

EFFECT OF DIFFERENT PLANT SPACING ALONG WITH CONCENTRATIONS OF GROWTH REGULATOR (MEPIQUAT CHLORIDE) AND TIME OF FOLIAR APPLICATION ON SEED INDEX OF COTTON

M. S. Ahmed*

CDB, Rangpur (*Corresponding author's email: shaheen01743229987@gmail.com)

ABSTRACT

Plant growth regulators (PGRs) are used in cotton production to optimize yield and quality and even suppressing excess growth whenever necessary. Experiments were conducted Plant growth regulators (PGRs) are used in cotton production to optimize yield and quality and even suppressing excess growth whenever necessary. Experiments were conducted in 2017 at Cotton Seed Multiplication, Training and Research Farm, Sreepur, Bangladesh to study the response of cotton yield and quality to different plant spacings, concentration and time of application of mepiquat chloride (MC) growth regulator. Plant spacings like 45 cm × 30 cm, 60 cm × 30 cm and 75 cm × 30 cm; MC spray @ 1.0, 2.0, 3.0 and 4.0 ml L⁻¹ water at 25, 50 and 75 DAE for each concentration along with water spray as control, were the treatment variables. Seed index of cotton was maximum (12.96 g) at spacing 60 cm × 30 cm and the lowest seed index (11.93 g) was recorded from spacing 45 cm × 30 cm. The highest seed index (13.62 g) was from control and the lowest (11.26 g) with 1 ml MC L⁻¹ water at 50 DAE treatments. SI observed highest (15.01 g) from water sprayed with 60 cm × 30 cm spacing and marked lowest (10.33 g) at 3 ml MC L⁻¹ water at 25 DAE with 60 cm × 30 cm spacing treatment combinations. So, cotton cultivation in Sreepur, Gazipur areas may be accelerated with foliar application of mepiquat chloride @ 2 ml L⁻¹ water at 25 DAE along with plant spacing of 60 cm x 30 cm for higher yield and quality.

Key words: Plant spacing, growth regulator, time of foliar, seed index, cotton.

Introduction

Upland cotton (*Gossypium hirsutum* L.) is a leading cash crop in many countries of the world. Bangladesh produces 156,509 bale or 28,328 ton lint and 28484 ton seed cotton from 43050 hectare of land per year (CDB, 2018). Higher demand of cotton could be met up by increasing per hectare yield following appropriate crop management techniques and using short durated quality seeds. Higher plant populations adversely affect yield per unit area simultaneously vegetative and reproductive growth of plants but is important to compensate yield loss due to short canopy of plant (Wright *et al.*, 2008; Silvertooth, 1999 and Hake *et al.*, 1991). Baumhardt *et al.* (2018) reported that plant height increased significantly with increased row spacing in cotton. While Jahedi *et al.* (2013) obtained reduced plant height, number sympodia and total bolls plant⁻¹ in cotton having narrow row spacing. Sowmiya and Sakthivel (2018) noted that sympodial branches plant⁻¹ and bolls plant⁻¹ were found significant in wider spacing (75 cm x 30 cm) in cotton. Xiaoyu *et al.* (2016) opined that the number of bolls increased while boll weight decreased as plant density rosed in cotton. Application of plant growth regulator (either auxin or retardant) can also lead to improve the growth, flowering and yield of many crops. Plant growth regulators are organic compounds, other than nutrients, that affect physiological processes of plants when applied in small concentrations. These compounds represent diverse chemistries and modes of action and provide numerous possibilities for altering crop growth and development. Their time of use extends from early season when they are applied in-furrow or as seed treatments at planting to late season in preparing the crop for harvest. Timing the first application of mepiquat chloride has caused concerns among cotton producers Copur *et al.* (2010) studied that the applied PGRs had significant positive effects on the seed cotton yield, plant height, average number of open bolls, number of sympodia, boll weight, lint percentage and seed index. Amit *et al.* (2015) revealed that foliar application of mepiquat chloride (MC) growth retardant @ 300 ppm yielded more seed cotton by improving the setting percentage and therefore, increased bolls plant⁻¹ without exhibiting any adverse effect on quality traits while plant was shortened. Chaplot (2015) obtained that foliar application of NAA at

100 ppm brought about significantly higher mean seed cotton, cotton seed and lint yield by 57.3, 53.3 and 67.6 percent, respectively over water spray which resulted due to better, balanced plant growth and greater partitioning of assimilates towards yield formation as evidenced by higher flowers plant⁻¹, bolls plant⁻¹, mature bolls plant⁻¹, per cent boll setting, seed cotton weight boll⁻¹ and cotton weight boll⁻¹. Systematic and comprehensive research effort on blending plant spacing, concentration and time of application of mepiquat chloride (MC) in order to increase yield of cotton are inadequate or absent at home or abroad. Keeping these views in mind, the present research programme was undertaken to study the effect of plant spacing and MC concentration along with time of application on seed traits.

