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Characterization of Some Cotton Genotypes using IBPGR Descriptors

J Tulasi, M Lal Ahamed, J S V Samba murthy and Y Ashoka Rani
Department of Genetics and Plant Breeding, Agricultural College, Bapatla 522 101, Andhra Pradesh

ABSTRACT

Constant evaluation and characterization of the existent, yet uncharacterized germplasm is useful, and it is many times the cornerstone for the development of new and better varieties. One of the problems in germplasm collection is uncharacterization for common germplasm descriptors. A systematic study was conducted to characterize the fifty cotton germplasm lines using IBPGR descriptors at Agricultural College, Bapatla, India during *kharif* 2010. The data was collected on days to 50% flowering, stem, leaf, flower, boll, and quality parameters. Variability was observed for eighteen parameters out of thirty three descriptors studied in the fifty genotypes. The descriptors are helpful in breeding for multiple disease resistant cultivars and improving the fiber quality characteristics.

Key words : Characterization, Cotton, Descriptors, IBPGR.

Germplasm collection is one of the important objective in plant breeding programmes to overcome the genetic erosion. In this, uncharacterization of germplasm for common descriptors is considered as the main bottleneck in breeding programmes. Keeping this in view, a systematic effort was made to characterize the cotton germplasm by using International Board of Plant Genetic Resources (IBPGR) descriptors of cotton to document the data for easy identification and also to avoid the duplication and unnecessary evaluations of repetitive accessions in the collection and for locating useful genes from the germplasm accessions. This ultimately aims at development of desirable cotton varieties for commercial cultivation by farmers.

MATERIAL AND METHODS

The main objective of the investigation was to characterize the cotton germplasm to assess their potential to contribute to future crop improvement programmes. The fifty cotton germplasm lines having different places of origin were evaluated during *kharif* 2010-11 at Agricultural College Farm, Bapatla, with inter and intra row spacing of 120x60 cm.

The study was divided into four parts *i.e.,* the first data collection was taken on days to 50% flowering; second on stem, leaf, and flower characteristics during peak flowering stage; third during peak boll development and the fourth on quality parameters of the cotton fiber after harvest.

Data was collected by selecting randomly ten plants per genotype and were used for the differentiation of the germplasm lines based on IBPGR descriptors. The descriptors recorded for the present investigation were days to 50% flowering, stem pigmentation, stem hairiness, leaf shape, leaf lobe number, leaf size, leaf colour, leaf pubescence, leaf appearance, leaf gossypol glands, leaf nectarines, leaf petiole pigmentation, bract shape, bract number of serration, flower sepal pigmentation, petal colour, petal spotting, position of stigma, filament colouration, anther colour, boll bearing habit, boll size, boll colour, boll shape, boll surface, boll prominence at tip, boll opening, plant habit, plant height, fiber length, fiber strength, fiber fineness and fiber uniformity.

RESULTS AND DISCUSSION

The frequency and descriptor values of the fifty cotton germplasm lines are summarized in Table 1. No plant among the germplasm lines evaluated showed a deviation to characteristic from the mentioned descriptors in Table 2. Xavier Zumba (2004) also studied the shafter cotton collection of USA for the descriptors and reported the use of lines in breeding programmes. Padmavathi *et al*. (2009) and Gill *et al*. (2009) also characterized the cotton

Table 1. Frequency of cotton genotypes for different IBPGR descriptors

Score	50%D	StP	SH	LS	LL	LC	LP	PP	SP	PC	PSpot
1		50		47				45	50		45
2					40	50				33	
3			15	3	10					17	
4											
5	47		35				46				
6											
7	3										
8											
9							4	5			5

SCORE	Stigma P	FC	AC	BS	BC	B shape	BT	PH	FL	FS	FF	FU
1	4	46			50	2	11					
2	46		34			24	39					
3			16	9		24		12	1	17	3	
4												
5				41				36	48	33	40	
6												
7								2	1		7	50
8												
9		4										

