Indian J.Pl. Genet. Resources 6(1): 41-45, 1993

COLLECTING COTTON (*GOSSYPIUM* SPP.) GERMPLASM IN KACHCHH AND SAURASHTRA REGIONS OF GUJARAT

S.S. Duhoon and M.N. Koppar

Natioanl Bureau of Plant Genetic Resources,
Pusa Campus, New Delhi 110 012

In an exploration undertaken in January, 1991, 77 germplasm comprising 3 cultivated species of cotton were collected from 67 sites in Kachchh and Saurashtra regions in Gujarat. Forty two samples in *Gossypium herbaceum* L. and 32 in *G. arboreum* L. represented the local diversity in Asiatic diploid cottons and 3 in *G. hirsutum* L. in American cotton. The collections showed a wide range of variability in plant height, plant habit, plant pigmentation, leaf lobing, boll number, size, shape and bursting, fibre length, ginning out-turn and resistance to salinity, drought and shattering. The primitive **Dhumad** types with indehiscent ripe bolls and **Wagad** types with semi dehiscent bolls in *G. herbaceum*, L. were observed to be important genetic resources for resistance to salinity, drought and non-shattering habit. Red and green pigmented open boll **mathio** types in *G. arboreum* L. were identified as desirable donors for high fibre length and boll number. Based on passport and laboratory data, some of individual plant selections were identified as promising for direct utilization in breeding as straight selections.

Key words : Cotton, *Gossypium* spp., variability, primitive types, salinity, drought, exploration

Cotton, in India, is grown under diverse edaphic and climatic conditions. Asiatic diploid cottons (*Gossypium herbaceum* L. and *G. arboreum* L.), in view of their local origin, have remarkable adaptability to these divergent conditions and are less vulnerable to a wide range of diseases and pests (Hussain and Khan, 1940; Singh and Bhutani, 1963; Duhoon and Singh, 1980). The existing diversity in Asiatic cottons is being gradually replaced by high yielding American cottons (*G. hirsutum* L.) and hybrids and other more remuneractive crops (Munshi Singh, 1989). Kachchh and Saurashtra in Gujarat are the important regions of diversity in Asiatic cottons particularly for drought, salinity and shattering resistance in *G. herbaceum* and fibre length in *G. arboreum*. Therefore, the present exploration was conducted with an objective to collect and conserve the local diversity in these cottons from these regions for future use, besides using them in the present programmes.

SAMPLING STRATEGIES

The collections consisted of randomly drawn 77 samples of seed cotton representing diversity in populations belonging to 3 cultivated species of genus *Gossypium*. The samples were collected in January 1993, from randomly selected populations at 67 sites in diverse habitats in 10 districts, viz., Palanpur, Kachchh, Banaskantha, Rajkot, Jamnagar, Junagadh, Amreli, Bhavnagar, Sundarnagar and Mehsana comprising Kachchh and Saurashtra regions in Gujarat. Fully matured single bolls from each of the 40-50 (as per availability) random plants in each population, were picked up to represent the diversity and to study the variability within and between populations. Passport data were recorded on each site alongwith important plant characters. The observations on most important post-harvest characters like boll weight, fibre length and ginning out-turn were recorded at Genetics Division, Indian Agricultural Research Institute, New Delhi. 100 seed cotton was ginned and the weight of lint was measured as ginning out-turn (%). The coarse grid methods with circular route was followed with main emphasis given to cover the periphery of the regions. Seperate samples were drawn wherever two or more distinct morphotypes occured simultaneously in the same population. A few outstanding plants were also separately picked for utilization as selections.

