DUS TESTING IN COTTON GENOTYPES

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ABSTRACT: Cotton is one of the economic crops of global importance. Protection of Plant varieties and Farmers Right Act (2001) insists on Distinctness, Uniformity and Stability (DUS) characterization of extant, farmers and new varieties and recommends the registration of varieties for any one specific novel character. The experimental material for the present investigation comprised of 28 Bt cotton hybrids of different companies, one non Bt check hybrid (HHH 223) with its parental lines and one non Bt check variety (H 1226). The studies were undertaken on the basis of DUS testing guidelines and experimental material was sown in the Research Area, Cotton Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar. Among the morphological characters studied flower petal colour, pollen colour, boll shape, leaf hairiness, plant growth habit, tip of the boll, position of stigma, plant height, boll weight, seed index, ginning out turn, fibre length, fibre strength, fibre fineness, fibre uniformity and fibre maturity proved to be useful and stable diagnostic characters which could classify the genotypes based on the phenotypic traits.

Keywords: DUS, cotton, morphological, fibre traits.

Cotton (*Gossypium hirsutum L.*) is currently the leading plant fibre crop worldwide and is grown commercially in the temperate and tropical regions of more than 50 countries. It is fibre, oil and protein yielding crop that plays a crucial role in the economy of India. For multiple use of lint and byproducts cotton is also referred as "White Gold". A classical breeding has contributed tremendously in terms of quality and yield, further improvements in yield, fibre strength, length, water absorption and thermal properties are required for textile and other industrial applications. The potentials for improving these properties through classical breeding are limited. New technological advancement over the last decades in the field of genetics and plant breeding has provided the superior tools for detailed genetic analysis of agricultural crops. 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. It means that the new variety has to be Distinct-Uniform-Stable (DUS) in its characteristics. Distinct means, a variety should be clearly distinguishable by one or more essential characteristics from any other existing variety. The variety is deemed uniform, if it is sufficiently uniform in its relevant characteristics, subject to variation that may be expected from the particular features of its population. The variety is said to be stable, if its relevant characteristics remain unchanged after repeated propagation. National DUS test guidelines for qualitative morphological characters listed by PPV FRA (Anonymous 2001), New Delhi for cotton crop were used for characterization of the genotypes.

The experimental material (28 Bt cotton hybrids, one non Bt check hybrid with its parental lines and one non Bt check variety) was planted in randomized block design with three replications, during kharif 2010-11, there were four rows of six meter length of each hybrid with a spacing of 100 x 60 cm. All the recommended package of practices were followed to raise a good

crop. Five competitive plants were selected randomly from each genotype in each replication. These plants were used for recording of data for different characters. The qualitative traits used were namely, Hypocotyl pigmentation, leaf colour, leaf hairiness, leaf nectarines, leaf petiole pigmentation, leaf shape, stem hairiness, stem pigmentation, bract type, flower petal colour, flower petal spot, flower stigma, flower anther filament colour, pollen colour, boll bearing habit, boll colour, boll shape, boll surface, boll tip, boll opening, seed fuzz, seed fuzz colour, seed index, lint index and other quality and fibre parameters etc.

The experimental material was characterized on the basis of morphological traits recorded in the field at different stages of plant growth for the identification of possible descriptors. Among the morphological characters studied flower petal colour, pollen colour, boll shape, leaf hairiness, plant growth habit, tip of the boll, position of stigma, plant height, boll weight, seed index, ginning out turn, fibre length, fibre strength, fibre fineness, fibre uniformity and fibre maturity proved to be useful and stable diagnostic characters which could classify the genotypes based on the phenotypic traits (Table 1) Similar grouping was reported by Padmavathi et al., (2009), Aruna et al., (2012) and Tulasi et al., (2012) in cotton.

Whereas the traits like hypocotyl pigmentation, leaf colour, leaf appearance, leaf gossypol glands, leaf nectaries, leaf petiole pigmentation, leaf shape, plant stem hairiness, plant stem pigmentation, bract type, flower petal spot, flower anther filament colouration, boll bearing habit, boll colour, boll surface, boll opening and seed fuzz colour showed similarity for the genotypes. The flower petal colour classified the genotypes into two categories i.e. cream and yellow petal colour, similarly for the

flower pollen colour there were two classes cream and yellow pollen colour. For the leaf hairiness genotypes were classified as medium and sparse hairiness, while the plant growth habit classified the genotypes in two categories spreading and semi spreading. According to tip of boll the genotypes were classified as pointed or blunt tip. For the position of stigma there were two classes as embedded or exerted stigma. The plant height classified the genotypes into three categories medium, tall and very tall, while for the boll weight there were two categories i.e. small and medium.