50% D:Days to 50% flowering(3=<45%-early,5=45-60 –medium, 7= > 60-late);StP: Stem pigmentation (1= absent, 9=present); SH: Stem Hairiness (3= sparse ; 5=medium); LS: Leaf Shape (1=palmate; 3=okra): LL: Leaf Lobes (2=three; 3=five); LC: Leaf Colour (2=green, 4=dark red); LP : Leaf Pubescence (5=medium; 9= strong); PP: Petiole pigmentation (1= absent, 9= present) SP: Sepal pigmentation (1=absent, 9= present); PC: Petal Colour (2=cream, 3=yellow, 6=brown); P spot (1=absent,9=present); StigmaP: Stigma Position (1=embedded;2= exserted); FC: Filament Colour (1=absent, 9=present); AC: Anther colour (2=cream, 3=yellow,4=purple); BS: Boll Size (3=small,5=medium); BC Boll colour (1=green, 2=red); Bshape : Boll Shape (1=round, 2= ovate, 3=elliptic); BT= Boll Tip 1=blunt;2=pointed); PH = Plant Height (3=short- 61-90cm, 5= medium ,91-120 cm 7= long ->120 cm); FL: Fibre Length (1=very short <20mm ,3= short 20.5-24.5mm, 5=medium 25-29mm, 7= long 29.5-33.5mm ,9= extra long>33.5mm); FS= Fibre Strength (3=weak-<20gtex, 5=medium 21.1-25.0 gtex, 7=strong >25.0gtex); FF= Fibre Fineness 1= very fine <3, 3=fine -3-3.9, 5=medium 4-4.9, 7=coarse 5-5.9, 9= very coarse >5.9); FU= Fibre Uniformity (3=poor-<40, 5= average-42-45, 7= good ->45)

germplasm lines and CMS lines, respectively by using different descriptors for easy varietal identification and also to know the relationship between parent and offspring.

Stem pigmentation was not observed in any of the lines. Stem hairiness was sparse in 15 and medium in 35 lines. A hairy stemmed plant is common cotton plant characteristic and most cotton breeders would rather prefer smooth plants in their breeding programmes as absence for hairiness reduces the egg lying as much as 50% making the plant unattractive as an oviposition site for the Bollworm (Ledge *et al.,* 1992).

Among the leaf characteristics, variation was observed for leaf pubescence, leaf lobes and leaf shape. No variation was observed for leaf size (Large

Table 2. Description of various IBPGR descriptors in fifty cotton genotypes.

GENOTYPE	50%D	StP	SH	LS	LL	LC	LP	PP	SP	PC	P-SPOT	Stigma-P
BWR 39	54.66	1	3	1	2	2	5	1	1	2	1	2
KH-11	52.33	1	3	1	2	2	5	1	1	2	1	2
L-725	56.66	1	5	1	2	2	5	1	1	2	1	2
SA-1104	55.00	1	5	1	2	2	5	1	1	3	1	2
NA-1584	58.00	1	5	1	2	2	5	1	1	2	1	2
BADANWAR	56.33	1	5	1	2	2	5	1	1	3	1	2
NA-1588	54.33	1	3	1	2	2	5	1	1	2	1	2
D.S-26	55.00	1	5	1	2	2	5	1	1	2	1	2
4085	54.00	1	5	1	2	2	5	1	1	2	1	2
CPD-755	56.33	1	3	1	2	2	5	9	1	2	1	2
LAXMI	53.00	1	5	1	2	2	5	1	1	3	1	2
BWR-61	53.66	1	5	1	2	2	5	1	1	2	1	2
RAH-100	51.00	1	5	1	3	2	5	1	1	3	1	2
CNH-301	57.00	1	5	1	2	2	5	1	1	3	1	2
ACOLA-2	55.66	1	5	1	2	2	5	1	1	2	1	2
CSH-3167	57.00	1	5	1	2	2	9	1	1	2	9	2
CPD-431	56.66	1	5	1	3	2	5	1	1	2	1	2
AC-88	56.33	1	5	1	2	2	5	1	1	2	1	2
NA-1678	55.66	1	3	1	2	2	5	1	1	2	1	2
CCH-05-2	56.00	1	5	1	2	2	5	1	1	2	1	2
DS-56	56.00	1	5	1	2	2	5	1	1	3	1	2
CCH-1071	55.00	1	5	1	2	2	5	1	1	2	1	2
VIKRAM	54.33	1	5	1	2	2	5	1	1	2	1	2
RAH-101	51.66	1	5	1	2	2	5	1	1	2	1	2
CNH-120 MB	56.33	1	3	1	2	2	5	1	1	3	9	2
JK-276-10-5	58.66	1	5	1	2	2	5	9	1	2	1	2
KHANDWA	59.33	1	5	1	2	2	5	1	1	2	1	2
NA-1568	60.00	1	5	1	3	2	5	1	1	2	1	2
RAH-8794	56.66	1	5	1	2	2	5	1	1	3	1	2
COP-420	61.33	1	3	1	2	2	5	1	1	2	1	2
LH-1566	57.33	1	3	1	3	2	5	1	1	3	1	1
JK-206-2	54.33	1	5	1	2	2	9	9	1	2	1	2
CCH-16	55.67	1	3	1	2	2	5	1	1	2	1	2
CSH-17	49.67	1	5	1	2	2	5	1	1	3	9	2
SFA-5	50.12	1	3	1	3	2	5	1	1	3	1	2
ICMF-23	56.67	1	5	1	3	2	9	1	1	2	1	1
K-153	59.67	1	5	1	2	2	5	1	1	2	1	2
CIPRAN-2361	57.67	1	3	1	2	2	5	9	1	2	1	2
ICMF-83	62.33	1	3	1	2	2	5	1	1	3	1	2
ADB-10050	55.67	1	5	1	2	2	5	1	1	3	1	2
ICMF-86	54.67	1	3	1	2	2	5	1	1	2	1	2
AET-5	54.58	1	3	3	3	2	5	1	1	3	1	1
CNH-7-947	54.00	1	5	1	2	2	9	1	1	2	1	2
NA-1650	62.33	1	5	3	2	2	5	1	1	2	9	2
GJHU-302	54.33	1	5	1	2	2	5	1	1	3	1	1
K-390-2	55.33	1	3	1	3	2	5	1	1	2	1	2
TCH-1599	59.00	1	5	1	3	2	5	9	1	2	1	2
HLS-323	54.33	1	5	1	2	2	5	1	1	3	9	2
LH-960	50.33	1	5	3	3	2	5	1	1	3	1	2
4084	52.67	1	5	1	2	2	5	1	1	2	1	2

