J. Cotton Res. Dev. **36**(1), 71-75 (January, 2022) **ISSN No. 0972-8619**

Evaluation of growth, yield and quality of cotton genotypes under different sowing time

RENU BALA, SHWETA*, KARMAL MALIK, MEENA SEWHAG AND PRIYANKA

Department of Agronomy, CCS Haryana Agricultural University, Hisar - 125004

Email: malik.shweta54@gmail.com

Abstract : To find out optimum sowing time and suitable genotype of cotton and to assess their effects on fibre quality parameters, field experiment was conducted during *kharif* 2017 at the Agronomy Research Farm of CCS, Haryana Agricultural University, Hisar. The soil of the experimental field is slightly alkaline in reaction, sandy loam in texture, low in organic carbon and nitrogen, medium in available phosphorus and potassium.The experiment was laid out in split plot design with four sowing date (S_1- 1st fortnight of April, S_2- 2nd fortnight of April, S_3- 1st fortnight of May and S_4 -2nd fortnight of May) as main plot and four cotton genotypes {G^1- *Bt* hybrid (RCH 650), G_2 - American variety (H 1098i) and G^3- *Desi* variety (HD 432)} as a sub plot replicated thrice. The results of the experiment indicated that sowing time of cotton had non-significant effect on fiber quality parameters (GOT, micronair value, fiber strength, span length and UHML). The seed cotton yield during sowing 2nd fortnight of April was higher might be due to the higher number of bolls/m2, boll weight and number of sympodial branches.GOT was recorded significantly higher in cotton genotype HD 432 than RCH 650 and HD 1098i.Cotton quality parameters like micronair value, fiber strength, span length and UHML was recorded significantly higher in genotype RCH 650 than H 1098i and HD 432.

Keywords: Fiber, genotypes, growth, sowing time

One of the most important agronomic considerations for farmers is to ensure optimum yield and quality of the crop. Early planting of cotton in India avails the advantage of favorable environmental conditions before the commencement of monsoon and high temperature during flowering and fruit development. Cotton is considered as an internationally traded crop which plays an important role for uplifting country's economy. A better crop growth ensures with the appropriate coordination of different management practices and efficient use of various production inputs and among these, sowing date is important to explore the potential of a cultivar in the region. (Ali, e*t al.*, 2005). Cotton seed requires a warm soil conditions and thus, planting can start as soon as soil temperature is warm enough to establish a healthy crop seedlings. It is an established fact that cotton is a perennial plant that is produced as an annual, so very responsive to environmental conditions (Yucel and Gormus 2002). The genotypes and sowing time are the two most important factors deciding theyield and quality characteristic of cotton crop. The growth, yield and fiber quality of cotton are maximized by suitable sowing time. For cotton crop, a daily minimum temperature of 15°C is required for germination and 21-27°C for proper vegetative growth. Temperature significantly effects leaf expansion, internodes elongation, dry matter production and partitioning of assimilates to different plant parts (Sankarnarayanan *et al.*, 2010). Keeping the above aspects in view, the present investigation "Fiber quality parameters of cotton as influenced by different sowing time and genotypes"has been planned with the objective to study the effect of sowing time and cotton genotypes on fibre quality.

MATERIALS AND METHODS

The field experiment was conducted at the Agronomy Research Farm of Haryana Agricultural University, Hisar, CCS which is situated at altitude of 215.2 m above mean sea level and 29°10' N latitude, 75°46' E longitude,

during *kharif*, 2017.The soil of experiment was sandy loam in texture with 73.8 per cent sand, 15.9 per cent silt and 10.3 per cent clay {International pipette method by Piper, 1966)} with pH 7.9. The soil was low in organic carbon (0.44%) Walkley and Black rapid titration method by Jackson, 1973), medium in available Nitrogen (134 kg/ha) (Alkaline permanganate method by Subbiah and Asija, 1956) and Phosphorus (19 kg/ha) Olsen method by Olsen *et al.*, 1954) and highly available potassium (366 kg/ha) (Flame photometer method by Richards, 1954).The experiment was laid out in split plot design with four sowing time (S_1 - 1st fortnight of April, S_2- 2nd fortnight of April, S_3 -1st fortnight of May and S_4 -2nd fortnight of May) as main plot and three cotton genotypes {G_1 - *Bt* hybrid (RCH 650), G_2 - American variety (H 1098i) and G_3 - *desi* variety (HD 432)} as a sub plot treatments replicated thrice. Full dose of P, K and $ZnSO_4$ were applied at the time of sowing in all genotypes. Two split of N in H-1098i were applied, first split was given after first irrigation and second split was applied at flowering stages. In *Bt* cotton three split of N were applied. First split at time of sowing while second and third at first irrigation and at flowering stage respectively. Pre emergence application of herbicide (pendimethalin) @ 5 kg/ha was applied, one hand weeding and four hoeing was done to check weed population. Height of five tagged plants in each plot was measured at maturity from the main stem to the tip of fully opened leaf at the top and expressed in cm. 500 g sample of seed cotton was taken from each plot for the measurement of Ginning outturn (GOT), pre cent and then ginned to get lint and cotton seed.