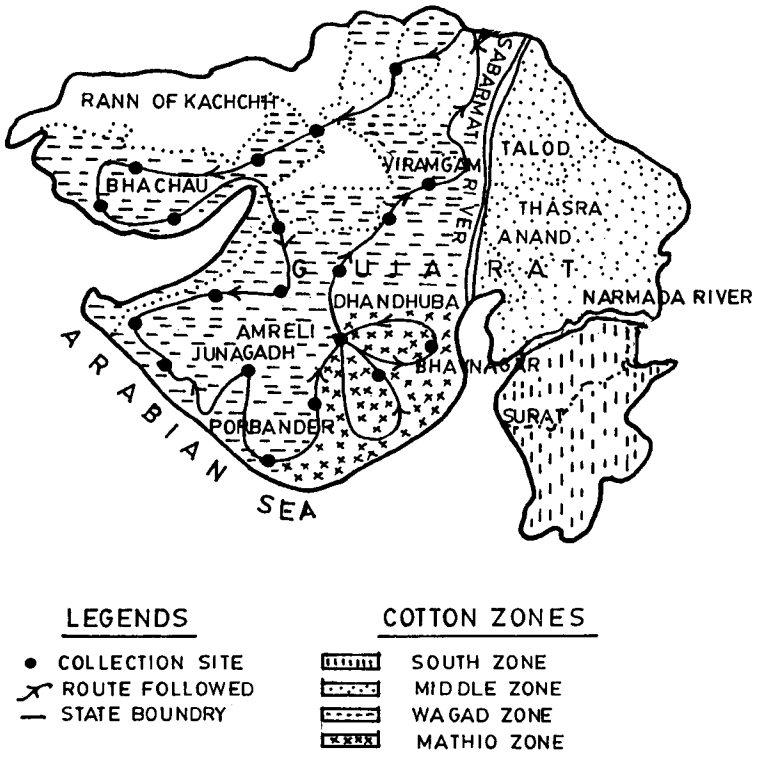

Fig. 1. Route map for cotton collecting in Gujarat

DETAILS OF COLLECTIONS

Saurashtra and Kachchh regions lie between 20°.5′ to 25° North latitude and 68° to 72°.5′ East longitudes (Fig.1). The gravelly, salt affected poor soils to clayey black fertile soils in Kachchh and sandy loam in mathio zone are common and the rainfall is scanty in these regions. The pH of the soils varied from 7.5 to 9.5 (NBSS & LUP, 1993).

Species variability

Gossypium herbaceum, G. arboreum, G. hirsutum and hybrids are grown in this region. The old world diploid cottons (*G. herbaceum* and *G. arboreum*) are grown mainly in problem soils under rainfed conditions whereas the cultivation of American cotton (*G. hirsutum*) and hybrids is confined to fertile soils where irrigation facilities exist. Out of 77 collections of cotton, 42 represented *G. herbaceum*, 32 *G. arboreum* and 3 *G. hirsutum*. The species-wise range of variability in the characters of major importance is presented in Table 1.

Table 1 : Range of variability in cotton samples collected from Gujarat

Characters	Species		
	Gossypium herbaceum (42 accessions)	*Gossypium arboreum* (77 accessions)	*Gossypium hirsutum* (3 accessions)
Plant height (cm)	30-125	85-158	40-110
Bolls/plant	6-64	8-75	3-22
Bolls weight (g)	2.5-3.5	2.0-3.0	2.8-4.0
Fibre length (mm)	12-19	15-25	20-24
Ginning Out-turn (%)	32.4-35.1	32.0-34.3	34.7-37.0
Crop duration (days)	135-150	125-145	100-110

Gossypium herbaceum L. is grown in Kachchh and Ghed regions. About 100 low lying villages around Kutiana in Junagadh district where water remains stagnant in rainy season, comprise the Ghed region. Cotton is sown when rain water receeds and grown with conserved moisture in black soils, having high water holding capacity. The diversity in this species is represented by two distinct types (i) **Dhumad** types with closed bolls and (ii) **Wagad** types with semi-open bolls. The deep root system and indehiscent/semi-dehiscent ripe bolls are adapted to escape drought and salinity **Dhumad** and **Wagad** types are believed to be an evolutionary link between wild South African perennial (*G. herbaceum* race *africanum*) and open boll cultivated, annual forms of *G. herbaceum* and *G. arboreum* L. (Munshi Singh, 1989).

