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DUS CHARACTERIZATION TEST OF UPLAND COTTON (*GOSSYPIUM HIRSUTUM* L.) FOR QUANTITATIVE CHARACTERS

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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 studies were undertaken on the basis of DUS testing guidelines using 10 varieties of cotton (*Gossypium hirsutum* L.). The experiment was conducted in the Experimental farm, Department of Genetics & Plant Breeding, Annamalai University, Annamalai Nagar-608002 during Kharif season, 2019. The morphological traits plant height (cm), plant growth habit, days to fifty percent flowering (days), boll weight (g) and seed index (100 seed weight in gram) were observed as grouping traits. All the varieties were grouped into different categories for each character based on 30 descriptors which may be used as reference varieties. The results revealed that all varieties showed considerable variation in 5 qualitative characters. The characterization of extant varieties was completed to establish distinctness of candidate variety from all other varieties to utilize these genotypes in further identification and improvement.
Keywords: DUS, cotton, morphological, Quantitative characters.

Introduction

Cotton is a principle fiber crop of global importance and has high commercial value which provides raw material in the form of lint to the textile industry. India remains the leading country in terms of area under cotton cultivation and raw cotton production in the world. As per CAB estimate, cotton production in India during 2017-18 was 377 lakh bales of 170 kg from 122 lakh hectares with a productivity of 524 kg lint/ha. In the year 2017-18, Gujarat, Maharashtra and Telangana were the major cotton growing states covering around 71% (86.4 lakh hectare) in area under cotton cultivation and 65% (246 lakh bales) of cotton production in India. There was significant increase (22%) in area under cotton estimated in South zone this year (Germplasm Resources Information Network (GRIN). Agricultural Research Service, 2017). In Tamil Nadu, cotton consumption is increasing day by day, beyond 100 lakhs bales per annum while our production remains static i.e. 6 lakhs bales per annum (in lakh bales of 170 kg). The area of cotton has declined from 2.5 lakhs ha (1998-99) to 1.48 lakhs ha (2017-18) (Cotton Statistics & News, Cotton Association Of India, 2018-19)

Gossypium hirsutum is an upland cotton, native to Central America, Mexico, the Caribbean and southern Florida (90% of world production). It is also known as upland cotton or Mexican cotton, is the most widely planted species of cotton in the world. Globally, about 90% of all cotton production is of cultivars derived from this species (Smith and Stephens, 1971; Wendel *et al.,* 1992).

Gossypium hirsutum includes a number of varieties or cross-bred cultivars with varying fiber lengths and tolerances to a number of growing conditions. The longer length varieties are called "long staple upland" and the shorter length varieties are referred to as "short staple upland". The long staple varieties are the most widely cultivated in commercial production (U.S. Forest Service, 2003; ICAR, 2017).

Under the "Protection of Plant Varieties and Farmers' Rights Act", a new plant variety can be registered and protected for a specific duration; 15 years for annuals and 18 years for vines and trees. Registration and protection can be granted to a variety only if it conforms to the criteria of Distinctness, Uniformity and stability. It means that the new variety has to Distinct- Uniform-Stable (DUS) in its characteristics.[9] This requires the examination of the variety if it conforms to the standards of DUS test. The examination of a variety for DUS generates a description of the Variety, using its relevant characteristics. In this experiment the DUS characters test of upland cotton (*Gossypium hirsutum* L.) was conducted in 10 varieties.

Materials and Methods

Ten varieties of cotton (Table 1) were grown in a Randomized Block Design at the Experimental farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalainagar situated at 11° 24' 0 N latitude, 79° 43' 60 E longitude and altitude of 734 m above mean sea level, during the *Kharif* season 2019 and the plants were grown at a spacing of 60cm × 90 cm. Genotypes were evaluated for 30 characters, *viz.,* hypocotyl colour, leaf colour, leaf hairiness, leaf appearance, leaf gossypol glands, leaf nectaries, leaf petiole pigmentation, leaf shape, plant stem hairiness, plant stem pigmentation, plant height (cm), plant growth habit, bract type, time of flowering (50% of plants with at least one open flower), petal colour,

petal spot, stigma, anther colouration, pollen colour, male sterility (only for A and B lines), bearing habit, colour, shape (longitudinal section), boll surface, boll prominence of tip, boll opening, weight of seed cotton/boll (g), seed fuzz, seed fuzz colour, seed index (100 seed wt in gram).Each entry was sown in three rows of 20 plants each. All the cultural practices have been followed. Observations were recorded on 10 randomly selected plants of each genotype for all the traits under study, at different stages of growth with appropriate procedures as per the "Guidelines for the Conduct of Test for DUS on" (PPV & FRA, 2001) (PPV and FR Act. 2001).