S.No.	GENOTYPE	FC	AC	BS	BC	B-SHAPE	BT	PH	FL	FS	FF	FU
1.	BWR 39	1	2	5	1	3	2	5	5	3	5	7
2.	KH-11	1	2	5	1	3	2	5	5	5	7	7
3.	L-725	1	3	3	1	2	1	5	5	5	5	7
4.	SA-1104	1	3	5	1	3	2	5	5	5	5	7
5.	NA-1584	1	2	5	1	2	2	5	5	5	5	7
6.	BADANWAR	1	3	5	1	3	2	5	5	3	5	7
7.	NA-1588	1	2	5	1	1	2	5	5	3	5	7
8.	D.S-26	1	2	5	1	3	2	5	5	5	5	7
9.	4085	1	2	5	1	3	2	5	5	3	5	7
10.	CPD-755	1	3	5	1	3	2	5	5	5	7	7
11.	LAXMI	1	2	5	1	3	1	5	5	5	7	7
12.	BWR-61	1	2	5	1	3	2	5	5	3	5	7
13.	RAH-100	1	2	5	1	3	2	5	5	3	5	7
14.	CNH-301	1	2	3	1	2	2	5	5	3	7	7
15.	ACOLA-2	1	3	5	1	3	2	5	5	5	5	7
16.	CSH-3167	1	3	5	1	3	2	5	5	5	5	7
17.	CPD-431	9	2	5	1	3	2	5	5	5	3	7
18.	AC-88	1	2	5	1	2	2	3	5	5	5	7
19.	NA-1678	1	2	5	1	3	2	5	5	5	5	7
20.	CCH-05-2	1	2	5	1	3	2	5	5	3	5	7
21.	DS-56	1	3	5	1	2	1	5	5	5	5	7
22.	CCH-1071	1	2	5	1	2	1	5	5	3	5	7
23.	VIKRAM	1	2	5	1	3	2	5	5	5	5	7
24.	RAH-101	1	3	5	1	1	2	5	5	5	5	7
25.	CNH-120 MB	1	3	5	1	2	2	5	5	3	5	7
26.	JK-276-10-5	1	2	5	1	3	2	5	5	3	5	7
27.	KHANDWA	1	2	5	1	2	2	3	5	3	5	7
28.	NA-1568	1	2	3	1	2	2	5	5	3	5	7
29.	RAH-8794	1	2	5	1	3	2	5	5	3	5	7
30.	COP-420	1	2	5	1	3	1	3	5	3	5	7
31.	LH-1566	1	3	5	1	2	2	5	5	3	5	7
32.	JK-206-2	1	2	5	1	2	1	3	5	5	5	7
33.	CCH-16	1	3	5	1	2	2	3	7	5	5	7
34.	CSH-17	9	3	3	1	2	2	5	3	3	7	7
35.	SFA-5	1	2	5	1	2	2	3	5	5	5	7
36.	ICMF-23	1	3	5	1	2	2	3	5	5	5	7
37.	K-153	1	2	5	1	2	1	7	5	5	5	7
38.	CIPRAN-2361	9	2	3	1	2	2	5	5	5	3	7
39.	ICMF-83	1	2	5	1	3	1	5	5	5	5	7
40.	ADB-10050	1	3	5	1	3	2	3	5	5	5	7
41.	ICMF-86	1	2	3	1	3	1	5	5	5	5	7
42.	AET-5	1	2	3	1	2	1	5	5	5	3	7
43.	CNH-7-947	1	3	5	1	2	2	5	5	5	5	7
44.	NA-1650	9	2	3	1	3	2	5	5	5	5	7
45.	GJHU-302	1	2	5	1	2	2	3	5	5	7	7
46.	K-390-2	1	3	3	1	3	2	7	5	5	7	7
47.	TCH-1599	1	2	5	1	2	2	3	5	5	5	7
48.	HLS-323	1	2	5	1	2	2	5	5	5	5	7
49.	LH-960	1	2	5	1	2	1	3	5	5	5	7
50.	4084	1	2	5	1	2	2	3	5	5	5	7

