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Performance of Different Genotypes of *Gossypium hirsutum* under Various Sowing Conditions on Yield Contributing Parameters

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Abstract
This study was aimed to evaluate the performance of different cotton genotypes at Chishtian District, Bahawalnagar region. Four cotton genotypes (IUB-2013, FH-142, FH-LALAZAR and MNH-886) were sown under two different sowing times i.e., normal sowing S1 (20th April) and late sowing S2 (20th May 2016). The experiment design was split plot design with three replications in which genotypes were kept in main plot and sowing dates were in sub plot. Different agronomic practices were applied timely to insure healthy crop stand. Total yield and yield contributing parameters like number of bolls plant-1, boll weight (g), and seed cotton yield (kg/ha) were recorded. Genotype FH-142 showed best result for the trait number of bolls per plant (81.67) followed by genotype FH-Lalazar (80) under normal sowing condition. For number of bolls per plant under late sowing condition, FH-Lalazar depicted highest value (59.33) followed by FH-142 (55.67). For bolls per plant, FH-Lalazar depicted highest value (23.33 g) followed by FH-142 (22.67 g) and IUB-2013 (18.67 g) under normal sowing conditions. While under late sowing condition, FH-Lalazar dominated among all genotypes and displayed high value of boll weight (19.67 g). Genotype FH- LALAZAR showed highest seed cotton (5496 kg/ha) followed by FH-142 (5424.3 kg/ha) under normal sowing (S1). However, in case of late sowing (S2), FH-LALAZAR exhibited greater value of seed cotton yield followed by FH-142. The data regarding varying genetic diversity of the genotypes can be helpful to take measures for improving cotton yield per hectare.
Keywords: Sowing dates, Yield, Seed, Cotton genotypes at Chishtian District, Bahawalnagar region.

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INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is an important crop. It belongs to genus Gossypium and family Malvaceae (Dorothy and Stolton, 1999). It is the white gold, occupy a prominent position in oil and textile industry. It serves as a backbone of Pakistan economy (Khan *et al*., 2009). However, its yield is greatly affected by environmental conditions and cultural practices. It is grown in warmer regions of the country (Riaz *et al*., 2013). High temperature can increase the reproductive growth rate that shorten photosynthesis span, which results in lower cotton yield. While low temperature promotes unwanted vegetative growth and delays boll ripening. The low temperatures at sowing stage delayed the germination and enhance pathogen attack while high temperature and dry weather promotes seedling death. Thus selection of optimum sowing time for various ecological regions is important to insure the productivity (Farooq *et al.,* 2011). The cotton crop also responds actively to management and environmental changes. Among various factors affecting cotton seed yield, high temperature act as a key control on the rate of cotton plant growth (Baker, 1965). The temperature from 20 to 30 ºC is ideal for growth of cotton (Reddy *et al.,* 1991), 28ºC is optimum temperature for photosynthesis (Burke *et al.,* 1988). Seed, root, vegetative growth, flowering, fruit set, yield and fiber quality are affected by temperature stress. In Pakistan temperature stress affects yield of cotton seed and quality of fiber because it approaches about 50ºC in summer (Singh *et al*., 2007; Khan *et al.,* 2008). In Pakistan cotton yield is lower

than other countries which can be accredited to dearth of innovative agronomical practices, cropping husbandry, market constraints and poor socio-economic conditions of the farming community. Varieties have significant role in production of crop. Qualitative and quantitative performance of Bt varieties is comparatively better than conventional varieties. Traditional varieties have less potential for yield and crop resistance. High quality seed has remarkably resistance against cotton insect pest and drought and produce high yield. Varieties varied significantly for bolls per unit area and lint percentage (Wang *et al*., 2004).

If a variety is sown at optimum sowing time, it can be helpful to realize the yield potential of that variety. One of the major abiotic stresses is the late planting stress that affects the cotton plant development and seed cotton yield (Huang, 2016). Significant improvements have been made by breeders in cotton adaptation to stress of late sowing conditions. Usually late plantings reduced properties of fibers relative to normal planting due to shortened fruiting period (Davidonis *et al.,* 2004). One of the main tasks of plant breeders for exploiting genetic variations to improve stress-tolerant cultivars is selection of different genotypes under environmental stress conditions (Clark *et al*. 1984). Genotypes that can perform better under late sowing conditions and have greater quality and stability will be beneficial for growers in late-planting areas like District Bahawalnagar. In the present study phenotypically prominent cotton genotypes preferably grown by the local farmers were evaluated under both sowing conditions at Tehsil Chishtian of District Bahawalnagar (Punjab, Pakistan).

