LONG STAPLE COTTON SCENARIO IN MAHARASHTRA AND FUTURE PROSPECTS

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Introduction

The stiff global competition and consumption of cotton fibre combined with the technological revolution in the spinning and yarn manufacturing sector have reprioritized the importance of fibre quality parameters. With increased automation in the textile industry, cotton with less neps and short fibres and possessing uniform micronaire and maturity would be needed (Sreenivasan *et. al.,* 2004). Fibre development which is basically under genetic control is readily influenced by the environment during the boll development period. The effect of climatic factors on the genetic potential of the cultivar, modify both length and maturity of cotton fibre to varying degrees (Bradow and Davidonis, 2004).

Agro-climatic zones and cotton fibre

On the basis of agro-climatic situations, there are three distinct cotton growing zones in India. They are north zone, central zone and south zone. The geographic situation, soil status and identical environmental conditions prevailing in these zones have profound influence on fibre development. The North Indian Cotton Zone comprising states of Punjab, Haryana, North-west Rajasthan and western Uttar Pradesh where flowering before 1st August and after 30th September is not giving good fibre quality and optimum boll weight. Therefore, bulk of cotton produced in the north zone is of medium category. Moreover, *desi* cotton varieties and hybrids are even non-spinnable.

Central zone comprises states of Gujarat, Maharashtra and Madhya Pradesh where cotton is cultivated as full season crop. The exclusive dependence of central zone on rainfed cultivation particularly Maharashtra (98%) and Madhya Pradesh (80%), where climatic situations are mostly favourable for development of superior medium cotton and to some extent long staple cotton. Therefore, bulk of cotton produced in the central zone is medium or superior medium to long staple category. On the contrary, the climatic conditions of south zone (comprising states of Andhra Pradesh, Karnataka and Tamil Nadu) are mostly favourable for cultivation of long to extra-long staple category of cotton.

Production and productivity of Central zone

Central zone (Gujarat, Maharashtra and Madhya Pradesh) grows cotton on an area of 56.01 lakh hectares and produces 141.0 lakh bales, contributing to 56.14 of the national production with an average productivity of 443 kg lint / ha (2005-2006). Gujarat, with a maximum irrigation potential had high productivity (655 kg lint/ha) from 20.77 lakh hectare (23.55% of national area) produces 80 lakh bales accounting to 32.98% to the national production. Now, Gujarat is emerging as the largest cotton

producer in the country (2005-2006). The situation in Maharashtra is quite different. Maharashtra, with largest area (29 to 30 lakh hectare) had lowest production of 46 lakh bales accounting to 32.76% area and hardly 18.97% for production to national average. This is mainly because of 97-98% area in Maharashtra is under rainfed condition.

Status of long staple cotton in Maharashtra

The climatic factors and rainfed cultivation prevailing in Maharashtra are mostly suitable for cultivation of superior medium (25 to 28 mm) to long staple (28 to 30 mm) cotton and not for extra-long staple cotton (32 to 35 mm). Presently, *hirsutum* x *hirsutum* hybrids are grown on a large area under rainfed condition as a single season crop without any double cropping system in Maharashtra. The productivity of long to extra-long staple interspecific *hirsutum* x *barbadense* hybrids is very low because of their susceptibility to pests and diseases. A great majority of intraspecific *hirsutum* x *hirsutum* hybrids that have covered a sizeable area in Maharashtra had robust, bushy and prolific plant type that continue to flower over a long period of time comes under superior medium to long staple category.

The *hirsutum* x *hirsutum* hybrid Godavari (NHH 1) released during 1978, PKV Hy3 during 1996 and PHH 316 during 2000 are the only marginal long staple hybrids having mean fibre length around 28 to 29 mm released by public sector (Table-1). In addition, intraspecific hybrids like Bunny from private sector had considerably contributed towards production of long staple cotton. However, as the area under transgenic `Bt' cotton hybrid is increasing day by day, the area of non-Bt hybrids is drastically reducing and may come to zero level of cultivation in future.

Table-1 : Intraspecific long staple hybrids (*hirsutum* x *hirsutum*) released in Maharashtra by public sector

Hybrid	Year of release	Yield (kg/ha)	Ginning outturn (%)	Mean fibre length (mm)	Spinning counts (s)	Area of recommendation
Godavari (NHH 1)	1978	1500	35	28-29	50	Marathwada region
PKV Hy4	1996	1800	35	28-29	50	Vidarabha region
PHH 316	2000	1800	40	28-29	50	Marathwada region

At present, though the cultivation of interspecific hybrids is at zero level in Maharashtra, the contribution of interspecific *hirsutum* x *barbadense* hybrids Varalaxmi (relased during 1972), Savitri (1978), DCH 32 (1981) and NHB 12 (1989) in raising production of long staple cotton in Maharashtra in the past cannot be ignored (Table-2).