type), leaf colour, leaf appearance (Flat), leaf gossypol glands and leaf nectaries. Large leaf size is helpful to bring optimum plant growth with high dry matter accumulation. Presence of leaf gossypol glands is good for the plant as it had antibiosis effect on insects like Bollworms, black flea hopper (Bottger *et al.,* 1964). Nectariless cottons help in controlling the pink bollworm damage and also reduction in attack of tarnished plant bugs (Mc Carty *et al.,* 1983) but no line is showing this character.

Hairiness on the leaves and modified leaves are common cotton characteristic and among fifty lines four lines showed strong pubescence and 46 lines were medium in pubescence Table 3. Green leaf colour is a common characteristic and all lines showed green leaf character only. Leaf lobes are five in 10 lines and three in remaining 40 lines. Leaf shape is okra in 3 lines and the remaining 47 lines had normal palmate leaf shape which is conducive for the egg lying by bollworms.

Bract is normal and the number of serrations on the bract is many in all the lines. Sepal pigmentation is absent in all the fifty lines. The cream colour is a common petal characteristic of upland cotton in 33 lines and yellow colour in 17 lines. Petal spot is present in five lines out of 50 lines which is a distinguishing character of Acala and Pima cottons and can be used as character for the parental or varietal identification. Stigma is exerted in most of the lines (46) and embedded in 4 lines. Filament colouration is absent in 46 lines out of fifty lines. Anther colour is cream in 26 lines and yellow in 14 lines.

Boll bearing habit is solitary and Boll size is medium in 41 lines and remaining 9 lines had small boll size. Boll colour is green in all 50 lines. Boll shape is round in 2 lines, elliptic in 24 lines and ovate in remaining 24 lines. Boll prominence at tip is blunt in 11 lines and pointed in remaining 39 lines. Boll opening is open in all the lines. Plant habit is indeterminate in all the lines and is the common character in cotton.

The plant height showed variation from 86 to 121cm among the lines. Most of the germplasm lines have the height of medium (90-120) stature which is preferred mostly for breeding programmes to make them adoptable to picker harvesting.

The variability of the fiber properties in cotton is an unfavorable element in a market that pits this natural fiber against artificial more uniform products represented by synthetic fibers. Most of the germplasm lines evaluated *i.e.,* 48 were considered as having medium fiber length between 25.0 to 30.0 mm while one line (CSH-17) had short length and one line (CCH-16) showed long fiber length. 50 germplasm lines had good fiber uniformity.

Thirty three had medium fiber strength (21.0 to 25.0 g/ tex) and 17 lines had fiber strength of below 20.0 g/tex. High fiber strength lines are desirable as fiber strength is directly correlated with yarn tenacity (Suh *et al.,* 1998). Forty germplasm lines had medium fiber fineness, 3 lines had fine fiber and seven lines had coarse fiber characteristics.

The characterization of the germplasm using IBPGR descriptors is helpful for varietal identification and protection. The fifty lines are reservoirs for different parameters and they can be exploited for different breeding programmes for breeding pest resistance and quality parameters improvement.

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