Table 1 : List of Varieties

Variety	Collected from
SVPR 2	Srivilliputhur, CRS
SVPR 3	
SVPR 4	
SVPR 5	
SURAJ	TNAU : Cotton Breeding Station, Coimbatore.
CO14	
MCU 5	
MCU 7	
MCU 9	
MCU 13	

Table 2 : Quantitative Characters in Cotton varieties

Sl. No.	Characteristics	States	Observation varieties	Stage of observation (DAS)	Type of assessment
1.	Plant Height (cm)	Dwarf (< 60)	----	75	MS
		Semi dwarf (60 - 90)	----		
		Medium tall (91 – 120)	----		
		Tall (121–150)	SURAJ, CO14, SVPR3.		
		Very tall (> 150)	SVPR2,4,5, MCU5,7,9,13.		
2.	Plant: Growth habit	Zero branching	----	75	MG
		Compact (Spreading < 30 cm)	----		
		Semi-spreading (31-60 cm)	SVPR2,3,4,5, SURAJ, CO14, MCU5,7,9,13.		
		Spreading (>60cm)	----		
3.	Flower: Time of flowering (50% of plants with at least one open flower)	Early (<50 days)	SVPR2,3,5, SURAJ, CO14, MCU7,9,13.	40	MG
		Medium (50-60 days)	SVPR4, MCU5		
		Late (>60 days)	----		
4.	Boll: Weight of seed cotton / boll (g)	Very small (<3.0)	----	75	MS
		Small (3.0-4.0)	CO14,MCU5,7		
		Medium (4.1-5.0)	SVPR2,3,4,5, MCU 9		
		Large (5.1-6.0)	SURAJ, MCU13		
		Very large (>6.0)	----		
5.	Seed: Index (100 seed wt in gram)	Very small (<5.0)	----	95	MS
		Small (5.0-7.0)	----		
		Medium (7.1-9.0)	SVPR2,3,4,5, SURAJ, CO14,MCU5,7,9,13.		
		Bold (7.1-9.0)	----		
		Very bold (>11.0)	----		

MG : Measurement by a single observation of a group of plants or parts of plants
MS : Measurement of a number of individual plants or parts of plants

Results and Discussion

Quantitative Characters

The five quantitative characters for all the 10 varieties are listed in Table - 2.

Plant Height (cm) was Tall (121–150) for the varieties SURAJ, CO14, SVPR3 and Very tall (> 150) in the varieties SVPR2,4,5, MCU5,7,9 and 13.The wide variation in plant height was noticed and they ranged from 121-178 cm (Table-2) in cotton genotype, thus could be extremely helped for varitial identification and genetic purity testing. This trait may be influenced by both agronomical and environmental conditions (Jagtap, 1987).

Plant Growth habit was Semi-spreading type (31-60 cm) for all the varieties SVPR2,3,4,5, SURAJ, CO14, MCU5,7,9 and 13.

Time of Flowering (50% of plants with at least one open flower) was Early (<50 days) for the varieties SVPR2,3,5, SURAJ, CO14,MCU7,9,13 and Medium for the varieties SVPR4 and MCU5.Days to 50% flowering ranged from 45 to 52 days. This difference may be due to genetical effect and least influence by environment (Jagtap, 1987).

Boll Weight of seed cotton / boll (g) was Small for the varieties CO14, MCU5,7, Medium for the varieties SVPR2,3,4,5, MCU 9 and Large for the varieties SURAJ and MCU13.

Seed Index (100 seed wt in gram) was Medium (7.1-9.0) for all the varieties observed. This was in accordance with Ameena (Ameena, 2009).

From the above characterizations we noticed that the variety SURAJ only showed Elliptical boll shape with chain bearing structure.

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