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PA 740: High yielding, superior fibre quality Desi cotton (*Gossypium arboreum*) variety for South zone of India

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Abstract
The varietal development programme of desi cotton (*Gossypium arboreum*) undertaken at Cotton Research Station, Maheboob Baugh Farm, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani has resulted into development and release of desi cotton (*Gossypium arboreum*) variety PA 740 for South zone of India. Pedigree method of breeding was used for development of Desi cotton variety PA 740. The variety PA 740 has recorded mean seed cotton yield of 13.63 Q/ha as against 13.67 Q/ha and 13.50 Q/ha of zonal and local checks, respectively. Similarly, in 'on farm trials', the variety has recorded 17.81% increased seed cotton yield over check variety PA 402. The proposed variety is tolerant to Bacterial blight and Alternaria leaf spot. The variety is found tolerant to sucking pests. The test variety has recorded mean fibre length of 27.86 mm, fibre strength of 25.06 g/tex and micronaire of 5.06. Newly developed variety PA 740 had given consistent performance for seed cotton yield across South Zone under *rainfed* condition. The variety PA 740 has long staple length, high fibre strength and acceptable micronaire and will meet the requirement of the modern textile industries. Release of such a high yielding stable variety with desirable fibre qualities will help to improve cotton productivity and income of *rainfed* farmers.

Keywords: Staple length, disease reaction, desi cotton, seed cotton yield

Introduction
Cotton is one of the most important cash crops and accounts for around 25% of the total global fibre production. Cotton is also one of the most important commercial crops cultivated in India. In the raw material consumption basket of the Indian textile industry, the proportion of cotton is around 59%. It plays a major role in sustaining the livelihood of an estimated 5.8 million cotton farmers and 40-50 million people engaged in related activities such as cotton processing and trade. India also has the distinction of having the largest area under cotton cultivation in the world i.e. about 126.07 lakh hectares. India continued to maintain the largest area under cotton and is the second largest producer of cotton next to China with 34% of world area and 21% of world production.

Out of four cultivated species of genus *Gossypium*, only two species *i.e. G. hirsutum* and *G. arboreum* are being mostly cultivated in Maharashtra. In the last few years there has been a significant reduction in area of *G. arboreum* cotton across the country and particularly in Maharashtra because of lower productivity and inferior fibre properties as compared to tetraploid cotton in rainfed eco-system. Therefore, more emphasis should be given to increase the seed cotton yield per unit area by developing varieties with short stature, big boll size and medium to longer staple length with sustained yield in multiple environments. Presently, cultivation of varieties and hybrids of tetraploid cotton has become more risky and non-remunerative, creating socio-economic tension amongst the cotton cultivars forcing them into the money lenders trap. The increased cost of cultivation in these cotton hybrids is due to high seed cost, more plant protection as they are susceptible types and requirement of higher fertilizer dose. On the contrary, diploids virtually involve low seed cost, low or no cost for plant protection and crop nutrition. Looking to this, one will really be optimistic for cultivation of *desi* cotton provided they yield at least on par with varieties and hybrids of tetraploid cotton and must possesses equivalent fiber quality.

Material and Methods

The variety PA 740 was developed by adopting pedigree method of breeding from cross of PA 183 X PA 375 at Cotton Research Station, Mahboob Baugh Farm, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The variety PA 740 was tested during *kharif* season 2011-12 to 2015-16 at different locations in south zone of the country. It has been released by Central Variety Identification Committee Meeting of AICCIP held on April 09, 2017 at TNAU, Coimbatore. The DNA fingerprinting is done at National Bureau of Plant Genetic Resources, New Delhi. The genotype PA 740 is tested in station trial at Parbhani location. Thereafter it is tested at various locations in South zone. The fibre quality analysis was done at CIRCOT centres.

