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Research Article

MORPHOLOGICAL CHARACTERIZATION OF AMERICAN COTTON HYBRIDS AND PARENTAL LINES

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ABSTRACT
Cotton is the king of fibre crop and is the most important commercial crop of India. The genus *Gossypium* is having 50 species among which 4 are cultivable which are *Gossypium hirsutum* L., *Gossypium barbadense* L., *G. herbaceum* L. and *Gossypium arboreum* L. The varieties and hybrids attain acceptance when the farmer gets genetically pure seeds of high standards. Keeping in view the importance of pure seeds the present investigations were carried out to study the varietal characterization of four inter specific (H 1098i X GCW 289, H 1098i X GCW278, HS6 X GCW117 and H 1098i X GCW 136) cotton hybrids and their parents for various morphological characters. The field studies were carried out during *kharif* 2010-11 and 2011-12 to study the morphological characterization of parents and their hybrids. Twenty five morphological characters were studied according to National DUS test guidelines for qualitative morphological characters listed by PPV FR, New Delhi for cotton crop. Genotypes were grouped in accordance to their morphological characters. Stem pigmentation and petal colour are the most important characters for varietal identification and variation was observed among the genotypes for these characters. Frego bract was observed in only one genotype i.e. GCW 136 and rest were of normal type. Variation was observed among for all the characters among genotypes and their hybrids except for the leaf nectarines, gossypol glands, growth habit, bract serrations, position of stigma, filament colouration, petal spot, boll bearing habit and boll surface.

Keywords: *Cotton, Gossypium, Hybrids, Parental Lines, Genotypes, Morphological Characters*

INTRODUCTION
Cotton is the king of fibre crop and is the most important commercial crop of India, assumes place of pride in the Indian economy which continues to be the predominant fibre in the Indian textile scene, despite stiff competition from the man-made synthetic fibres. Cotton production, processing and trade in cotton goods provide employment to about 60 million people in our country. The genus *Gossypium* is having 50 species among which 4 are cultivable with spinnable lint, while 44 are wild diploids and two are wild tetraploids (Percival and Kohel, 1990). Out of the four cultivated species, *Gossypium hirsutum* L. and *Gossypium barbadense* L. commonly called as new world cotton which is tetraploid (2n = 4x = 52), whereas, *G. herbaceum* L. and *Gossypium arboreum* L. are diploid (2n = 2x = 26) and are commonly known as old world cotton.
Descriptors of varieties of crop species are required for characterization of varietal identity, determine varietal purity and establish the distinctiveness of new variety from existing varieties and documentation of genetic resources. In early days, all over the world, a small list of descriptors was sufficient to distinguish between crop varieties in use.
However, in the recent decades, the world witnessed the emergence of large and highly competitive variety development programmes, particularly in the developed countries and also in some of the developing countries.
At the global level, a large number of new candidate varieties are being generated for testing every year, thus, underlining the need for establishing their clear-cut diagnostic features. The varieties and hybrids attain acceptance when the farmer gets genetically pure seeds of high standards. For this purpose, each cultivar should be properly defined with suitable descriptors, so, as to maintain its identity during seed production through field inspection and certification.

MATERIALS AND METHODS

The field studies were carried out during *kharif* 2010-11 and 2011-12 to study the morphological characterization of parents and their hybrids. The seed material for the present investigation comprised four hybrids (H 1098i X GCA 289, H 1098i X GCA278, HS6 X GCA117 and H 1098i X GCA 136) and their six parents of cotton (H 1098i, GCA 289, GCA278, HS6, GCA117 and GCA 136). The experimental design used was Randomized Block Design with three replications, one row of each genotype was sown with row length 6.0 m, row to row distance 67.5 cm, plant to plant distance 30 cm. All the recommended package of practices were followed to raise a good crop. All the recommended agronomic practices were followed to raise the good crop. National DUS test guidelines for qualitative morphological characters listed by PPV FR, New Delhi for cotton crop were used for characterization of the hybrid and their parental lines. The leaf characters of five randomly selected and tagged plants in each treatment and replication were used to differentiate the cotton hybrids and their parental lines under study based on visual assessment.

