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Effect of nipping and sowing time on economics and yield of cotton genotypes

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Abstract : An field experiment was conducted to show the effect of nipping and sowing time on the performance of cotton at Cotton Research Area, CCS Haryana Agricultural University, Hisar, during *kharif,* 2021 to investigate the effect of sowing dates (13th April, 28th April and 14th May) on the growth, economics and yield of cotton genotypes (*Desi* HD 432 and *Bt*- RCH 776) by performing different nipping treatments (F_1 (Control), F_2 (Nipping at 60 DAS), F_3 (Nipping at 90 DAS), F_4 (Nipping at 120 DAS), F_5 (Nipping at 60 and 90 DAS), F_6 (Nipping at 90 and 120 DAS). The experiment was conducted in split split plot design and replicated thrice. It was noted that 2nd fortnight of April was most promising sowing date resulted significantly higher (2635 kg) seed cotton yield/ha with higher bolls/plant, sympodia/plant and seed index as compared to 1st fortnight April sowing (2581kg/ha) and comparable with sowing of mid-May. In case of genotypes, *Bt* cotton (RCH 776) perform better with higher sympodial branches/plant (18.43), bolls/plant (53.20), boll weight (4.55 g) and seed cotton yield (2740 kg/ha) as compared to *desi* genotype (HD 432) under all conditions. F_2 (Nipping at 60 DAS) and F_5 (Nipping at 60 and 90 DAS) recorded significantly higher seed cotton yield, sympodia/plant and bolls/plant as as compared to other treatments. B:C was recorded higher with 2nd fortnight of April and Mid-May sowing than 1st fortnight of April sowing, *Bt* cotton recorded higher B:C than *desi* cotton. Nipping at 60 DAS and nipping at 60 and 90 DAS resulted higher B:C as compared to other treatments. Cotton genotypes RCH 776 sown at 2nd fortnight of April and nipping done at 60 DAS achieved highest seed cotton yield and benefit cost ratio.

Keywords: Cotton, genotypes, nipping, sowing time, yield

Cotton (*Gossypium* spp.), popularly known as "White Gold," is one of the major commercial cash crops which is mainly cultivated in semi-arid regions throughout the world. It is a soft, fluffy staple fibre that grows around the seeds inside a protective case, known as boll. It belongs to the genus *Gossypium* in the family Malvaceae. In Haryana, cotton was grown in an area of 6.48 lakh ha with a production of 18.94 lakh bales and productivity of 497 kg/ha lint. Despite having the distinction of cotton cultivation on large area, the productivity of cotton in India is 469 kg/ha, as against the global average of 792 kg/ha (Anonymous, 2022). Among the various constraints, the excessive vegetative growth, boll shedding, unsuitable sowing time and inappropriate agronomic practices are the most important constraints for its low productivity. The yield of cotton is mostly associated with sowing time as boll weight and formation of bolls/plant are co related with the yield.

Selection of suitable genotype is also an important component in any cropping system. Among genotypes *desi* varieties shows straight and vigorous growth with minimum inputs as compared with *Bt* cotton.

The most important non monetary input and controllable component in the cotton crop that has been demonstrated to have a positive influence on cotton growth and development is optimum planting time. Understanding the impact of varied sowing times on cotton phenology and growth is critical for good crop management. For maximizing yields, sowing times vary from place to place depending on the climatic conditions. In Haryana, Sowing is suggested in between April and mid May (Kumar *et al.*, 2014). Sowing time linearly effects the seed cotton yield, because early maturing cultivars start flowering and boll formation well earlier as compared to late ones. Crop planted too early show poor crop stand, which reduces yield potential; on the other hand, delayed sowing impedes the crop to achieve complete canopy development, making it more susceptible to lower temperature stress during later phases of crop growth, resulting in poor growth and yield. Therefore, optimum sowing time and suitable genotype is required to further enhance the cotton productivity.

Vigorous vegetative growth may be suppressed to some extent by modifying cultural practices such as adoption of topping or nipping of plant. Nipping restricts the vegetative growth, eliminates lodging by strengthening the main stem and branches, reduces boll rots and encourage the growth of more side branches resulting in more flowers and cotton bolls as well as the timely bursting of cotton bolls. In addition to tillage, fertilizer application, spraying, and irrigation operations, nipping is also a standard cultural practice that should be done to control the indeterminate growth characteristic of cotton (Renou *et al.*, 2011). Nipping is performed to prevent lodging, control excessive growth and improve yield (Mao *et al.*, 2015; Ayd and Arslan, 2018). Nipping can be done manually, mechanically or chemically and both manual and mechanical nipping are considered to be physical forms of nipping. Manual topping is a traditional agronomic practice dating back centuries, though it is still commonly used. Manual topping through the removal of the main-stem apex can break the apical dominance, control the growth of the cotton main stem, reduce invalid branches and fruits, increase the transport of nutrients and assimilates to effective fruiting branches and bolls, and reduce insect pests and rotten bolls (Renou *et al.*, 2011). Keeping this in view, the present study, "Effect of nipping and sowing time on economics and yield of cotton genotypes" during *kharif* seasons of the years 2021 was conducted with the following objectives:

