

LCCN 85-931448

ISSN: 1023-1072 (Print), ISSN: 2663-7863 (Online)
<https://doi.org/10.47432>



PAKISTAN JOURNAL OF AGRICULTURE AGRICULTURAL ENGINEERING AND VETERINARY SCIENCES

An Official International Biannual Publication of Sindh Agriculture University Tandojam, Pakistan

Volume 39 (1) June, 2023

SINDH AGRICULTURE UNIVERSITY TANDOJAM

<http://pjaaevs.sau.edu.pk/index.php/ojs>



© 2023, Sindh Agriculture University, Tandojam (<http://pjaaevs.sau.edu.pk/index.php/ojs>)
This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/)



PLANTING DATES AFFECTS ON SEED COTTON YIELD AND CONTRIBUTED CHARACTERS OF COTTON ADVANCE LINES UNDER CHANGING CLIMATIC CONDITIONS OF TANDOJAM, SINDH PAKISTAN

Z. A. Deho

Nuclear Institute of Agriculture, Tandojam, Pakistan

ABSTRACT

Cotton crop is an imperative role in Pakistan's economy. It faces several environmental situations which check its growth and production. Climate changes bring a head new pressure for cotton cultivation in the Pakistan especially in Sindh province. The present study was carried out at Nuclear Institute of Agriculture (NIA), Tandojam in 2021. Four advance lines NIA-88, M-32, NIA-Bt. 89 and NIA-Bt.90 along with two local check varieties IUB-2013 and CRIS-121 were evaluated under two planting dates viz. 1st April and 1st May having three replicates under randomized complete block design with factorial arrangements. The data depicted that crop sown on 1st April produced more seed cotton yield (2855.5 kg ha⁻¹) than sown on 1st May with (1674.4 kg ha⁻¹). Comparing the average varietal performance in both sowing dates, NIA-88 produced maximum seed cotton yield (2339.2 kg ha⁻¹) while minimum seed cotton yield (2137.2 kg ha⁻¹) was exhibited by check variety CRIS-121. Boll retention % was maximum (44%) in advance line NIA-88. The maximum number of bolls plant⁻¹ (42.0), sympodial branches plant⁻¹ (26.0), ginning out turn percentage (42.0), seed index (8.1g) and staple length (29.0mm) respectively was obtained in 1st April sowing date while minimum number of bolls plant⁻¹, sympodial branches plant⁻¹, ginning out turn percentage, seed index and staple length (33.0), (15.0), (36.3), (6.0g) and (27.0mm) took in 1st May sown crop. Associating the average varietal performance in both sowing dates NIA-88 produced maximum number of bolls plant⁻¹(44.0), sympodial branches plant⁻¹ (23.0), ginning out turn percentage (40.4), seed index (9.0g) and staple length (29.0mm) respectively. The results indicated that the planting dates and genotypes influenced on seed cotton yield and associated traits in current changing climate scenario for cotton crop.

Keywords: cotton, climate change, fiber quality, planting dates, seed cotton yield

INTRODUCTION

Pakistan is 5th largest producer of cotton in the world. Export of cotton and textile products have a share of around 60 percent in overall exports of the country. It contributes around 0.6% to GDP and 2.4% of the value added in Agriculture (GoP, 2021-2022). The most significant and manageable factor for cotton crop is optimum planting time for new cultivar in region (Jaffar, *et al.*, 2023). The environment change is affecting the Agricultural production by affecting on managing practices such as planting time. Also, sowing time is one of the main factors affecting seed cotton yield. Cotton production is a form of production depending on environmental conditions. Cotton sowing should be from 1st March to 16th April for maximum and quality harvest (Iqbal, *et al.*, 2021). In addition to the

ecological differences, the differences in the cotton production techniques applied as well as genetic structure of the varieties grown in cotton production regions can lead to the formation of the yield and quality quite differently from each other (Killi, 2005). It is essential to examine optimum sowing time for developing full genetic potential of cotton under specific agro-climatic conditions (Kakar *et al.*, 2012). For good crop formation, cotton crop demands warm soil and air temperature for better germination and emergence. Moreover, early planting leads to poor crop position while late sown crops are more vulnerable to insect pest and adverse environmental conditions (Gormus and Yucel, 2002). Many researchers found that sowing time was selected as a key issue of cotton cultivars (Salih *et al.*, 2019). Additionally, late sown cotton crop initiates flowering later in the growing season, which will cause bolls to develop later in cooler conditions, lengthening

