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To evaluate the effects of sowing dates cum varietal study of different cotton genotypes, (Gossypium hirsutum L.)

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Abstract: *Cotton yield is mostly associated with sowing date and also interlinked with yield contributing traits. The main object of present study was to evaluate the effects of sowing dates on cum varietal trial of different cotton genotypes and its interlinked traits, in 2014. During this experiment four different sowing dates were applied, those were (1st April, 20th April, 10th May and 30th May, 2014) against three cotton cultivars (TH-84/99, TH-8/99 and CRIS-134), using a three replicated Randomized Complete Block Design under climatic conditions of Tandojam Sindh Pakistan. The results revealed that cotton sown on 20th April proved to be an optimum sowing date and differences in the values of all the traits between 1st April or 20th April sowing were non-significant (P>0.05). The 1st April sowing date resulted 150 cm plant height, 1.62 monopodial branches, 18.73 sympodial branches, 38.39 productive bolls, 26.80 mm staple length, 112.95 g seed cotton yield plant^{-1}, 34.72% G.O.T. and 2385.82 kg of seed cotton yield ha^{-1}. Crop sown on 20th April resulted 144.88 cm plant height, 1.59 monopodial branches, 18.63 sympodial branches, 39.00 productive bolls, 26.97 mm staple length, 118.42 g seed cotton yield plant^{-1}, 35.17% G.O.T. and 2394.21 kg seed cotton yield ha^{-1}. While during delayed sowing time up to 10th May the result was 139.22 cm plant height; 1.81 monopodial branches; 17.85 sympodial branches; 36.22 productive bolls; 26.86 mm staple length; 101.61 g seed cotton yield plant^{-1}; 35% G.O.T. and 2219.88 kg seed cotton yield ha^{-1}. Cotton sown on 30th May produced 131.33 cm plant height, 1.51 monopodial branches, 15.33 sympodial branches, 33.33 productive bolls, 26.47 mm staple length, 93.78 g seed cotton yield plant^{-1}; 34.32% G.O.T. and 2091.08 kg seed cotton yield ha^{-1}. In case of varieties, CRIS-134 showed its superiority over TH-84/99 and TH-8/99 in all the characters studied with 147 cm plant height, 2.02 monopodial branches, 20.55 sympodial branches, 39.07 bolls, 27.24 mm staple length, 116.82 g seed cotton yield plant^{-1}; 35.37% G.O.T. and 2396.55 kg seed cotton yield ha^{-1}.*

Key words: *Cotton, Sowing date, Climatic condition, GOT%, Yield*

I. Introduction

Cotton, *Gossypium hirsutum* L., is a key fiber crop, due to its immense importance it is cultivated throughout the world and efforts are being taken for its high yield and production in order to meet the needs of ever-increasing population of the world. It is a major source of foreign exchange earnings and also considered as white gold of our national economy (Arshad *et al.* 2004). Among the cotton producing countries, Pakistan ranked 4th in production. Cotton is grown in Pakistan on an area of 2815 thousand hectors and about lint production is 11839.9 thousand bales with an average yield of 751ha^{-1} (GOP 2013).During 2011-12, Cotton accounts for 7.3 percent of the value added in agriculture and about 1.6 percent to GDP. Pakistan's industries contribute about 46% to the total output produced in a country. Sowing time is one of the key factors to influence cotton productivity (Singh *et al.* 2002 and Varlev *et al*. 2000). In Pakistan, cotton is grown from April to June while the sowing time in other parts of the world may vary depending upon the climatic conditions. Yield is a polygenic character, like boll weight and formation of bolls per plant are inter linked with the yield (Mahmood-ul-Hassan *et al.* 2003). The planting of cotton should be done in May 1st to June 1st. cotton variety CIM-497 showed more susceptibility to viral diseases when sown on June 15th, whereas CIM-506 showed more tolerance to viral attack than other varieties when it is grown in the month of June (Tahir *et al.* 2004). Sheikh *et al.* (2006) reported that ginning outturn was significantly affected by varieties and sowing dates; while Soomro *et al.* (2007) reported that delayed cotton sowing may result delayed picking; and found that ginning outturn was low in late sown crop due to early pickings. It was also concluded that even a delay of one week in sowing may result in a marked decreased in yield (Qayyum *et al.* 1990). Tunio *et al.* (1992) suggested early sowing of cotton (15th April to 15th May); while Soomro *et al.* (2000) reported that 15th May sown crop gave increased number of bolls per plant, boll weight and seed cotton yield per hectare, but reported adverse effects of delayed sowing on

seed cotton yield. The present study was carried out to investigate the effect of sowing dates on the growth and seed cotton yield of three promising cotton varieties under the climatic condition of Tandojam sindh, Pakistan.