- To study the performance of cotton under varying sowing times and nipping treatments.
- To find out the optimum time of sowing and economics of different treatments

A field experiment entitled, "Effect of nipping and sowing time on growth and yield of cotton genotypes" was conducted at Cotton Research area of CCS Haryana Agricultural University, Hisar, during *kharif* 2021. The experiment was conducted in split-split plot design and replicated thrice. The experiment consisted of three sowing times in main plots: M_1 (1^{st} fortnight of April), M_2 (2^{nd} fortnight of April), M_3 (Mid of may), two genotypes in sub plots: V_1 (HD 432), V_2 (RCH 776) and six nipping treatments in sub-sub plots: F_1 (Control), F_2 (Nipping at 60 DAS), F_3 (Nipping at 90 DAS), F_4 (Nipping at 120 DAS), F_5 (Nipping at 60 and 90 DAS), F_6 (Nipping at 90 and 120 DAS).

The soil was fully pulverized before sowing of crop with accurate soil leveling and depth for better root penetration and efficient utilization of nutrients and water. Recommended dose of fertilizer for RCH 776 is 175 kg N, 60 kg P_2O_5, 60 kg K_2O and 25 kg $ZnSO_4$ /hectare, for HD 432; 50 kg N and 25 kg $ZnSO_4$ ha^{-1}. For HD 432, whole nitrogen was applied after 1^{st} irrigation. Total bolls harvested/m2 was calculated in each plot from five tagged plants by adding the mean number of good and bad opened bolls harvested/m2. Five fully opened bolls from tagged plants in each plot were picked randomly and weighed and recorded as average boll weight plant in grams. Total seed cotton harvested from all the picking (two) /plot and seed cotton yield in kg/ha was computed on the basis of net seed cotton yield/plot. Weight of 100 cotton seeds were randomly taken after ginning from each plot and expressed in grams.

$$B:C = \frac{\text{Gross returns}}{\text{Cost of cultivation}}$$

The experimental treatments were managed according to plan. All the statistical analyses were performed by using OPSTAT Computer Software.

The lowest nodes of the plant give rise to auxiliary vegetative branches known as monopodial branches. Different sowing times had no significant effects on the number of monopodial branches, while the genotypes influenced it up to significant extent (Table 1). Similar results were also noted by Sankaranarayanan *et al.*, (2020) and Iqbal and Khan (2011), Kumar *et al.*, (2014). RCH 776 recorded significantly higher monopodial branches/plant when compared with HD 432. The monopodial branches/plant was not significantly affected by the various nipping treatments.

The fruiting or reproductive branches also known as sympodial branch, is a vital quantitative parameter that contributes directly to the seed cotton yield (Niamatullah *et al.*, 2017). The sympodial branches/plant produced was significantly influenced by genotypes and sowing timings. The cotton crop sown in 2nd fortnight of April produced significantly higher number of sympodial branches/plant as compared to 1st fortnight of April sowing and comparable with mid-May sowing. The same findings were reported by Rizwan *et al.*, (2021). Same findings were also reported by Buttar *et al.*, (2005). RCH 776 performs better than HD 432 in terms of sympodial branches/plant. The variation in different genotypes for sympodial branches/plant might be due to differences in their genetic makeup of the genotypes. Same was supported by Mukesh *et al.*, (2021) and Bolonhezi *et al.*, (2000). Nipping at 60 and 90 DAS reported the highest sympodial branches/plant, which was statistically comparable to nipping at 60 DAS.

The different planting timings and genotypes had a substantial impact on the number of bolls/plant, while their interactions had no appreciable impact. The results presented in Table 1. showed that the significantly higher bolls/plant were recorded under mid of May and 2nd fortnight April sown crop. Same findings were reported by Hallikeri *et al.*, (2010) and Prakash *et al.*, (2010). The maximum bolls/plant were observed in nipping at 60 DAS which was statistically equal to nipping at 60 and 90 DAS.

The results denoted that different sowing times had no considerable impact on the boll weight but still 2nd fortnight of April sown crop recorded comparatively highest boll weight than all other sowing times due to the higher accumulation of photosynthates and more time available for boll development. Temperatures below 12°C at night may be harmful for boll retention and development (Yates *et al.*, 2013). There was no significant influence of nipping treatments were found on boll weight of cotton.