*Corresponding author: zdeho@hotmail.com



the period from sowing to boll opening and delaying maturity (Bauer *et al.*, 2000). Results revealed that seed cotton yield contributing parameters were expressively affected by planting dates (Niazi, 2005). Planting time efficiently impacts on seed cotton yield and yield traits in cotton. Early sowing is chosen than late sowing due to its progressive effects on various traits especially yield. (Saeed *et al.*, 2014; Sharif *et al.*, 2020) examined that seed cotton yield and fiber quality were affected by genotypes and planting times (Soomro *et al.*, 2000) noted that the planting time has very important role in realizing maximum seed cotton yield in a country like Pakistan where the climatic conditions differ from province. Climatic factors such as temperature, wind, rainfall and relative humidity significantly affect the boll production of cotton (Cetin, *et al.*, 2010). Therefore, keeping in view the above facts, present study was planned to investigate the impact of planting dates on seed cotton yield and fiber quality parameters of newly developed advance cotton lines for better cotton production.

MATERIALS AND METHODS

The field experiment was carried out at the experimental field of Nuclear Institute of Agriculture, Tandojam, Sindh, Pakistan during kharif season 2021. The experimental site was situated in a semi-arid subtropical climate, 14m above the sea level in Sindh province of Pakistan. The soil of experimental field was silty and sandy clay loam in texture (Soltanpur series). Four advance lines NIA-88, M-32, NIA-Bt. 89 and NIA-Bt.90 along with two local check varieties IUB-2013 and CRIS-121 were evaluated under two planting dates viz. 1st April and 1st May. The experiment was laid out in randomized complete block design with factorial arrangements with three replicates. The plot size was (4.6m x 6.1m = 28.06m²). The land was prepared well. The cotton sowing was done on ridges. Thinning, weeding, inter-culturing, fertilizer and insecticide application applied as per the recommendations. Fertilizers were applied at the recommended rates; N in the form of urea (115 kg ha⁻¹), P in the form of Diammonium Phosphate DAP (60 kg ha⁻¹) and K as Sulphate of Potash SOP (62.5 kg ha⁻¹). All P₂O₅ and K₂O along with 25% N were applied at the time of sowing by mixing in the soil, while remaining N was applied into two splits; first split 50% was applied at squaring and remaining 25% at the time of flowering stage. Five plants were selected randomly in each plot for taking

data. Out of 6 rows, 4 were harvested for taking yield data. The data were recorded and analyzed for LSD at 0.05% after ANOVA by using statistical software, Statistix® Version 8.1, Analytical Software, 2005 Inc. Tallahassee, FL, USA.

RESULTS AND DISCUSSION

Sympodial branches plant⁻¹

The analysis of variance for sympodial branches plant⁻¹ showed that sowing dates, varieties mean squares were highly significant and their interactions were significant at ($P < 0.05\%$) are presented in (Table 1). The maximum number of sympodial branches plant⁻¹ (26) observed in 1st April sowing date as compared with 1st May (15) sympodial branches plant⁻¹ in (Table 2). Farid *et al.* (2017) also reported the increase of 34% more number of sympodial branches in early sowing than late sowing. In advance lines the maximum sympodial branches were found in advance line M-32 (22), followed by NIA-88 (21) branches respectively depicted in (Table 3). The significant differences among varieties for number of sympodial branches plant⁻¹ had also been reported by (Copur, 2006).