Results and Discussion

Evaluation in station trial

The variety PA 740 was tested in station trial at Parbhani location during *kharif* 2011-12. It showed 27.54%, 25.23% and 35.03% yield increase over checks PA 255, PA 402 and NH 615.

Table 1: Performance of PA 740 in station trial at Parbhani during 2011 -12

Genotype	Seed Cotton Yield (Kg/ha)	% increase over
PA 740	2278	--
PA 255	1786	27.54
PA 402	1819	25.23
NH 615	1687	35.03
CD at 5%	374.96	
CV(%)	9.33	

Evaluation in Zonal trials

The proposed variety has recorded mean seed cotton yield of 1363 kg/ha as against 1367 kg/ha and 1350 kg/ha of zonal check (DLSa 17) and local checks, respectively.

Table 2: Centre wise/year wise Seed Cotton Yield data of proposed variety PA 740 and checks

Year of testing	Location	Proposed variety PA 740	Zonal Check (DLSA 17)	Local Check (AKA 235/K11)	% increase over		CD at 5%	Local Checks
					Zonal Check (DLSA 17)	Local Check (AKA 235/K11)		
2013-14	Dharwad	1420	1616	1444	- 12.12	- 1.66	346	AK 235
	Nandyal	1854	1708	2462	+ 8.54	- 75.30	253	Srinandi
	Kovilapatti	1816	1116	1230	+ 61.45	+ 67.73	251	K11
	Mean	1697	1480	1712	+ 12.78	- 0.08		
	Rank	4	12	3				
2014-15	Dharwad	800	1019	747	- 27.37	+ 6.62	222	AK 235
	Nandyal	2186	1765	1969	+ 19.25	+ 9.92	381	Yaganti
	Kovilapatti	988	1296	968	- 31.17	+ 2.02	194	K11
	Mean	1325	1360	1228	- 2.64	+ 7.32		
	Rank	4	3	7				
2015-16	Dharwad	1330	1481	1447	- 10.19	- 8.79	351	AK 235
	Nandyal	482	639	472	- 24.56	+ 2.07	147	Yaganti
	Kovilapatti	1389	1665	1417	- 19.87	- 1.97	296	K11
	Mean	667	1262	1112	- 89.20	- 66.71		
	Rank	9	5	8				
Mean		1363	1367	1350	- 0.32	+ 0.96		

Reaction to diseases and pests

The variety PA 740 was tested for disease reaction across south zone for various diseases during 2013-14 to 2015-16. It was found tolerant to bacterial blight, alternaria and grey mildew. It had recorded comparable performance as compared to checks (Table 3).The variety PA 740 was tested for pest reaction across south zone for various insect pests. It was found tolerant to jassids. It had recorded comparable performance for bollworms (Table 4).

Table 3: Reaction to major diseases

Disease	Year	Proposed Variety PA 740	Zonal Check (DLSA 17)	Local Check (AKA 235 /K 11)
Bacterial blight (BLB)	2013-14	0	0	0
	2014-15	-	-	-
	2105-16	-	-	-
Grey mildew (GM)	2013-14	4.0	4.0	4.0
	2014-15	-	-	-
	2105-16	4.0	4.0	4.0
Alternaria (ALB/ALS	2013-14	4.0	4.0	4.0
	2014-15	-	-	-
	2105-16	2.0	3.0	3.0
Rust	2013-14	3.0	4.0	4.0
	2014-15	-	-	-
	2105-16	1.0	1.0	1.0

Table 4: Reaction to major pests

Pests	Year	Proposed Variety PA 740	Zonal Check (DLSA 17)	Local Check (AKA 235 / K11)	Suceptible Check (DCH 32)
Jassid on leaves	2013-14	-	-	-	-
	2014-15	4.2	3.2	6.6	22.2

	2015-16	1.8	3.2	1.8	18.80
Jassid injury grade	2013-14	-	-	-	-
	2014-15	I	I	I	IV
	2015-16	I	I	I	IV
Fruiting bodies damage (%)	2013-14	-	-	-	-
	2014-15	7.1	7.12	7.05	14.55
	2015-16	-	-	-	-
Open boll damage (%)	2013-14	-	-	-	-
	2014-15	0.51	0.66	0.7	16.26
	2015-16	12.2	12.6	10.7	9.4

Fibre quality parameters

The variety PA 740 has staple length of 27.86 mm which was far superior to local check. It has good uniformity ratio with less micronaire. Apart from the above fibre traits it has fairly good fibre strength in comparison with checks. The quality analysis was carried out at different CORCOT centres.