G. arboreum is grown in some parts of Amreli and Bhavnagar districts. These cottons with open relatively smaller bolls are popularly known as **mathio** cottons because their leaves resembles those of moth bean (*Phaseolus aconitifolius*). Four morphotypes distinguished by plant pigmentation and leaf lobing were observed in this species, occassionally within the same populations. The morphotypes with red and green pigmeted plants were equally frequent. In both red and green pigmented types, narrowly and broadly lobed leaf types occurred and were collected. The distribution of these species is overlapping at some places, particularly in the periphery of these regions.

In *G. hirsutum*, three samples having desirable canopy with small sized, uprightly thick, hairy leaves were collected. The collections exhibited a wide range of variability for plant height (30-158cm.), crop maturity (100-150 days), plant habit (sympodial types with compact habit, monopodial types with bushy habit and pyramid shaped), plant pigmentation (red, green and intermediate types), leaf size (small, large), leaf lobing (narrow deep to broad shallow), boll weight (2.4 g.), boll shape (round, conical and tapering), boll type (pendulous/upright), boll bursting (closed, semi-open to open), boll number (6 to 75/plant), fibre length (12-25 mm), ginning out-turn (32-37%) and field resistance to drought, salinity and shattering.

One set of collections has been deposited in the National Gene Bank for conservation and another set sent to the active germplasm site at Central Institute for Cotton Research, Nagpur for characterization, maintenance and

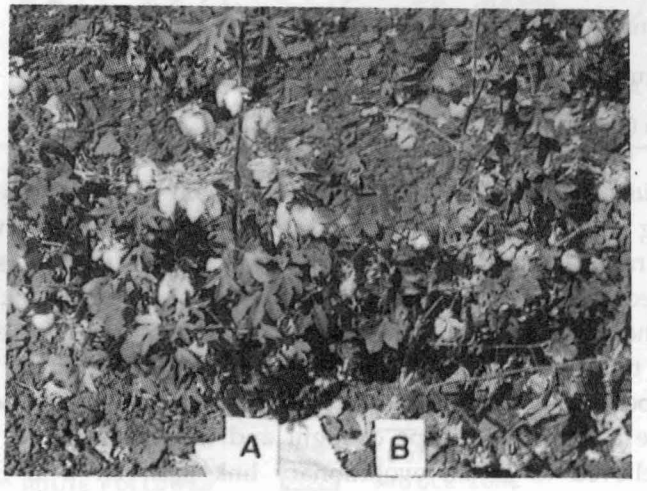

Fig. 2. Waged types with semi-open bolls (A) and Dhumad types with closed ripe bolls (B) in G. *herbaceum* L. from Kachchh region in Gujarat

enhancement. These genetic resources have the potential for direct and indirect utilization in breeding particularly for fibre length and resistance to drought, salinity and shattering, the main problems in Asiatic diploid cottons.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. R.S. Rana, Director, National Bureau of Plant Genetic Resources, New Delhi for providing necessary facilities and Dr. R.L. Savalia, Associate Cotton Breeder, Gujarat Agricultural University, Agricultural Research Station, Amreli, for his help in surveying **Mathio** cotton zone.

REFERENCES

Avtar Singh and D.K. Bhutani. 1963. Insect pest of cotton I. Incidence of pink bollworm in cotton in Punjab. *Indian Cott. Gr. rev.* **17**:343-48.

Hussain, M.A. and M.H. Khan. 1940. Studies on *Platyedra gossypiella* Sound in Punjab. *Indian J. Ent.*, **2**:45.

Duhoon, S.S. and Munshi Singh. 1980. Resistance to spotted bollworms, *Earias* spp. in cotton, *Gossypium arboreum* Linn. *Indian J. Ent.* **42**(1):116-121.

Munshi Singh. 1984. Kapas Vigyan: *Mongr.*, (in Hindi), ICAR publication. 253 p.

Munshi Singh. 1989. Collecting in Bhutan, *Indian J. Pl. Genet. Resources* **2**(2):82-83.

NBSS & LUP. 1993. Soil resource map of Gujarat. National Bureau of Soil Survey and Land Use Planning, Nagpur.