Number of bolls plant⁻¹

Number of bolls is essential yield contributing parameter. The analysis of variance for sympodial branches plant⁻¹ depicted that in planting dates, varieties mean squares were highly significant and their interactions were significant at ($P < 0.05\%$) in (Table 1). The maximum number of bolls plant⁻¹ (44) recorded in 1st April sowing date as compared with 1st May (33) bolls plant⁻¹ in (Table 2). The maximum number of bolls plant⁻¹ (44) recorded in advance lines and minimum number of bolls plant⁻¹ (36) was observed in check variety CRIS121 in (Table 3). These results agreed with findings of (Jamro *et al.*, 2017) who documented that subsequent delay in sowing time produced less number of bolls and a drastic decrease in number of bolls as sowing was delayed up to 30th May. Soomro *et al.*, (2014) also confirmed the similar results of adverse effects of delayed sowing than early sowing.

Boll retention (%)

Boll retention percentage delicate to environmental situations. The boll retention % data showed that the planting date mean squares were non-significant, but varieties and their interactions were highly significant at ($P < 0.05\%$) in (Table 1). The maximum boll

retention (30%) was noted in 1st April sown whereas; minimum boll retention (28%) was observed in 1st May sown crop in (Table 2). The maximum boll retention percent was noted in advance line NIA-88 (44%) whereas; minimum boll retention (18%) was observed in check variety CRIS-121 showed in (Table 3). Sharif *et al.* (2020) reported that maximum bolls were taken in early planted crop.

Ginning out turn (%)

The analysis of variance for ginning out turn% showed that sowing dates mean squares were highly significant whereas varieties and their interactions were non-significant at ($P < 0.05\%$) are presented in (Table 1). The data pertaining to ginning out turn percent reveals that the planting date 1st April produced maximum ginning out turn% (42.0%) as compared with 1st May (36.4%) ginning out turn percent depicted in (Table 2). In advance lines maximum ginning out turn percent (40.0%) was recorded in advance line NIA-88 in (Table 3). It has been reported that ginning out turn (GOT %) in different cotton cultivars may vary significantly (Fahad *et al.*, 2008).

Seed index (g)

Hundred seed weight is an important character in determining seed cotton yield, especially in seed cotton. The analysis of variance for seed

index (g) depicted that sowing dates mean squares were highly significant and their interactions were significant at ($P < 0.05\%$) (Table 1). The maximum seed index (8.1g) was recorded in 1st April sowing date while minimum seed index (6.0g) was noted in 1st May crop sown (Table 2). The advance line NIA-88 produced maximum seed index (9.0g) while minimum seed index (6.0g) was recorded in advance line NIA-Bt.90 and check variety IUB-2013 respectively in (Table 3). Seed index were highly affected by sowing dates (Mohamed *et al.*, 2016).

Staple length (mm)

The staple length (mm) is an important fiber trait to determine the quality textile products (Mustafayev *et al.*, 1999). The analysis of variance for staple length (mm) revealed that sowing dates mean squares were highly significant whereas advance lines and their interactions were non-significant ($P < 0.05\%$) (Table 1). The longer staple length (29.0mm) was recorded in 1st April sowing dates whereas; minimum staple length (27.4mm) was noted in 1st May sown crop (Table 2). In advance lines NIA-88 produced (28.4mm) staple length. The minimum staple length mm (27.3) was recorded in check variety IUB-2013 (Table 3).

Table 1. Mean square for agronomic traits of cotton advance lines evaluated under different planting dates

Analysis of variance	Sympodial branches plant ⁻¹	No. of bolls plant ⁻¹	Boll retention %	GOT%	Seed Index (g)	Staple length (mm)	SCY kg ha ⁻¹
Rep.	0.08	1.36	24.992	2.348	0.0833	0.1078	30243.0
Planting Dates	1034.69**	1111.11**	37.414ns	243.880**	38.0278**	44.8900**	1.25507**
Advance Lines	19.18**	58.51**	441.321**	4.597ns	7.1167*	0.8958ns	29505.4ns
Planting Dates x Advance lines	15.89*	37.98*	72.36*	7.306ns	5.5611*	0.7900ns	124639**
Error	1.66	4.42	8.206	1.768	0.7803	0.3051	12395.5