Table-2: Interspecific long staple (*hirsutum* x *barbadense*) released in Maharashtra by public sector

Hybrid	Year of release	Yield (kg/ha)	Ginning outturn (%)	Mean fibre length (mm)	Spinning counts (s)	Area of recommendation
Varalaxmi	1972	1400-1500 (R)	35	31	80	Maharashtra
Savitri	1978	1500-1600 (R)	32	30	60	Deccan Canal Tract
DCH 32	1981	1500-1600	36	33	80	Maharashtra
MHB 12	1989	1600-1700	30	33	80	Marathwada

An interspecific hybrid (*herbaceum* x *arboreum*), Pha 46 of diploid cotton was released during 1996 for raingrown area of Marathwada region. The hybrid had excellent fibre properties and was spinnable upto 40s count like any other tetraploid cotton. However, because of problems related with seed production, the hybrid could not become popular.

Table-3 : Interspecific diploid hybrid Pha 46

Hybrid	Year of release	Yield (kg/ha)	Ginning outturn (%)	Mean fibre length (mm)	Spinning counts (s)	Area of recommendation
Pha 46	1996	1700-1800	32	28-29	40	Marathwada region

Long linted diploid *desi* cotton cultivation

Of late, the cultivation of American cotton hybrid and varieties has become more risky and non-remunerative owing to which the rainfed farmers are facing lot of hardships. The higher cost of cultivation in hybrids has forced them into the money lenders' trap and created a kind of socio-economic tension amongst the cotton cultivators of Maharashtra.

Desi cotton has inherent ability to resist major pests and diseases as compared to tetraploid cotton. The spread of varieties and hybrids of tetraploid cotton was mainly because of their superior fibre length and big boll size. However, considering the beneficial features like tolerance to drought, resistant to pests and diseases of *desi* cotton by improving fibre properties, a variety PA 255 (Parbhani Turab) was evolved at Parbhani and released during 2000. The release of such a long staple variety having high productivity, early maturity, excellent fibre qualities and tolerance to biotic and abiotic stresses for cultivation under rainfed cotton has helped the marginal farmers to raise their productivity of quality cotton with minimum inputs.

Table-4: Characters of long linted productive *desi* cotton varieties Parbhani Turab (PA 255) and PA 183 (Sawata)

Hybrid	Year of release	Yield (kg/ha)	Ginning outturn (%)	Mean fibre length (mm)	Spinning counts (s)	Area of recommendation
PA 183	1994	1400	38-39	27-28	25-30	Marathwada region of Maharashtra
PA 255	1999	1600	37-38	28-29	30-35	Marathwada region of Maharashtra

Table-5: Fibre and yarn data of *desi* cotton variety PA 255 (Parbhani Turab) in comparison with *hirsutum* variety LRA 5166

S.No.	Trait	PA 255	LRA 5166
1	Length by weight (mm)	23.4	22.6
2	Upper quality length (mm)	27.7	28.3
3	Short fibre content (W) %<12.7	8.9	13.9
4	Length by number (mm)	17.7	16.3
5	Short fibre content (n)	30.0	39.7
6	5% length (mm)	32.1	31.8
7	2.5% length (mm)	34.4	34.1
8	Fineness (m/tex)	16.6	16.4
9	Immature fibre content	5.4	6.7
10	Maturity ratio	0.92	0.87
11	Nep (um)	6.81	7.74
12	Nep (Cnt/g)	92.4	163
13	Seed coat Neps (um)	10.38	14.39
14	Seed coat Neps (Cnt/g)	7.3	26
15	Uniformity ratio	48	46
16	Micronaire value	4.7	43
17	Fibre strength (g/tex)	22.9	22.7
18	Elongation (%)	4.9	5.6
19	Short fibre content	9.9	12.7

Table-6 : Yarn results of PA 255 in comparison with LRA 5166

S.No.	Trait	PA 255 (30s)	LRA 5166 (30s)
1	Count strength product	2126	2231
2	Transozet Breaking Force CV %	308.6 (12.50)	330.2 (14.22)
3	Transozet Tenacity CV %	16.28 (12.50)	15.75 (14.22)
4	Transozet Elongation CV %	4.57 (11.38)	5.64 (8.99)
5	UT 4 (U%) CV %	14.82 (1.5)	18.13 (1.6)
6	UT 4 Thin places (-50%) CV %	171 (21.8)	768 (17.4)
7	UT4 Thick places (+50%) CV %	554 (18.2)	1865 (5.0)
8	UT4 Neps (+200%) CV %	1062 (8.4)	3472 (5.1)

Future Thrust

1. As entire cotton in Maharashtra is grown as single season crop, development of conventional MS based and Bt cotton of long staple category (28 to 30 mm 2.5% span length, 22-24 g/tex fibre strength and micronaire of around 4.0) sutiable for rainfed condition be given major emphasis.
2. Though the area under transgenic `Bt' cotton hybrid is increasing day by day but so far no long linted `Bt' hybrid suitable for rainfed cultivation in Maharashtra has been released by public sectors. Hence, involvement of public sector in developing `Bt' cotton varieties is necessary to reduce the high cost of seed for the benefit of farmers of rainfed area.
3. Development of transgenic long linted Bt cotton varieties of diploid *desi* cotton
4. Development of long staple, introgressed (*hirsutum* x *arboreum*) *hirsutized arboreums* having high fibre qualities (28 to 30 mm 2.5% span length, 25 g/tex fibre strength, 3.8 to 4.5 micronaire) suitable for rainfed cultivation in Maharashtra is the need of hour.

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