The seed index categorized the genotypes into medium, bold and very bold where as for the ginning out turn there were four categories low, medium, high and very high. For the fibre quality traits there were three categories for the fibre length and fibre strength i.e. medium long, long & extra long and weak, medium & strong respectively, while for the fibre fineness and fibre maturity there were two categories medium & fine and good & average maturity group. Considering plant growth habit as the primary character, 32 genotypes were grouped under two categories spreading and semi spreading, which were further classified based on boll shape into two groups each of ovate and round. Further classification was based on flower petal colour and then flower pollen colour which could separate out Ankur Jai Bt, MRC 6025 Bt, MRC 6304 Bt, Tulsi 162 II, VICH 308 II and SP 7010 II. Seed fuzz and leaf hairiness could further separate out ABCH 1020 II and Bioseed 6588 II. So the path could be key diagnostic feature for characterization of genotypes. Similarly Singh (1995) also prepared flow chart for identifying genotype on the basis of various observations recorded, while Patil and Suryawanshi (1996) prepared bulletin for diagnostic morphological characteristics of cotton.

Table 1: Classification of genotypes based on morphological traits.

Classification	Cream	Yellow
Flower petal colour	MRC 6304 Bt, MRC 6025 Bt, Ankur Jai Bt, Cot 33 Bt, VICH 307 BG II, NCS 902 Bt, Tulasi 162 BG II, RCH 134 BG II, H1157, H1220, HHH223, H1226	Mist BG II, Namcot 617 BG II, ABCH 1165 Bt, ABCH 1020 BG II, JKCH 1947 Bt, JKCH 1050, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 308 BG II, VICH 309 BG II, VICH 310 BG II, SP 7010 BG II, SP 7007 BG II, IT 905 Bt, NCS 904 Bt, NCS 858 BG II, NCS 855 BG II, Tulasi 4 BG II, RCH 134 Bt

Classification	Cream	Yellow
Flower pollen colour	MRC 6304 Bt, Cot 33 Bt, VICH 307 BG II, NCS 902 Bt, Mist BG II, JKCH 1947 Bt, JKCH 1050, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 308 BG II, VICH 309 BG II, SP 7007 BG II, IT 905 Bt, NCS 904 Bt, NCS 858 BG II, NCS 855 BG II, RCH 134 Bt RCH 134 BG II, H1157, H1220, HHH223, H1226	MRC 6025 Bt, Ankur Jai Bt, Namcot 617 BG II, ABCH 1165 Bt, ABCH 1020 BG II, VICH 310 BG II, SP 7010 BG II, Tulasi 4 BG II, Tulasi 162 BG II

Classification	Medium	Sparse
Leaf hairiness	MRC 6304 Bt, Cot 33 Bt, VICH 307 BG II, NCS 902 Bt, Mist BG II, JKCH 1050, MRC 6025 Bt, Ankur Jai Bt, Namcot 617 BG II, ABCH 1165 Bt, VICH 310 BG II, SP 7010 BG II, Tulasi 4 BG II, Tulasi 162 BG II, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 308 BG II, VICH 309 BG II, SP 7007 BG II, IT 905 Bt, NCS 904 Bt, NCS 858 BG II, NCS 855 BG II, RCH 134 Bt RCH 134 BG II, H1157, H1220, HHH223, H1226	JKCH 1947 Bt, ABCH 1020 BG II

Classification	Spreading	Semi spreading
Plant growth habit	Ankur Jai Bt, Cot 33 Bt, Namcot 617 BG II, ABCH 1020 BG II, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 310 BG II, IT 905 Bt, NCS 902 Bt, RCH 134 Bt and RCH 134 BG II	MRC 6304 Bt, VICH 307 BG II, Mist BG II, JKCH 1947 Bt, JKCH 1050, MRC 6025 Bt, ABCH 1165 Bt, SP 7010 BG II, Tulasi 4 BG II, Tulasi 162 BG II, VICH 308 BG II, VICH 309 BG II, SP 7007 BG II, NCS 904 Bt, NCS 858 BG II, NCS 855 BG II, H1157, H1220, HHH223, H1226