** Highly significant; Significant, NS = Non-significant

Table 2. Effects of planting dates on Sympodial branches plant⁻¹, No, of Bolls plant⁻¹, Boll retention%, Ginning out turn%, Seed index (g), Staple length (mm) and Seed cotton yield (kg ha⁻¹)

Parameters	Planting dates		LSD ($P > 0.05\%$)
	1 st April	1 st May	
Sympodial branches ⁻¹	26a	15b	0.89
No, of bolls plant ⁻¹	44a	33b	1.45
Boll retention%	30a	28b	1.98
Ginning out turn%	42a	36.4b	0.92
Seed index (g)	8.1a	6.0b	0.75
Staple length (mm)	29.0a	27.4b	0.38
SCY kg ha ⁻¹	2855.5a	1676.4b	76.965

Table 3. Interactive effects of planting dates and advance lines on agronomic traits of cotton

Parameters	Advance lines					
	NIA-88	M-32	NIA-Bt. 89	NIA-Bt.90	IUB-2013	CRIS-121
Sympodial branches plant ⁻¹	23a	22a	20b	19b	19b	19b
No. of bolls plant ⁻¹	44a	37b	37b	37b	37b	36b
Boll retention%	44a	29b	31b	25c	28bc	18d
Ginning out turn%	40a	38b	39ab	39b	38b	39ab
Seed index (g)	9.0a	8.0b	7.0bc	6.0c	6.0c	7.0bc
Staple length (mm)	28.4a	28.0ab	28.0bc	27.7abc	27.3c	28.2ab
Seed cotton yield (kg ha ⁻¹)	2339.2a	2313.0a	2283.3a	2262.0ab	2255.2ab	2137.2b

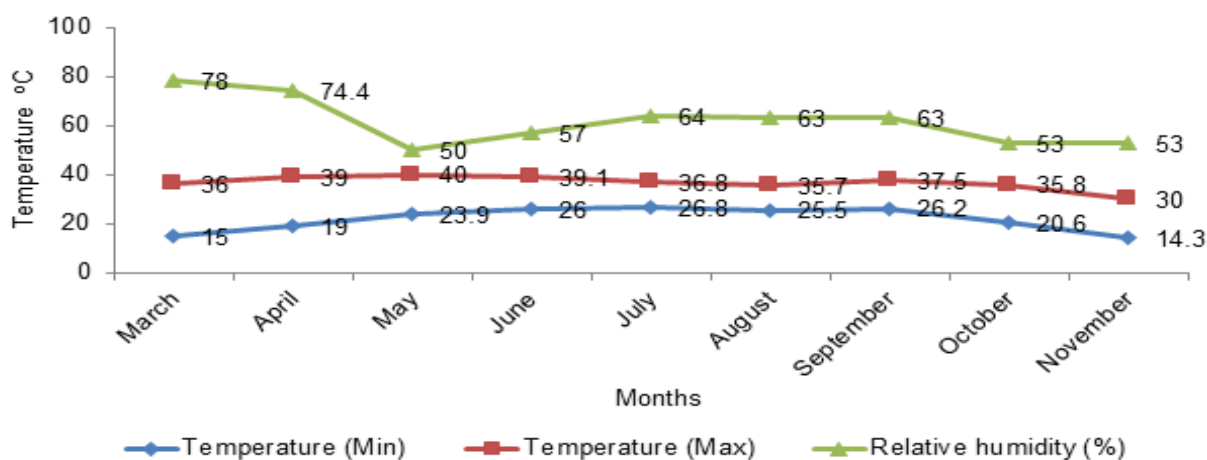


Figure 1. Meteorological data showing minimum, maximum temperature and humidity% during cotton crop season at Nuclear Institute of Agriculture, Tandojam

Seed cotton yield (kg ha⁻¹)