Seed cotton yield is affected by many yield attributing parameters such as bolls/plant, boll weight and sympodial branches etc. The results revealed that genotypes and sowing time had a significant effect on seed cotton yield. The higher seed cotton yield was recorded in 2nd fortnight of April sowing comparable with mid- May sowing might be due to the higher number of sympodial branches and boll weight. These similar results were demonstrated by Sarlach and Brar (2020), Singh *et al.*, (2020), Ullah *et al.*, (2015), Awan *et al.*, (2011). Significantly higher seed cotton yield was observed in nipping at 60 and 90 DAS which was statistically *at par* with nipping at 60 DAS. It might be due to adequate food supply to sink and ultimately reflected on better development of yield attributes. (Devi *et al.*, 2021). Compared to HD 432, the genotype RCH 776 reported a considerably higher seed index. The variation for

Table 1. Effects of different sowing times and nipping treatments on yield and yield attributes of cotton genotypes

Treatments	Monopodia	Sympodia	Bolls/plant	Boll wt. (g)	SCY (kg/ha)	Seed index (g)
Sowing times						
1st fortnight of April	1.94	15.53	46.53	3.58	2481	6.67
2nd fortnight of April	1.99	17.93	48.25	3.59	2635	7.03
Mid of May	1.84	16.75	48.47	3.57	2618	7.00
SEm ±	0.08	0.56	0.53	0.06	36	0.05
CD at (p=0.05)	NS	1.32	1.30	NS	113	0.22
Genotypes						
HD 432	1.76	15.04	42.30	2.55	2417	4.55
RCH 776	2.10	18.43	53.20	4.55	2740	9.25
SEm ±	0.07	0.23	0.25	0.04	29	0.07
CD at (p=0.05)	0.26	0.78	0.87	0.12	85	0.25
Nipping treatments						
Control	1.83	15.82	46.56	3.55	2526	6.83
Nipping at 60 DAS	1.96	17.92	53.33	3.54	2688	6.83
Nipping at 90 DAS	2.14	16.51	44.06	3.62	2538	6.82
Nipping at 120 DAS	1.90	15.63	43.78	3.53	2509	7.00
Nipping at 60 and 90 DAS	1.89	18.26	53.28	3.56	2698	6.90
Nipping at 90 and 120 DAS	1.83	16.28	45.50	3.50	2515	7.00
SEm ±	0.09	0.54	0.89	0.04	37	0.08
CD at (p=0.05)	NS	1.53	2.51	NS	105	NS

Table 2. Effects of different sowing time and genotypes under various nipping treatments on economics of cotton

Treatments	Cost of cultivation (₹/ha)	Gross Returns(₹/ha)	Net Returns (₹/ha)	B:C
Sowing time				
1st fortnight of April	87276	170793	83517	1.96
2nd fortnight of April	87476	181009	93533	2.07
Mid of May	86994	179956	92962	2.07
Genotypes				
HD 432	79791	152800	73009	1.92
RCH 776	94707	201704	106997	2.13
Nipping treatments				
Control	83666	173680	90014	2.04
Nipping at 60 DAS	88336	184576	96240	2.09
Nipping at 90 DAS	86202	174557	88355	2.02
Nipping at 120 DAS	86194	172491	86297	2.00
Nipping at 60 and 90 DAS	90849	185345	94496	2.07
Nipping at 90 and 120 DAS	88245	172764	84519	1.96

production of seed index in varieties due to varietal genetic potential. There was no significant influence of nipping treatments were found on seed index of cotton. Among sowing times, 2nd fortnight of April and mid of May sowing recorded highest B:C (2.07) followed by 1st fortnight of April (Table 2.) In case of genotypes, RCH 776 recorded higher B:C (2.13) than HD 432 (1.92). Among different nipping treatments, nipping at 60 DAS recorded highest B:C (2.09) followed by nipping at 60 and 90 DAS (2.07). Jadhav and Bhosle, (2019) reported that Detopping at 75 DAS recorded significantly highest gross monetary returns (Rs. 47272 and Rs. 66792) and net monetary returns (Rs. 24067 and Rs. 34852). Highest B:C was recorded in Detopping at 75 DAS and De-topping at 90 DAS. Cotton genotypes sown at 2nd fortnight of April resulted significantly higher seed cotton yield which was statistically *at par* with sowing at mid of May. Among nipping treatments significantly higher seed cotton yield was observed in nipping at 60 and 90 DAS which was statistically *at par* with nipping at 60 DAS.

CONCLUSION

Cotton genotypes sown at 2nd fortnight of April resulted significantly higher seed cotton yield which was statistically *at par* with sowing at mid of May. Cotton genotype RCH 776 perform better and resulted in significantly higher seed cotton yield as compared to HD 432. Among various nipping treatments, nipping at 60 DAS achieved highest benefit cost ratio followed by nipping at 60 and 90 DAS as compared to control and other nipping treatments.