Classification	Pointed	Blunt
Prominence of tip in boll	JKCH 1947 Bt, ABCH 1020 BG II, MRC 6304 Bt, Cot 33 Bt, VICH 307 BG II, NCS 902 Bt, Mist BG II, JKCH 1050, MRC 6025 Bt, Ankur Jai Bt, Namcot 617 BG II, ABCH 1165 Bt, VICH 310 BG II, SP 7010 BG II, Tulasi 4 BG II, Tulasi 162 BG II, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 309 BG II, SP 7007 BG II, IT 905 Bt, NCS 904 Bt, NCS 858 BG II, NCS 855 BG II, RCH 134 Bt RCH 134 BG II, H1157, H1220, HHH223, H1226	VICH 308 BG II

Classification	Embedded	Exerted
Flower stigma	JKCH 1947 Bt, ABCH 1020 BG II, MRC 6304 Bt, Cot 33 Bt, VICH 307 BG II, NCS 902 Bt, Mist BG II, JKCH 1050, MRC 6025 Bt, Ankur Jai Bt, Namcot 617 BG II, ABCH 1165 Bt, VICH 308 BG II, VICH 310 BG II, SP 7010 BG II, Tulasi 4 BG II, Tulasi 162 BG II, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 309 BG II, SP 7007 BG II, IT 905 Bt, NCS 904 Bt, NCS 858 BG II, NCS 855 BG II, RCH 134 Bt, RCH 134 BG II, H1220, HHH223, H1226	H1157

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Classification	Ovate	Round
Boll shape	JKCH 1947 Bt, ABCH 1020 BG II, MRC 6304 Bt, Cot 33 Bt, NCS 902 Bt, Mist BG II, JKCH 1050, MRC 6025 Bt, Ankur Jai Bt, Namcot 617 BG II, ABCH 1165 Bt, VICH 310 BG II, Tulasi 4 BG II, Bioseed 6588 BG II, VICH 309 BG II, SP 7007 BG II, IT 905 Bt, NCS 904 Bt, NCS 858 BG II, NCS 855 BG II, RCH 134, Bt RCH 134 BG II	Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 307 BG II, VICH 308 BG II, SP 7010 BG II, Tulasi 162 BG II, H 1157, H 1220, HHH 223, H 1226

Classification	Medium	Tall	Very tall
Plant height	Namcot 617 BG II	MRC 6304 Bt, MRC 6025 Bt, Cot 33 Bt, Mist BG II, ABCH 1165 Bt, ABCH 1020 BG II, VICH 307 BG II, VICH 308 BG II, SP 7010 BG II, IT 905 Bt, NCS 858 BG II, Tulsi 4 BG II, Tulsi 162 BG II, H 1157, H 1220, HHH 223 and H 1226.	Ankur Jai Bt, JKCH 1947 Bt, JKCH 1050 Bt, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 309 BG II, VICH 310 BG II, NCS 904 Bt, SP 7007 BG II, NCS 902 Bt, NCS 855 BG II, RCH 134 Bt, RCH 134 BG II.

Classification	Small	Medium
Boll weight	Cot 33 Bt, ABCH 1165 Bt, ABCH 1020 BG II, JKCH 1947 Bt, JKCH 1050 Bt, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 307 BG II, VICH 308 BG II, VICH 309 BG II, VICH 310 BG II, SP 7007 BG II, IT 905 Bt, NCS 904 Bt, NCS 902 Bt, RCH 134 Bt, RCH 134 BG II, H 1157, H 1220, HHH 223, H 1226	MRC 6304 Bt, MRC 6025 Bt, Ankur Jai Bt, Mist BG II, Namcot 617 BG II, Bioseed 6588 BG II, SP 7010 BG II, NCS 858 BG II, NCS 855 BG II, Tulsi 4 BG II, Tulsi 162 BG II

Classification	Medium	Bold	Very bold
Seed index	MRC 6304 Bt, Mist BG II, ABCH 1165 Bt, JKCH 1947 Bt, JKCH 1050 Bt, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 307 BG II, VICH 309 BG II, SP 7010 BG II, SP 7007 BG II, IT 905 Bt, NCS 904 Bt, NCS 858 BG II, NCS 855 BG II, RCH 134 Bt, H 1157, H 1220, HHH 223, H 1226	MRC 6025 Bt, Ankur Jai Bt, Cot 33 Bt, Namcot 617 BG II, ABCH 1020 BG II, VICH 308 BG II, VICH 310 BG II, NCS 902 Bt, Tulsi 4 BG II, RCH 134 BG II	Tulsi 162 BG II