Table 5: Data on Quality Characters

Fibre parameter	Year	Proposed Variety PA 740	Zonal Check (DLSA 17)	Local Check (AKA 235 / K11)
2.5% Span length (mm)	2013-14	28.0	28.0	25.9
	2014-15	27.2	27.0	25.7
	2015-16	28.4	28.9	26.3
	Mean	27.86	27.96	25.96
Micronaire (µg/inch)	2013-14	5.5	5.3	6.0
	2014-15	4.9	4.8	5.3
	2015-16	4.8	5.0	5.6
	Mean	5.06	5.03	5.63
Bundle Strength (g/tex)	2013-14	21.6	19.7	20.3
	2014-15	22.1	20.7	20.8
	2015-16	31.5	30.6	28.5
	Mean	25.06	23.66	23.20

Agronomic requirements

The plant density of 44444 plants/ha (spacing of 75 × 30 cm) and application of 50:25:25 kg NPK (100%RDF) was found optimum for the proposed variety PA 740 at Dharwad At Mudhol, proposed variety responded to plant population of 55555 plants/ha (spacing 60 × 30 cm) and application of 20:00:00 NPK. Where as at Nandyal, plant density of of 55555 plants/ha (spacing of 60 × 30 cm) and application of 20:20:00 kg NPK was found optimum for the proposed variety PA 740.

Table 6: Adaptability to changes in agronomic conditions Location: Dharwad

Particular	Item	Proposed variety PA 740	Local Check (DLSA 17)	Qualifying variety (JLA 0603)
Plant population Experiment				
Yield (kg/ha) under recommended spacing	44444 plants/ha (75X30 cm)	1956 kg/ha	2145 kg/ha	2244 kg/ha
Percentage loss or gain when sown with	Higher population- 55555 plants/ha (60X30 cm)	-10.84% (1744 kg/ha)	- 4.34% (2052 kg/ha)	- 10.97% (1998 kg/ha)
	Lower population- 37037 plants/ha (90X30 cm)	- 11.92% (1723 kg/ha)	- 7.70% (1980 kg/ha)	-22.69% (1735 kg/ha)
Fertilizer level experiments				
Yield (kg/ha) under recommended fertilizer dose	50:25:25 NPK kg/ha	1805 kg/ha	1998 kg/ha	1978 kg/ha
Percentage loss or gain with	Lower dose (40:20:20 NPK kg/ha)	-4.55% (1723 kg/ha)	- 2.66% (1945 kg/ha)	- 4.05% (1898 kg/ha)
	Higher dose (60:30:30 NPK kg/ha)	+ 5.04% (1896 kg/ha)	+ 11.76% (2233 kg/ha)	+ 6.21% (2101 kg/ha)

In spite of achieving record production during the past years, the textile industry faces shortage of long staple *arboreum* cotton. The variety PA 740 having fibre length of 27.86 mm, fibre strength of 25.06 g/tex and fine micronaire of 5.06, Therefore, the farmers of the zone are readily accepted this variety because of high yield and sucking pest tolerance, whereas, mill owners can satisfy their demand for long fibre produce. Area under organic farming is increasing day by day. High yielding, pest and disease tolerent with superior fibre qualities are the only options for organic cotton production. Therefore, farmers/consumers and owners of textile industries of the South Zone will definitely accept the variety PA 740.

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