II. Materials And Methods

The present study was designed to evaluate the sowing date cum varietal trail to examine the effect of various sowing dates on the growth and seed cotton yield of some promising cotton varieties which was carried out at the experimental field of Cotton Section, Agriculture Research Institute, Tandojam. The experiment was laid out in three replicated Randomized Complete Block Design (RCBD) with plot size of 5.25m x 6.0m ($31.50m^2$).The treatments consisted of three different cotton varieties i.e.TH-84/99 Malmal,TH-8/99 Koonj and Cris-134, and three planting schedules viz.1st April, 20th April,10th May and 30th May. The land preparation was done properly at recommended depth for better root penetration and for equal distribution of irrigation and fertilizer. The space between plant to plant and row to row was 30 and 75 cm, respectively. The traits studied were, plant height (cm), number of monopodial branches plant^{-1}, number of sympodial branches plant^{-1}, number of productive bolls plant^{-1}, GOT (%), staple length (mm), and seed cotton yield plant^{-1} (g).

Data Analysis

The collected data were subjected to statistical analysis using Analysis of variance technique. The LSD (Least Significant Differences) test was applied to compare the individual treatment means as per the statistical methods developed by Gomez and Gomez (1984). The above statistical analyses were performed by using Mstat-C Computer Software for Statistics.

III. Results And Discussion

The present study was carried out to assess the effect of different sowing date on the growth and seed cotton yield along with some quality traits for some promising cotton varieties. Four different sowing dates against three cultivars were used to examine the effect of sowing date on yield and its contributing traits. The results of statistical analysis of observed data through the computer programme MSTAT-C and various study traits are presented in following tables revealed that all the traits between 1st April or 20th April sowing date were non-significant (P>0.05).

Plant height (cm)

The plant height of cotton varieties was influenced by various sowing dates which is shown in Table-1 the plant height was maximum (150 cm) on average when the cotton crop was sown on 1st April, followed by 20th April and 10th with average plant height of 144.88 cm and 139.22 cm, respectively. The plant height reduced to its lowest (131.33 cm) when sowing time was delayed up to 30th May. This indicates that delayed sowing of cotton adversely affect the plant height, while early plantation stimulates the plants to grow taller plants due to maximum growth period. In case of varieties, the maximum plant height on average (147 cm) was observed in commercial variety CRIS-134.

Table.1 Mean plant height (cm) of different cotton varieties as influenced by sowing dates.

Sowing Dates	Varieties			Mean for sowing dates
	TH-84/99 (Malmal)	TH-8/99 (Koonj)	CRIS-134	
SD1 = 1st April	145.66	147.33	157.00	150.00 a
SD2 = 20th April	142.66	142.00	150.00	144.88 ab
SD3 = 10th May	137.33	136.33	144.00	139.22 b
SD4 = 30th May	128.33	128.66	137.00	131.33 c

Monopodial branches plant^{-1}

The monopodial branches plant^{-1} of cotton varieties as influenced by various sowing dates are presented in Table-2, while sowing date and interaction between varieties and sowing dates had non-significant (P>0.05) effect on this trait. Monopodial branches plant^{-1} were comparatively higher (1.81) when cotton was sown on 10th May, followed by the crop sown on 1st April and 20th April with 1.62 and 1.59 monopodial branches plant^{-1}, respectively. The minimum number of monopodial branches plant^{-1} was 1.51 which was recorded in delayed sown cotton crop i.e. on 30th May. The results suggested that there was no considerable effect of sowing dates on the number of monopodial branches and variation may be associated with diverse

environmental conditions. In case of varieties, the number of monopodial branches were significantly higher i.e. 2.02 plant^{-1} in variety CRIS-134.