The analysis of variance for seed cotton yield kg ha⁻¹ (Table 1) depicted that sowing dates and their interactions were highly significant at ($P<0.05\%$) whereas, advance lines were non-significant. The highest seed cotton yield (2855.5kg ha⁻¹) was recorded in 1st April sowing date whereas lowest seed cotton yield (1676.0 kg ha⁻¹) was recorded on the 1st May sown crop (Table 2). Advance line NIA-88 took maximum seed cotton yield (2339.2 kg ha⁻¹) however minimum seed cotton yield (2137.2 kg ha⁻¹) was noted in check variety CRIS-121 (Table 3). Sowing date significantly affected on seed cotton yield (Huang. 2016). Sowing dates are an important factor affecting the yield and reproductive duration of crop. Climate change, an earlier planting date might be an efficient method for increasing seed cotton yield. Sharif *et al.* (2020) reported that crops sown on 10th April produced more seed cotton yield than planted on 10th May crop sown.

Meteorological data

Temperature is also a primary factor controlling rates of plant growth and development. Schrader *et al.* (2004) stated that high

temperatures that plants were likely to experience inhibit photosynthesis. During crop grown season average minimum temperature 19.2°C and maximum 39.1°C was noted in the month of April and average minimum temperature 26°C and maximum 39.1°C recorded in the month of June and July which was suitable temperature remained at the time of flowering and boll formation. The relative humidity was remained 64% in the month of July Figure1.

CONCLUSION

Planting date is an important factor affecting the seed cotton yield. With climate change, an earlier planting date might be an efficient method of increasing seed cotton yield. The present research work achieved that the seed cotton yield and associated traits were affected by planting times. Between the planting times early sowing (1st April) produced higher seed cotton yield, Ginning out turn %, more boll retention %. Among the advance line NIA-88 achieved maximum seed cotton yield and yield traits. The results of this study will be providing a standard for growers and management organizations to choose the optimum planting

date to increase seed cotton yield in their own areas.

