Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(6): 1081-1083
Received: 22-08-2020
Accepted: 10-10-2020

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PA 740: High yielding, long staple Desi cotton (*Gossypium arboreum*) variety for Marathwada region of Maharashtra

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Abstract
The varietal development programme was undertaken at Cotton Research Station, Maheboob Baugh Farm, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. Pedigree method of breeding was used for development of Desi cotton variety PA 740. The variety PA 740 has recorded 21.41% and 19.30 % higher seed cotton yield over local checks PA 402 and Pa 08, respectively. Similarly, in 'on farm trials', the variety 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 Marathwada region under *rainfed* condition. Test 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: desi cotton, Staple length, seed cotton yield, fibre, pest reaction

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. In spite of this, the genetic potential of diploids still remains unexploited suggesting to formulate strong breeding strategies for its genetic enhancement to avoid erosion of this species having tolerance to both biotic and abiotic stresses for the benefit of farmers of India.

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 2016-17 at different locations in Marathwada region of Maharashtra. The variety was recommended by State Seed Sub- Committee (Maharashtra) for Variety Release Meeting held on dated 16.06.2018 at Mumbai. 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 Marathwada region. The fibre quality analysis was done at CIRCOT, Mumbai.

Results and discussion

Evaluation in station, advance multilocation and state trials

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.While it showed yield increase of 21.41%, 19.30 % and 14.23 % in advance multilocation varietal trial over checks PA 402, PA 08 and NH 615 respectively.

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	

Table 2: Summary data of PA 740 in different trials conducted during 2011-12 to 2016-17 in Marathwada region

Particular	Year of testing	No of trials	Proposed variety PA 740	Check variety PA 402	Check variety PA 08	Check variety NH 615
Preliminary station trial	2011-12	1	2278	1819	-	1687
Advance Multilocation varietal trial	2012-13 to 2013-14	7	1574	1248	1337	1132
State Multilocation varietal trial	2013-14 to 2016-17	13	1193	1013	1049	-
Weighted Mean		21	1372	1130	1150	1201
% increase over			-	21.41	19.30	14.23

The variety PA 740 was tested at multilocations and seasons in different trials during *kharif* 2011-12 to 2016-17. It showed yield increase of 21.41 % and 19.30 % over checks PA 402 and PA 08.

Table 3: Performance of PA 740 in State Multilocation Varietal Trials (SMVT) in Marathwada region

Genotype	Seed cotton yield (kg/ha)				Weighted Mean	Percent increase over
	2013-14 (3)	2014-15 (3)	2015-16 (2)	2016-17 (4)		
PA 740	1336	1165	1339	999	1193	-
PA 402	1227	1054	1113	718	1013	17.76
PA 08	1258	983	1177	828	1049	13.72
AKA 7	1201	885	1008	841	988	20.74
AKA 8	1191	1054	1097	754	1010	18.11
JLA 794	1099	1066	1161	947	1054	13.18

The variety PA 740 was tested in State Multilocation Varietal Trials (SMVT) in Marathwada region in different trials during 2013-14 to 2016-17. It showed yield increase of 17.76 % and 13.72 % over checks PA 402 and PA 08.

Table 4: Fibre and spinning test report

Sr. No	Fibre trait	Proposed variety PA 740	Check 1 PA 402	Check 2 PA 08	Check 3 AKA 7	Check 4 AKA 8	Check 5 JLA 794
1	2.5 % Span length/UHML (mm)	28.96	28.33	26.43	25.83	27.53	26.03
2	Uniformity index (%)	83.50	82.00	83.00	83.00	82.00	83.00
3	Fibre fineness (Micronaire)	4.67	4.93	5.27	5.20	5.43	5.37
4	Fibre Strength (g/tex)	26.70	25.13	23.97	24.70	24.63	24.20
5	Elongation (%)	5.70	5.77	5.83	6.17	6.03	5.90
6	Ginning Percentage (%)	37.42	36.46	36.64			

The variety PA 740 has staple length (Upper half mean length) of 28.96 mm which is far superior to rest of the checks. It has good uniformity ratio with less micronaire of 4.67. Apart from the above fibre traits it has fairly good fibre strength and elongation percentage. The quality analysis was carried out at CORCOT, Mumbai.

Table 5: Screening for disease reaction

Disease	Year	Proposed variety PA 740		Check variety 1 PA 402		Check variety 2 PA 08	
		% incidence	Reaction	% incidence	Reaction	% incidence	Reaction
Bacterial blight	2014-15	0.00	DF	6.25	MR	4.80	R
	2015-16	6.00	MR	8.50	MR	8.75	MR
	2016-17	0.00	DF	6.75	MR	5.00	R
	Mean	2.00	R	7.16	MR	6.18	MR
Alternaria	2014-15	4.50	R	8.50	MR	7.25	MR
	2015-16	5.30	MR	15.25	MS	12.50	MS
	2016-17	4.75	R	8.00	MR	8.15	MR
	Mean	4.85	R	10.58	MR	9.30	MR
Grey mildew	2014-15	0.00	DF	3.50	R	4.00	R
	2015-16	0.00	DF	0.00	DF	0.00	DF
	2016-17	0.00	DF	4.00	R	3.25	R
	Mean	0.00	DF	2.50	R	2.41	R

The variety PA 740 was tested for disease reaction across Marathwada region for various diseases. It was found resistant to bacterial blight, alterneria and grey mildew during as compared to checks.

Table 6: Screening of PA 740 for reaction to key pests

pests	Year	Proposed variety PA 740	Check variety 1 PA 402	Check variety 2 PA 08
Jassids	2013-14	3.40 (1.97)	7.30 (2.78)	7.80 (2.86)
	2014-15	5.80 (2.41)	8.50 (2.91)	4.25 (2.06)
	2015-16	12.80 (3.57)	20.80 (4.56)	19.25 (4.37)
	Mean	7.33	12.20	10.43
Aphids	2013-14	35.16 (5.96)	48.83 (7.01)	39.49 (6.30)
	2014-15	11.30 (3.36)	10.10 (3.18)	9.60 (3.09)
	2015-16	38.50 (6.20)	44.30 (6.72)	43.60 (6.64)
	Mean	28.32	34.41	30.89
Thirps	2013-14	3.66 (2.03)	4.33 (2.19)	4.83 (2.29)
	2014-15	11.35 (3.44)	10.65 (3.26)	9.80 (3.13)
	2015-16	15.60 (3.94)	9.45 (3.07)	18.65 (4.31)
	Mean	10.20	8.14	11.09
White fly	2013-14	5.30 (2.40)	4.46 (2.21)	5.90 (2.52)
	2014-15	4.60 (2.14)	9.30 (3.05)	5.95 (2.44)
	2015-16	25.50 (5.04)	17.30 (4.14)	19.95 (4.45)
	Mean	11.80	10.35	10.60

The variety PA 740 was tested for pest reaction across Marathwada region for various insect pests. It was found tolerant to jassids, thrips and white fly.

Table 7: Response of PA 740 in adaptive trials at farmers field

Year	No. of trials conducted	Mean Seed Cotton Yield (kg/ha)	
		Proposed variety PA 740	Check variety PA 402
2016-17	12	1476	1257
2017-18	08	1258	1063
Total	20	1389	1179
	% increase over	-	17.81

Sum total of twenty adaptive trials were conducted at farmers filed in Maharashtra during 2016-17 and 2017-18. It showed overall increase of 17.81 % yield over check PA 402.

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