Table.2 Mean monopodial branches plant^{-1} of different cotton varieties as influenced by sowing dated

Sowing Date	Varieties			Mean for sowing dates
	TH-84/99 (Malmal)	TH-8/99 (Koonj)	CRIS- 134	
SD1 = 1st April	1.22	1.33	2.33	1.62
SD2 = 20th April	1.44	1.44	1.88	1.59
SD3 = 10th May	1.66	1.55	2.22	1.81
SD4 = 30th May	1.44	1.44	2.22	1.51

Sympodial branches plant^{-1}

The number of sympodial branches plant^{-1} of cotton varieties as influenced by different sowing dates is presented in Table-3. Number of sympodial branches were higher i.e. 18.73 and 18.63 plant^{-1} when cotton was sown on 1st April and 20th April, respectively; while delayed sowing on 10th May resulted reduction in number of sympodial branches to 17.85 plant^{-1}. However, the lowest number of sympodial branches (15.33) plant^{-1} was obtained when sowing was further delayed to 30th May. It was observed that sympodial branches were negatively influenced by delayed sowing beyond 10th May. In varieties, CRIS-134 produced significantly maximum number of sympodial branches (20.55) plant^{-1}, followed by varieties TH-8/99 and TH-84/99 producing 16.72 and 15.63.

Table-3 Mean sympodial branches plant^{-1} of different cotton varieties as influenced by sowing dates.

Sowing Dates	Varieties			Mean for sowing dates
	V=TH-84/99 (Malmal)	V=TH-8/99 (Koonj)	V=CRIS-134	
SD1 = 1st April	17.11	17.66	21.44	18.73 a
SD2 = 20th April	16.33	17.44	22.12	18.63 a
SD3 = 10th May	15.44	16.77	21.33	17.85 a
SD4 = 30th May	13.66	14.99	17.33	15.33 ab
Mean for varieties	15.63 b	16.72 b	20.55 a	-

Number of productive bolls plant^{-1}

The number of productive bolls plant^{-1} of various cotton varieties as influenced by different sowing dates is given in Table-4 .It can be seen from the results in Table-4 that the number of productive bolls was maximum (39.00 plant^{-1}) when cotton was sown on 20th April, closely followed by 38.39 and 36.22 average number of productive bolls plant^{-1} recorded in cotton varieties sown on 1st April and 10th May, respectively. However, delayed sowing on 30th May reduced number of productive bolls to 30.33 plant^{-1}.The number of productive bolls plant^{-1} adversely influenced with delaying sowing beyond 10th May. In case of varieties, CRIS-134 produced significantly higher number of productive bolls (39.07) plant^{-1} as compared to varieties TH-8/99 and TH-84/99 producing 35.02 and 33.87 average number of productive bolls plant^{-1}, respectively.

Table.4 Mean number of productive bolls plant^{-1} of different cotton varieties as influenced by sowing dates.

Sowing Dates	Varieties			Mean for sowing dates
	TH-84/99 (Malmal)	TH-8/99 (Koonj)	CRIS-134	
SD1 = 1st April	36.03	38.24	40.91	38.39 a
SD2 = 20th April	35.96	38.63	42.41	39.00 a
SD3 = 10th May	34.27	35.33	39.07	36.22 a
SD4 = 30th May	29.23	27.86	33.91	30.33 b

Staple length (mm)

The data regarding staple length of cotton varieties as influenced by various sowing dates are shown in Table-5.The staple length was significantly higher (26.97 mm in cotton sown on 20th April, followed by average staple length of 26.86 and 26.80 mm, that was recorded from the cotton sown on 10th May and 1st April, respectively. However, the staple length was lowest (26.47 mm) when the crop was sown on 30th May. This indicates that there was considerable difference in staple length under various sowing dates. In case of varieties, the staple length was higher i.e. 27.24 mm in variety CRIS-134, followed by variety TH-8/99 with average staple length of 26.397 mm, and the lowest staple length of 26.10 mm was recorded in case of variety TH-84/99. This suggested that staple length is mostly considered as the genetic characteristic of a variety rather to associate with the crop management. The interaction studies suggested that staple length was highest (27.53 mm) in variety CRIS-134 x 20th April sowing interaction, while minimum (25.77 mm) under interaction of variety TH-84/99 x 30th May sowing.