Fourth leaf from the top of the plant was used for leaf characters such as leaf shape, leaf colour, Leaf appearance, Leaf nectaries, Leaf petiole pigmentation, Leaf gossypol glands and Leaf lobe number at peak flowering stage. Based on visual assessment leaf shape were classified as palmate (normal), semi digitate (semi okra) and digitate (okra), While the leaf colour was classified as green, light green, dark green and dark red colour which was observed under day light condition. The presence or absence of pigmentation on the stem was recorded at peak flowering stage. Hairiness on stem was classified as strong and medium hairs on the stem.

The flower characters such as petal colour, petal spot, anther colour, position of stigma, boll shape, bract type and number of serrations on bract were recorded at peak flowering stage. The colour of the petal was classified as cream and yellow colour. While the colour of the anther was classified as cream, yellow and deep yellow colour. The boll shape was recorded before boll bursting and classified as rounded, ovate and elliptic whereas the boll opening was classified as opened and semi opened. The position of stigma was classified as embedded and exerted. The bract type based on the visual assessment classified as normal and frego. Petal colour was classified as yellow, cream, red and bicolour whereas petal spot and filament colouration was classified as present or absent.

RESULTS AND DISCUSSION

The results obtained in the present investigations have been presented in tables 1, 2 & 3. The shape of the leaves of cotton genotypes were grouped as palmate, digitate and semi digitate, while the leaf colour was grouped as light green, green and dark red.

Variation in the leaf shape and colour of the leaf was observed among the genotypes and it may be due to genetic characters of parents and may vary due to soil, environmental, cultural and nutritional factors during crop growth (Aruna *et al.*, 2012).

Leaf nectarines and leaf gossypol glands were present in all the genotypes, whereas in case of leaf appearance two genotypes i.e. GCW 278 and GCW 117) were of flat types and rest were of cup shaped (Chen, 1987; Pooja *et al.*, 2016).

The character leaf petiole and stem pigmentation was present in one genotype (GCW 289) and it was also present in hybrid of that genotype indicated that this character was governed by dominant gene in parent (Ponnuswamy *et al.*, 2003).

Stem pigmentation is one of the conspicuous in varietal characterization and pigmentation is clearly visible at fully matured stage (Shen *et al.*, 1987; Pooja *et al.*, 2016) and it was present in genotype GCW 289 and hybrid H 1098 ix GCW 289. Pigmentation of stem is governed by dominant gene in *Gossypium hirsutum*. Stem hairiness was strong in two parents and their hybrids indicating that this character is governed by dominant gene.

No variation in plant morphological characters was noticed among the genotypes and their hybrids for their growth habit, bract serrations, position of stigma, filament colouration, petal spot, boll bearing habit and boll surface (Kolanov, 1987).

Table 1: Morphological Character of Hybrids and their Parental Lines

Parent/Hybrid	Leaf Shape	Leaf Colour	Leaf Appearance	Leaf Nectaries	Leaf Petiole Pigmentation	Leaf Gossypol Glands	Leaf Lobe Number	Stem Pigmentation	Stem Hairiness	Bract Type
GCW 136	Palmate	Green	Cup	Present	Absent	Present	Five	Absent	Medium	Frego
GCW 289	Palmate	Dark red	Cup	Present	Present	Present	Five	Present	Medium	Normal
H1098i	Palmate	Green	Cup	Present	Absent	Present	Five	Absent	strong	Normal
GCW278	Digitate	Green	Flat	Present	Absent	Present	Five	Absent	Medium	Normal
GCW 117	Palmate	Green	Flat	Present	Absent	Present	Three	Absent	Medium	Normal
HS6	Palmate	Light green	Cup	Present	Absent	Present	Five	Absent	Strong	Normal
H1098i X GCA 289	Palmate	Dark red	Cup	Present	Present	Present	Five	Present	Medium	Normal
H1098i X GCW278	Semidigitate	Green	Cup	Present	Absent	Present	Five	Absent	Medium	Normal
HS6 X GCW117	Palmate	Green	Cup	Present	Absent	Present	Five	Absent	Strong	Normal
H1098i X GCW 136	Palmate	Green	Cup	Present	Absent	Present	Five	Absent	Strong	Normal