It was calculated by using following formula.

$$\text{GOT (\%)} = \frac{\text{Weight of lint}}{\text{Weight of seed cotton}} \times 100$$

For finding the micronair value a sample of 100/lint was taken and measure micronaire value by using Precitronic Digital Mic Tester. Fiber strength denotes the maximum tension in term of breaking node fiber and was measured by fibrograph. It is expressed in g/tex and also known as bundle strength. Random sample of cotton fiber is prepared and by breaking the fiber at a constant amount location, made sure that the samples were broken with constant number of fiber between jaws, and raw strength data are directly proportional to the force required to break the fibre. Span length is the distance spanned by specified per cent of fibers in test beard or distance from clamp on fiber beard. It is expressed in mm. A sample of having weight 100 g lint was taken to measure span length by Statex Electrospan automatically measures span length taken from sample blowroom, cards, drawframes and combers. Seed cotton picked from each picking was added to get total seed cotton yield (kg/ha).Data were analyzed by using analysis of variance (ANOVA). The LSD test was used to decipher the effect of treatments at 0.05 probability significance level.

RESULTS AND DISCUSSION

Growth

At maturity, significantly higher plant height (176.9 cm) was observed under 1st fortnight of May, which was *at par* with 2nd fortnight of April (176.8 cm) over to 1st fortnight of April and 2nd fortnight of May. At maturity stage 2nd fortnight of May produced significantly lower plant height over all other sowing dates. The height of HD 432 was significantly higher than RCH 650 and H1098i. The difference between RCH 650 and H1098i height was non significant (Fig 1).

Significantly lower CGR during105 DAS to maturity (35.89) was observed when crop was sown 2nd fortnight of May. During the period of 105 DAS to maturity, significantly higher CGR (37.6) was recorded under sowing 1st fortnight of May than 1st fortnight of April and 2nd fortnight of April, and at par to 2nd fortnight of May. All the genotypes showed significant differences in CGR. Genotype H1098i recorded maximum CGR (36.02) which was significantly higher than RCH 650 and HD 432, during 105 DAS to maturity.

Sowing time showed effect on NAR at 105 DAS to maturity stage, negative value for NAR was observed. Non significant effect of genotypes was observed at 105 DAS to maturity. The NAR decreased as the sowing was delayed from 1st fortnight of April to 2nd fortnight of May.

Quality

Sowing time had a non significant effect on the ginning outturn (GOT) of various cotton genotypes. Cotton sown during 1st fortnight of April, 2nd fortnight of April, 1st fortnight of May, and 2nd fortnight of May recorded GOTs of 37.71, 37.75, 37.63 and 37.01 per cent, respectively (Table 1). Similar results have been reported by Puri (2001). Cotton genotypes had a significant effect on the ginning outturn (GOT). The genotype HD 432 recorded maximum GOT (41.94 %) which was significantly higher than the genotypes RCH 650 (35.84 %) and H 1098i (36.84 %). Difference in GOT is genetically governed and expression may change with the change in environment.