Classification	Low	Medium	High	Very high
Ginning out turn	MRC 6025 Bt, ABCH 1020 BG II, Tulsi 4 BG II, Tulsi 162 BG II, H 1220, H 1226	MRC 6304 Bt, Ankur Jai Bt, Namcot 617 BG II, VICH 308 BG II, VICH 310 BG II, NCS 902 Bt, RCH 134 BG II, H 1157, HHH 223	Cot 33 Bt, Mist BG II, ABCH 1165 Bt, JKCH 1947 Bt, JKCH 1050 Bt, VICH 307 BG II, VICH 309 BG II, SP 7010 BG II, IT 905 Bt, NCS 904 Bt, NCS 855 BG II, RCH 134 Bt	Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, SP 7007 BG II, NCS 858 BG II

Classification	Medium long	Long	Extra long
Fibre length	SP 7007 BG II, HHH 223, H 1226	MRC 6304 Bt, MRC 6025 Bt, Ankur Jai Bt, Cot 33 Bt, Mist BG II, Namcot 617 BG II, ABCH 1165 Bt, JKCH 1947 Bt, JKCH 1050 Bt, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 307 BG II, VICH 308 BG II, VICH 309 BG II, VICH 310 BG II, SP 7010 BG II, IT 905 Bt, NCS 904 Bt, NCS 858 BG II, NCS 902 Bt, NCS 855 BG II, Tulsi 4 BG II, Tulsi 162 BG II, RCH 134 Bt, RCH 134 BG II, H 1220	ABCH 1020 BG II, H 1157

Classification	Weak	Medium	Strong
Fibre strength	Mist BG II	MRC 6304 Bt, MRC 6025 Bt, Ankur Jai Bt, Cot 33 Bt, Namcot 617 BG II, ABCH 1165 Bt, ABCH 1020 BG II, JKCH 1947 Bt, JKCH 1050 Bt, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 307 BG II, VICH 308 BG II, VICH 309 BG II, VICH 310 BG II, SP 7010 BG II, SP 7007 BG II, NCS 904 Bt, NCS 858 BG II, RCH 134 BG II, H 1157, H 1220, HHH 223, H 1226	Bioseed 6588 BG II, IT 905 Bt, NCS 902 Bt, NCS 855 BG II, Tulsi 4 BG II, Tulsi 162 BG II, RCH 134 Bt

Classification	Medium	Fine
Fibre fineness	MRC 6304 Bt, MRC 6025 Bt, Ankur Jai Bt, Cot 33 Bt, Mist BG II, Namcot 617 BG II, ABCH 1165 Bt, ABCH 1020 BG II, JKCH 1947 Bt, JKCH 1050 Bt, Bioseed 6588 BG II, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 308 BG II, VICH 309 BG II, VICH 310 BG II, SP 7010 BG II, SP 7007 BG II, IT 905 Bt, NCS 904 Bt, NCS 858 BG II, NCS 855 BG II, Tulsi 162 BG II, RCH 134 Bt, RCH 134 BG II, H 1157, H 1220, HHH 223, H 1226	VICH 307 BG II, NCS 902 Bt, Tulsi 4 BG II

Classification	Poor	Fair	Average	Good	Excellent
Fibre uniformity	H 1220	MRC 6304 Bt, MRC 6025 Bt, ABCH 1165 Bt, RCH 134 BG II	Ankur Jai Bt, Mist BG II, Namcot 617 BG II, ABCH 1020 BG II, JKCH 1947 Bt, VICH 308 BG II, VICH 310 BG II, SP 7010 BG II, IT 905 Bt, H 1157	Cot 33 Bt, Bioseed 6488 Bt, Bioseed 6488 BG II, VICH 309 BG II, NCS 902 Bt, NCS 855 BG II, Tulsi 4 BG II, RCH 134 Bt, HHH 223	JKCH 1050 Bt, Bioseed 6588 BG II, VICH 307 BG II, SP 7007 BG II, NCS 904 Bt, NCS 858 BG II, Tulsi 162 BG II, H 1226

These results were in conformity with the observations made by Patil and Suryawanshi (1996), Reddy et al., (2007), Padmavathi et al., (2009) and Tulasi et al., (2012) in cotton.

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