MATERIALS AND METHODS

The field experiment was carried out in Randomized Complete Block Design with three replications at the field area of Tehsil Chishtian, District Bahawalnagar, Punjab, Pakistan during Kharif season of 2015. Four commercial cotton varieties named LALAZAR, FH-142, IUB-2013 and MNH-886 were sown under two different sowing time i.e., normal sowing (SD1: 20th April) and late sowing (SD2: 20th May) in order to access the yield potential at Chishtian Agro climatic region. The experiment was conducted using split plot design with three replications. Genotypes were set in main plots and sowing dates were set in subplots. Bed and furrows were made after land preparation. Row to row distance was 75 cm and plant to plant distance was 30 cm. Furrows were irrigated properly and de-linted cotton seeds of four genotypes were dibbled manually during both sowing dates i.e., normal and late sowing conditions. Light irrigation was again applied to obtain maximum seed germination. Gap filling was conducted and subsequent irrigations were applied up till crop maturity depending upon weather conditions. Different fertilizer and all other necessary agronomic practices were applied to maintain good crop health throughout the crop season. Randomly 10 plants from each treatment were selected at mature stage for measuring and collecting data of plant height (cm), Number of bolls per plant and boll weight. The seed cotton was harvested according to genotypes that were cultivated separately under both sowing conditions. Finally the cotton seed calculated in unit kg per hectare. The 100 seeds were taken from each treatment and measured in gram. Data collected on different parameters including Plant height (cm), number of bolls per plant, boll weight (g), and yields of cotton seed (kg/hac) were analyzed statistically by using Statistic program. For analysis of variance, means were separated using Fisher's protected least significance difference (LSD) test at 5% probability level (Steel *et al*., 1997).

RESULTS AND DISCUSSION

This study showed significant results indicating varying genetic diversity of the genotypes for characters like number of bolls per plant, boll weight and seed cotton yield per hectare. Genotype FH-142 showed best result for the trait number of bolls per plant that was (81.67) followed by genotype FH- Lalazar (80) under normal sowing condition. In contrary to this parameter the least values were showed by IUB-2013 and MNH-886 that was same (68) under normal sowing condition. For number of bolls per plant under late sowing condition, FH-Lalazar depicted highest value (59.33) followed by FH-142 (55.67). MNH-886 showed poor performance and its value was (41) (Table 1). In a similar study it was documented that cultivar Sadori (40.92) and IR-3701 (40.34) produced the maximum number of bolls per plant followed bycv.CRIS-134 (39.28), while cultivar AA-802 formed minimum number of bolls (29.31) (). There was slight difference among the genotypes performance against the character boll weight under normal sowing condition. FH-Lalazar depicted highest value (23.33 g) followed by FH-142 (22.67 g) and IUB-2013 (18.67 g). The lowest value exhibited by MNH-886 that was (17 g). While under late sowing condition, FH-Lalazar dominated among all genotypes and displayed high value of boll weight (19.67 g). The least value shown by MNH-886 that was (12.33 g) (Table 2). Previous study suggested that medium bolls are the characteristics of early maturing cotton cultivars (Baloch *et al.,* 2014).

For seed cotton yield per plant, there was very minute difference between the genotypes FH-Lalazar (5496 kg/ha) and FH-142 (5424 kg/ha) under normal sowing condition (Table 3). These two genotypes have good genetic potential for most important economic trait seed cotton yield per plant under normal sowing condition. These results are in agreement with those obtained by Saeed et al. (2014). In contrary to the same trait under late sowing condition, the scale of genotypes performance was remained same from top to bottom as in the case under normal sowing condition. The results revealed that FH-142 depicted high value of seed cotton yield (3091.7 kg/ha) followed by FH-LALAZAR (3043.3 kg/ha). This argument is also supported by Luqman et al. (2015). Present results are in accordance with those of Jatoi et al. (2012) Gul et al. (2014) and Baloch et al. (2014)

who described that early maturing cotton cultivars produced better yields. The lowest value was displayed by MNH-886 (1578.3 kg/ha) (Table 3). Kakar et al. (2012) reported maximum seed cotton yield (3096) kg/ha followed by cultivar NIA- 77 (2881) kg ha and Malmal (2878) kg ha.

Table 1. Mean performance of genotypes for number of bolls per plant under normal and late sowing conditions.

Treatments	Sowing Time		Mean
	SDI (Normal Sowing)	SD2 (Late Sowing)	
T1 (FH-LALAZAR)	80 a	59.33 c	69.67 a
T2 (FH-142)	81.67 a	55.67 c	68.67 a
T3 (IUB-2013)	68 b	45.33 d	56.67 b
T4 (MNH-886)	68 b	41 d	54.50 b
Mean	74.41 a	50.33 b	

Means followed by different letter shows significant result at 5% level of significance

Table 2. Mean performance of genotypes for boll weight under normal and late sowing conditions.

Treatments	Sowing Time		Mean
	SDI (Normal Sowing)	SD2 (Late Sowing)	
T1 (FH-LALAZAR)	23.33	19.67	21.50 a
T2 (FH-142)	22.67	16.67	19.67
T3 (IUB-2013)	18.67	13.00	15.83
T4 (MNH-886)	17.00	12.33	14.67
Mean	20.42 a	15.42 b	

Means followed by different letter shows significant result at 5% level of significance

Table 3. Mean performance of genotypes for seed cotton yield kg/ha under normal and late sowing conditions.

Treatments	Sowing Time		Mean
	SDI (Normal Sowing)	SD2 (Late Sowing)	
T1 (FH-LALAZAR)	5496 a	3043.3 d	4269.7 a
T2 (FH-142)	5424.3 a	3091.7 d	4358 a
T3 (IUB-2013)	4351.7 b	2434.7 e	3393.2 b
T4 (MNH-886)	3956 c	1578.3 f	2767.2 c
Mean	4807 a	2537 b	

Means followed by different letter shows significant result at 5% level of significance

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CONFLICT OF INTEREST

There is no conflict of interest.

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