AUTHOR'S CONTRIBUTION

Z. A. Deho: Conceptualized the main idea, conducted the experiment and wrote manuscript.

REFERENCES

- Analytical software, Statistix version 8.1: User's manual. 2005. Analytical software, Tallahassee, Florida, USA.
- Cetin, O. and S. Basbag. 2010. Effects of climatic factors on cotton production in semi-arid regions. Department of Irrigation Engineering Agricultural Faculty, Dicle University, Diyarbakir, Turkey, 11 (3): 785-791.
- Copur, O. 2006. Determination of yield and yield components of some cotton cultivars in semi-arid conditions. Pakistan Journal of Biological Science. 9 (14): 2572- 2578.
- Fahad, E., A. Ali, M. A. Nadeem, M. Tahir and A. Majeed. 2008. Comparative Yield Performance of New Cultivars of Cotton (*Gossypium hirsutum* L.). Pakistan Journal of Life and Social Sciences. Department of Agronomy, University of Agriculture, Faisalabad, 6 (1): 1-3
- Farid, M. A., M. Ijaz, S. Hussain, M. Hussain, O. Farooq, A. Sattar, A. Sheraz, A. Wajid, A. Ullah and M.R. Faiz. 2017. Growth and yield response of cotton cultivars at different planting dates. Pakistan Journal of Life Social Science, 15 (3): 158-162.
- GoP, 2021-22. Economic Survey of Pakistan. Economic Advisory Wing. Islamabad: Pakistan, pp. 19.
- Gormus, O. and C. Yucel. 2002. Different planting date and potassium fertility effects on cotton yield and fiber properties in the Cukurova region, Turkey. Field Crops Research, 78 (2-3): 141-149.
- Huang, J. 2016. Different sowing dates affected cotton yield and yield components. International Journal of Plant Production, 10 (1): 63-83.
- Iqbal, M., M. M. Iqbal, S. Ahmad, A. Mahmood, M. Akram, H. Husnain, M. Shahid, S. Ahmad, A. Raza, A. Hussain, A. D. Abid, Q. Abbas, M. Hussain, M. Akram and M. U. Hassan. 2021. Pakistan Journal of Agricultural Research, 34 (3): 569-579.
- Jaffar, I., M. Faheem, M. Roman, S. Magsi, H. Rauf, Z. Arif, T. Khaliq and M. Tahir. 2023. Climate change effects on cotton planting date and planting density using modelling techniques: Review. Pure and Applied Biology, 12 (1): 732-753.
- Jamro, S. A., M. U. Ali, M. Buriro, M. I. Ahmad, G. M. Jamro, A. Khan, F. A. Shah, W. A. Siddique A. Sher and M. I. Jakhro. 2017. Impact of various sowing Dates on growth and yield parameters of different cotton varieties. Journal of Applied Environmental Biology Science, 8 (7): 135-143.
- Kakar, N. U., F. C. Oad, S. Tunio, Q. U. Chachar and M. M. Kandhro. 2012. Response of sowing time to various cotton genotypes. Sarhad Journal of Agriculture, 28 (3): 379-385.
- Killi, F. 2005. Effect of early, normal and late planting dates on yield components of two cotton cultivars under irrigated conditions of Turkey-Innovative Scientific Information and Services Network Bioscience Research, 2 (1): 38-42.
- Mohamed, K. A., S. O. Yagoub, A. E. Kamal AbdElsalam and A. I. Abuali. 2016. Response of sowing dates, cultivars and nitrogen application on growth, yield and oil contents of cotton crop (*Gossypium hirsutum* L.) growth at Nuba Mountain. Scholars Journal of Agriculture and Veterinary Sciences, 3 (5): 351-357.
- Mustafayev, S., L. Efe, B. Gokkaya and K. Alaskerov. 1999. Naturally coloured cotton and their future perspectives. In Proceedings of 1st symposium on Cotton Production, Fiber Technology and Textile in Turkish world (Eds.): Oglakci and B. Cicek, Kahramanmaras-Turkey. Proceedings, pp. 315-324.
- Niazi, S. K. 2005. Response of cotton cultivars to different sowing dates. M.Sc. (Agronomy) Thesis submitted to Sindh Agriculture University, Tandojam, pp.1-59.
- Saeed, F., S. A. Kang and M. Amin. 2014. Performance of genotypes at different sowing dates on yield and quality traits in *Gossypium hirsutum* L. International Journal of Agriculture and Crop Sciences, 7 (5): 274-278.
- Salih, R. F. 2019. Effect of Sowing Dates and Varieties of Cotton (*Gossypium hirsutum* L.) on Growth and Yield Parameters. Zanco Journal of Pure and Applied Sciences, 31 (3): 64-70.
- Schrader, S. M., R. R. Wise, W. F. Wacholtz, D. R. Ort and T. D. Sharkey. 2004. Thylakoid membrane responses to moderately high

- leaf temperature in Pima Cotton. *Plant, Cell and Environment*, 27 (6): 725-735.
- Sharif, I., A. Nazir, E. Shahzadi, S. M. Chohan and G. Sarwar. 2020. Influence of sowing dates on cotton growth (*Gossypium hirsutum* L), yield and fiber quality. *Pakistan Journal of Agricultural Research*, 33 (4): 866-871.
- Soomro, A. R., M. H. Channa, A. A. Channa, G. H. Kalwar, G. N. Dayo and A. H. Memon. 2000. The effect of different sowing dates on the yield of newly developed strain under climatic conditions of Ghotki, Sindh, Pakistan *Journal of Biological Sciences*, 3 (11): 1901-1903.
- Soomro, A. W., F. H. Panhwar, A. R. Channa, M. Z. Ahsan, M. S. Majidano, F. I. Khaskheli and K. B. Sial. 2014. Effects of sowing time on yield, GOT and fiber traits of upland cotton (*Gossypium hirsutum* L.). *International Journal of Scientific and Engineering Research*, 5 (12): 194-198.

(Received: April 04, 2023; Accepted: May 23, 2023)