REFERENCES

Anonymous, 2022. Area, production and productivity of cotton in India. http://cotcorp.gov.in/statistics.aspx

Awan, H.I., Mansoor, M., Khan, E.A. and Khan, M.A. (2011). Effect of sowing time and plant spacing on fibre quality and seed cotton yield. *Sarhad Jour. Agric.* **27**: 411-13.

Bolonhezi, A.C., Justi, M.M., Oliveira, R.C. and Bolonhezi, C. 2000. Narrow spacing for varieties of herbaceous cotton (*Gossypium hirsutum* L.), plant development and retention of reproductive structures. *Field Crop Res.* **53**: 611-13.

Buttar, G.S.; Mahey, R.K. and Aggarwal, N. 2005. Effect of sowing dates, planting methods and irrigation scheduling on the growth and yield of American Cotton (*Gossypium hirsutum*). *J. Cotton Res. Dev.*1**9**: 213-15.

Devi, P., Singh, K., Thakral, S.K., Malik, S. and Sewhag, M. 2021. Effect of methods of application and scheduling in nitrogen on nitrogen use efficiency and seed cotton yield of *Bt* cotton in semi-arid regions of Haryana. *J. Cotton Res. Dev.* **35**: 101-06.

Hallikeri, S.S., Halemani, H.L., Katageri, I.S., Patil, B.C., Patil, V.C. and Palled, Y.B. 2010. Influence of sowing time and moisture regimes on cry protein concentration and related parameters of *Bt*-cotton. *Karnataka Jour. Agric. Sci.* **22**: 995-1000.

Iqbal, M. and Khan, M.A. 2011. Response of cotton genotypes to planting date and plant spacing. *Frontiers of Agriculture in China.* **5**: 262–67.

Kumar, Rajesh., Bhattoo, M.S., Punia, S.S., Bhusal, N., and Yadav, S. 2014. Performance of different *Bt* cotton (*Gossypium hirsutum* L.) hybrids under varying dates of sowing. *J. Cotton Res. Dev.* **28**: 263-64.

Mao, L.L., Zhang, L.Z., Zhang, S.P., Evers, J.B., van der Werf, W., Wang, J.J., and Spiertz, H. 2015. Resource use efficiency, ecological intensification and sustainability of intercropping systems. *J. Integ. Agricul.* **14**: 1542-50.

Mukesh., Singh, K., Devi, P., Sewhag, M. and Malik, S. 2021. Performance of cotton genotypes intercropped with pearl millet and greengram. *J. Cotton Res. Dev.* **35**: 97-100.

Niamatullah, K., Ullah, N., Ullah, I. and Shah, A.I. 2017. Yield and yield contributing traits of cotton genotypes as affected by sowing dates. *Sarhad Jour. Agric.* **33**: 406-11.

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

Renou, A., Tereta, I., and Togola, M. (2011). Manual topping decreases bollworm infestations in cotton cultivation in Mali. *Crop Protection.* **30**: 1370-75.

Rizwan, M., Abro, S., Asif, M.U., Hameed, A., Mahboob, W., Deho, Z.A., and Sial, M.A. (2021). Evaluation of cotton germplasm for morphological and biochemical host plant resistance traits against sucking insect pest complex. *J. Cotton Res.* **4**: 1-8.

Sankaranarayanan, K., Prakash, A.H., and Rajendran, K. 2020. Effect of sowing time on productivity of *Bt* and non *Bt* cotton under climate change. *Bull. Nati. Res. Centre.* **44**:1-12.

Sarlach, R.S. and Brar, A.S. 2020. Growth, productivity and quality of *Bt* and non-*Bt* cotton hybrids (*Gossypium hirsutum* L.) as influenced by environment. *Interna. J. Agric., Envir. Biotechnol.* **13**: 193-199.

Singh, K., Singh, H.P. and Mishra, S.K. 2020. Irrigation module and sowing date affect seed cotton yield, quality, productivity indices, and economics of cotton in north-western India. *Communications in Soil Sci. Pl. Analysis.* **51**: 919-31.

Ullah, K., Khan, N., Usman, Z., Ullah, R., Saleem, F.Y., Shah, S.A.I. and Salman, M. 2015. Impact of temperature on yield and related traits in cotton genotypes. *J. Integrative Agricul.* **15**: 678-83.

Yates, S.J., Kahl, M.F., Dougall, A.J., and Mueller, W.J. 2013. The impact of variable, cold minimum temperatures on boll retention, boll growth, and yield recovery of cotton. *J. Cotton Sci.* **17**: 89-101.

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