*G. barbadense*)

(d) Perennial kidney cotton (*G. barbadense* var. *brasiliense*)

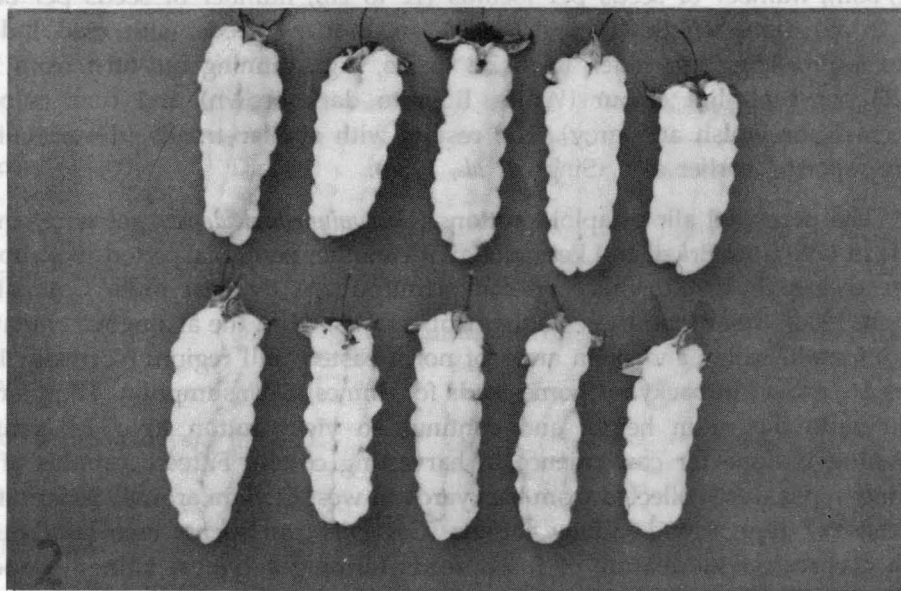


Plate II. Exploitable variability in *Cernuum* cottons from Garo hills

and seeds are naked. Eight samples represented variability in normal types with separate seeds bearing fibres on the entire surface.

The trees had many long branches, poor to excellent bearing, deeply lobed large leaves and exhibited variability for plant height (200-600 cm), bolls per plant (25 to about 1500), boll weight (2.0-3.5 g), seeds per loculus (5 to 7), seeds per boll (16 to 21), ginning out-turn (20-25%), fibre length (20-25 mm), seed index (6.5 to 8.0 g), loculus length (2.5-3.5 cm) and black naked to fuzzy bold fused/separate seeds. The farmers reported harvesting of 0.5 to 6 kg. seeds per tree depending upon the age and size of the tree and bearing of the fruits. The seeds of kidney cotton have ethnobotanic significance also. The paste prepared from the soaked seeds of kidney cotton, rhizomes of *Cyprus rotundus*, tender shoots of *Cynodon dactylon* and jaggery is used as external application and oral intake for the treatment of dog bites in Rieng and Tipra tribes of Tripura.

The accession numbers SD-17-2859, SD-17-2897, SD-17-2856, SD-17-2854, SD-17-2838, SD-17-2846 and SD-17-2849 with white lint and SD-17-2820 and SD-17-2808 with brown lint, belonging to race *cernuum* of *G. arboreum* by virtue of their high seed number per locule 18-20 seed, per boll (57-59), high boll weight (6.0 g), high ginning out-turn (54-55%), high boll retentivity and field resistance to major pests and diseases like jassids, bollworms and black

arm are the most valuable genetic resources having great potential for direct and/or indirect exploitation in cotton improvement programme. The coloured cottons with desired resistance to pests and diseases have the additional advantage of avoiding the use of inorganic dyes.

In addition to the above collected materials, a lot of exploitable variability still exists particularly in the inaccessible remote areas in this region which is the seat of diversification of *G. arboreum*. Therefore, intensive surveys involving the state organizations are required to be conducted to capture this important gene pool for posterity. A part of the collected samples had been deposited in the National Gene Bank at NBPGR for long term storage and another part sent of CICR, Nagpur for characterization, evaluation and utilization.

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