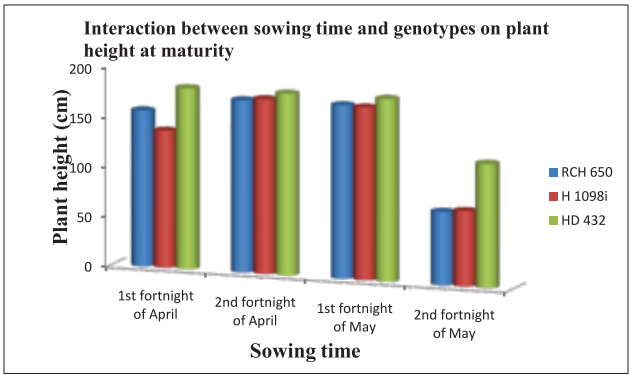

Fig. 1. Interaction between sowing time and genotypes on plant height at maturity

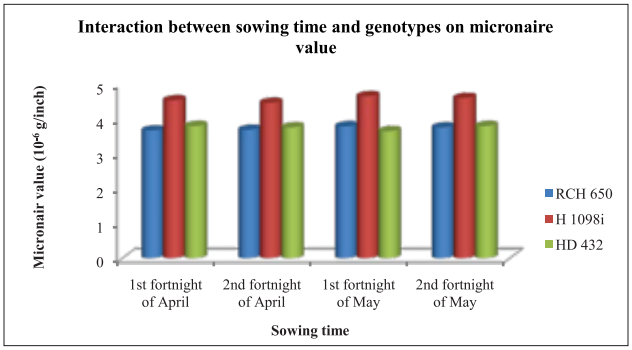

Fig. 3. Interaction between sowing time and genotypes on micronaire value

Micronair value of cotton is a fiber quality parameter that reflects a combination of fiber maturity and fiber linear density (often referred to as fineness). Different sowing time had a non-significant effect on micronair value (Table 1 and Fig 3). Micronair value above 4.5 may indicate that fiber is coarse and undesirable for spinners as it results in very few fibers in yarn cross section, reducing its strength. Low micronair value below 3.5 indicates that fiber is immature, leading to breakages in fibers within the yarn and also resulted in poor dye uptake during textile processing. Among the genotypes, statistically significant differences in micronair value were observed. Cotton genotypes RCH 650 recorded better micronaire value (4.42) than H 1098i (4.57) and HD 432 (6.09). Similar finding was reported by Braunack *et al.*, (2012).

Sowing time had a non significant effect on fiber strength of cotton genotypes. Significant differences were observed among the genotypes for fiber strength (g/tex) which indicated that

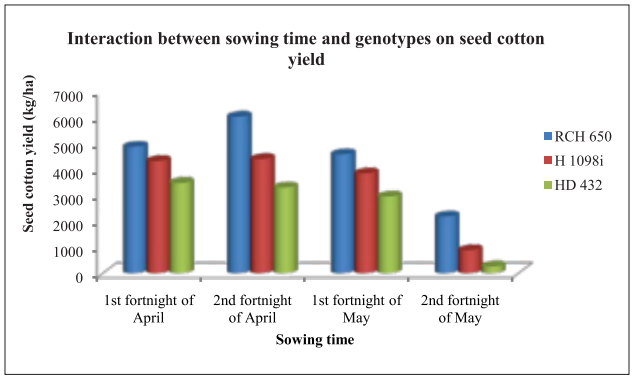

Fig. 2. Interaction between sowing time and genotypes on seed cotton yield

genotype RCH 650 (28.21 g/tex) recorded significantly higher fiber strength as compared to H 1098i (26.64 g/tex) and HD 432 (22.32 g/tex). This might be due to the fact that varied genetic makeup, competition from other bolls, assimilatory capacity of the genotypes determines the fiber strength of cotton. Similar results were reported by Awan *et al.*, (2011) who observed significant difference in fiber strength due to different genotypes.

Table1: Effects of different sowing time and genotypes on growth and yield of cotton

Treatment	Net Assimilation Rate (g/dm2/day)	CGR (g/m^2/day) 105 DAS-Maturity	Seed cotton yield (kg/ha)	Micronairvalue (10^{-6} g/inch)	GOT (%)
Sowing time					
1st fortnight of April	- 0.41	18.56	4203	4.94	37.71
2nd fortnight of April	- 0.52	27.44	4556	5.10	37.75
1st fortnight of May	- 0.63	37.06	3775	4.93	37.63
2nd fortnight of May	- 0.75	35.89	1103	5.14	37.01
SEm ±	0.04	0.52	66	0.06	0.36
CD (0.05)	0.16	1.82	233	NS	NS
Genotypes					
RCH 650	- 0.58	18.56	4395	4.42	35.82
H 1098i	- 0.58	36.02	3344	4.57	36.82
HD 432	- 0.56	34.64	2488	6.09	41.94
SEm ±	0.03	0.63	183	0.04	0.23
CD (0.05)	NS	1.90	555	0.14	0.68