Table.5 Mean staple length (mm) of different cotton varieties as influenced by sowing dates.

Sowing Dates	Varieties			Mean for sowing dates
	TH-84/99 (Malmal)	TH-8/99 (Koonj)	CRIS-134	
SD1 = 1st April	26.32	26.84	27.22	26.80 a
SD2 = 20th April	26.22	27.15	27.53	26.97 a
SD3 = 10th May	26.09	27.16	27.31	26.86 a

Seed cotton yield plant^{-1} (g)

The results regarding the seed cotton yield plant^{-1} (g) of various cotton varieties as influenced by different sowing dates are presented in Table-6 It is evident from the given result in Table-6 that cotton sown on 20th April produced significantly maximum seed cotton yield of 118.42 g plant^{-1}, closely followed by 1st April sowing with 112.95 g average seed cotton yield plant^{-1}. Seed cotton yield plant^{-1} considerably decreased to 101.61 g, under delayed sowing on 10th May, while the minimum seed cotton yield of 93.78 g plant^{-1} was recorded under 30th May sowing. This showed that each delay in sowing of cotton over 20th April showed adverse impacts on seed cotton yield plant^{-1}. However, the differences in seed cotton yield plant^{-1} were negligible when crop was sown either on 1st April or on 20th April. In case of varieties, CRIS-134 produced significantly higher seed cotton yield of 116.82 g, while variety TH-84/99 produced seed cotton yield of 104.23 g plant^{-1}, while lowest (99 g plant^{-1}) was in case of variety TH-8/99.

Table.6 Mean seed cotton yield plant^{-1} (g) of different cotton varieties as influenced by sowing dates.

Sowing Dates	Varieties			Mean for sowing dates
	TH-84/99 (Malmal)	TH-8/99 (Koonj)	CRIS-134	
SD1 = 1st April	111.68	103.93	123.25	112.95 a
SD2 = 20th April	115.57	112.87	126.86	118.42 a
SD3 = 10th May	98.28	90.98	115.55	101.61 a
SD4 = 30th May	91.41	88.28	101.64	93.78 c

Ginning out-turn (G.O.T %)

The results regarding the ginning out-turn (G.O.T) of cotton varieties as affected by various sowing dates are presented in Table-7. The results showed that ginning out-turns was relatively higher (35.17%) in cotton crop sown on 20th April, followed by average ginning out-turn of 35.00 percent, recorded from the crop sown on 10th May. However, the ginning out-turn was 34.72 and 34.32 percent when the crop was sown on 1st April and 30th May, respectively. It was noted that there was marked difference in ginning out-turn under various sowing dates. In case of varieties, the ginning out-turn was remarkably higher i.e. 35.37 percent for CRIS-134, while TH-8/99 and TH-84/99 had lower ginning out-turn of 34.82 and 34.22 percent, respectively.

Table.7 Mean ginning out-turn (GOT %) of different cotton varieties as influenced by sowing dates.

Sowing Dates	Varieties			Mean for sowing dates
	TH-84/99 (Malmal)	TH-8/99 (Koonj)	CRIS-134	
SD1 = 1st April	33.95	34.84	35.38	34.72 a
SD2 = 20th April	34.70	35.09	35.71	35.17 a
SD3 = 10th May	34.54	34.35	35.63	35.00 a
SD4 = 30th May	33.68	34.50	34.76	34.32 ab

IV. Conclusion

After exploring the results of the present experiment, it was concluded that delay in cotton sowing particularly with CRIS-134, TH-84/99 (Malmal) and TH-8/99 (Koonj), beyond 20th April adversely affected the growth, seed cotton yield and quality variables of cotton; while CRIS-134 variety proved to be more suitable as compared to TH-84/99 and TH-8/99 under soil and climatic conditions of Hyderabad district Sindh Pakistan.

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