Table 2: Morphological Character of Hybrids and their Parental Lines

Parent/Hybrid	Bract Serration	Anther Colour	Position of Stigma	Filament Colouration	Petal Colour	Petal Spotting	Sepal Pigmentation	Plant Growth Habit	Boll Bearing Habit	Boll Colour
GCW 136	Many	Cream	Embedded	Absent	Yellow	Absent	Absent	indeterminate	Solitary	Green
GCW 289	Many	Yellow	Embedded	Absent	Red	Absent	Present	indeterminate	Solitary	Red
H1098i	Many	Cream	Embedded	Absent	Cream	Absent	Absent	indeterminate	Solitary	Green
GCW278	Many	Cream	Embedded	Absent	Yellow	Absent	Absent	indeterminate	Solitary	Green
GCW 117	Many	Yellow	Embedded	Absent	Yellow	Absent	Absent	indeterminate	Solitary	Green
HS6	Many	Cream	Embedded	Absent	Cream	Absent	Absent	indeterminate	Solitary	Green
H1098i X GCA 289	Many	Yellow	Embedded	Absent	Bicolor	Absent	Present	indeterminate	Solitary	Red
H1098i X GCW278	Many	Cream	Embedded	Absent	Yellow	Absent	Absent	indeterminate	Solitary	Green
HS6 X GCW117	Many	Cream	Embedded	Absent	Yellow	Absent	Absent	indeterminate	Solitary	Green
H1098i X GCW 136	Many	Cream	Embedded	Absent	Yellow	Absent	Absent	indeterminate	Solitary	Green

Table 3: Morphological Character of Hybrids and their Parental Lines

Parent/Hybrid	Boll Surface	Boll Tip Prominence	Leaf Lobe Number	Boll Opening	Boll Shape	Boll Size
GCW 136	Smooth	Pointed	Five	Open	Ovate	Medium
GCW 289	Smooth	Pointed	Five	Open	Ovate	Medium
H1098i	Smooth	Pointed	Five	Open	Ovate	Large
GCW278	Smooth	Pointed	Five	Open	Ovate	Medium
GCW 117	Smooth	Blunt	Three	Open	Ovate	Medium
HS6	Smooth	Pointed	Five	Semi open	Elliptic	Large
H1098i X GCA 289	Smooth	Pointed	Five	Open	Ovate	Medium
H1098i X GCW278	Smooth	Pointed	Five	Open	Ovate	Large
HS6 X GCW117	Smooth	Pointed	Five	Semi open	Ovate	Medium
H1098i X GCW 136	Smooth	Pointed	Five	Semi open	Ovate	Medium

Boll tip prominence was blunt and leaf lobe numbers were three in the genotype GCW 117 whereas it was observed pointed and five leaf lobe numbers in rest of the genotypes. In case of boll shape elliptic type of boll was observed in genotype HS 6 and ovate was in other genotypes. Large type of boll size was examined in genotypes H 1098-i, HS 6 and hybrid (H1098-i x GCW 278). The Petal colour is one of the most important character for identification and characterization of the genotypes, this is because it is governed by genes. Petal spot is used as the marker character for varietal identification and it is very useful character in plant breeding point of view (Reddy *et al.*, 2007; Ahuja *et al.*, 2009; Pooja *et al.*, 2016). Frego bract was observed in only one genotype i.e. GCW 136 and rest were of normal type. The bract type is also a very unique character as it is also governed by genes but from breeding point of view it is not a desirable character as it exposed the floral parts to insects.

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