Seed cotton yield (kg/ha)

Sowing time and genotypes had significant effect on seed cotton yield (Table 1 and Fig 2) and the results revealed that seed cotton yield was significantly higher (4555 kg/ha) in 2nd fortnight of April sown crop than all other sowing time. Among the genotypes, RCH 650 produced significantly higher seed cotton yield (4395 kg/ha) over H 1098i (3344 kg/ha) and HD 432 (2488 kg/ha). The seed cotton yield during sowing 2nd fortnight of April was higher might be due to the higher number of bolls/m2, boll weight and number of sympodial branches (Renu *et al.*, 2019). Cotton yield decreased with late sowing due to the reduction in season length (Wrather *et al.*, 2008) and reducing the number of fruiting branches and bolls. Yield reduction due to late sowing may be attributed to shortening of crop period which adversely affected the reproductive process of crop (Prakash *et al.*, (2010) and Braunack *et al.*, (2012).

CONCLUSION

From the obtained results it can be concluded that various sowing time fail to influence quality parameters (GOT, micronaire value, fiber strength and UHML) and had significant effect on seed cotton yieldof cotton genotypes. Among various cotton genotypes, better fibre quality parameters were observed in cotton genotype RCH 650 over H 1098i and HD 432. Significantly higher (4555 kg/ha) in 2nd fortnight of April sown crop than all other sowing time.

REFERENCES

Ali, H., Muhammad, D., Aftzal, M. N. and Abid, S. A. 2005. Seed cotton yield of different cultivars as affected by sowing time under agro- climatic conditions of Southern Punjab. *The Indus Cotton.* **2**: 186-88

Awan, H., I. Awan, M. Mansoor, E.A. Khan and M. A. Khan. 2011. Effect of sowing time and plant spacing on fiber quality and seed cotton yield. *Sarhad J. Agri.* **27**: 411-13.

Braunack, M.V.; Bange, M.P. and Johnston, D. B. 2012. Can planting date and cultivar selection improve resource use efficiency of cotton system? *Field Crops Res.* **137**: 1-11.

Jackson, M.L. 1973. *Soil Chemical Analysis.* Prentice Hall India Pvt. Limited, New Delhi. p.498.

Olsen, S.R.; Cole, C.V.; Watanable, F.S and

Dean, L.A. 1954. *Estimation of available phosphorus in soil by extraction with sodium bicarbonate*, U.S.D.A. Circ. p. 939.

Piper, C.S. 1966. *Soil and Plant Analysis*. Hons Publishers, Bombay

Prakash, A.H.; Bandyopadhyay, K.K.; Gopalakrishnan, N. and Anderson, A., Kumar, A. 2010. Interaction of thermal time and nitrogen levels on growth and productivity of cotton (*Gossypium hirsutum*). *Indian J. Agri. Sci.* **80**: 704-09.

Renu Bala, Shweta, Karmal Malik, Meena Sewhag and Priyanka 2020. Effect of sowing dates on yield of cotton genotypes under Hisar Conditions. *J. Cotton Res. Dev.* ***34*** *: 72-77*

Richards, L.A. 1954. *Diagnosis and Improvement of Saline and Alkali Soils*. USDA Hand BookNo. 60, Washington, D. C.

Sankarnaryanan, K.; Praharaj, C.S.; Nalayani, P.; Bandyopadhyay, K.K. and Gopalakrishnan, N. 2010. Climate change and its effect on cotton (*Gossypium* sp.) *Indian J. Agri. Sci.* **80**: 561-75.

Subbaiah, B.V and Asija, G.L. 1956. A rapid procedure of estimation of available nitrogen in soils. *Curr. Sci.* **65** : 477-80

Wrather, J.A.; Phipps, B.J.; Stevens, W.E.; Phillips, A.S. and Vories, E.D. 2008. Cotton planting date and plant population effects on yield and fiber quality in the Mississippi Delta. *The J. Cotton Sci.* **12**:1–7

Yucel, C. and Gormus, O. 2002. Different planting date and potassium fertility effects on cotton yield and fiber properties in the Cukurova region, Turkey. *Field Crops Res.* **78**:141-49

Received for publication : June 21, 2021
Accepted for publication : September 19, 2021