Materials and Methods

The experimental field belongs to the agro-ecological zone of Modhupur Tract (AEZ-28) of Bangladesh. Cotton inbred cultivar CB 14 was selected as it is early maturing (short duration) and high yielding cultivar. A factorial experiment with three levels of plant spacing and thirteen different concentrated MC foliar applications along with time of spraying was as Factor A: level of Plant spacings (3): 60 cm × 30 cm (55,555 plants ha⁻¹) as check selected from first year experiment as promising treatment, 45 cm × 30 cm (74,074 plants ha⁻¹), 75 cm × 30 cm (44,444 plants ha⁻¹); and Factor B: MC concentrations along with time of spraying (13): Water spray (control), MC spray @ 1.0, 2.0, 3.0 and 4.0 ml L⁻¹ water at 25 DAE, Mepiquat Chloride spray @ 1.0, 2.0, 3.0 and 4.0 ml L⁻¹ water at 50 DAE and Mepiquat Chloride spray @ 1.0, 2.0, 3.0 and 4.0 ml L⁻¹ water at 75 DAE respectively. MC was sprayed around the crop canopy on 20 September (25 DAE), 20 October (50 DAE) and 14 November, 2017 (75 DAE). The crop was finally harvested on 28 February, 2018. SI of cotton was analyzed with the help of computer package MSTAT-C. Least Significant Difference (LSD) was used for mean separation at 5% level of probability.

Results and Discussion

Effect of plant spacing: Seed index of cotton had considerable variation among the plant spacings. The maximum seed index (12.96 g) was recorded at spacing 60 cm × 30 cm and it was similar with 75 cm × 30 cm spacing (Table 1). The lowest seed index (11.93 g) was recorded from spacing 45 cm × 30 cm. Zhao *et al.* (2019) studied that the 100-seed weight significantly decreased as plant density increased.

Table 1. Effect of plant spacing on seed index of cotton

Treatments	Seed index (g)
60 cm × 30 cm	12.96 a
45 cm × 30 cm	11.93 c
75 cm × 30 cm	12.29 ab
LSD	0.215
CV (%)	2.86

In a column, figure(s) followed by same letter do not differ significantly at 5% level.

Effect of time of application and concentration of MC growth regulator: MC had significant effect on seed index of cotton (Table 2). Seed index increased progressively over time of MC sprayed attaining the highest at 25 DAE. The highest seed index (13.62 g) was obtained from control and the lowest (11.26 g) at 1 ml MC L⁻¹ water at 50 DAE treatments. Zhao *et al.* (2019) studied that the 100-seed weight significantly increased with MC applying under different plant densities in cotton.

Combined effect of plant spacing and time of application and concentration of MC growth regulator: Different plant spacing and MC sprayed at different times and concentration significantly increased the seed index of cotton than control (Table 3). SI observed highest (15.01 g) from water sprayed with 60 cm × 30 cm spacing and it was marked lowest (10.33 g) at 3 ml MC L⁻¹ water at 25 DAE with 60 cm × 30 cm spacing treatment combinations. Zhao *et al.* (2019) studied that the 100-seed weight significantly decreased

as plant density increased while this parameter significantly increased with MC applying under different plant densities in cotton.

Table 2. Effect of MC level along with application time on seed index of cotton

Treatments	Seed index (g)
Control (water spray)	13.62 a
1.0 ml L ⁻¹ MC spray at 25 DAE	12.21 cd
2.0 ml L ⁻¹ MC spray at 25 DAE	11.34 e
3.0 ml L ⁻¹ MC spray at 25 DAE	13.32 ab
4.0 ml L ⁻¹ MC spray at 25 DAE	12.94 a-c
1.0 ml L ⁻¹ MC spray at 50 DAE	11.26 e
2.0 ml L ⁻¹ MC spray at 50 DAE	13.17 ab
3.0 ml L ⁻¹ MC spray at 50 DAE	12.62 b-d
4.0 ml L ⁻¹ MC spray at 50 DAE	11.89 de
1.0 ml L ⁻¹ MC spray at 75 DAE	12.74 bc
2.0 ml L ⁻¹ MC spray at 75 DAE	13.48 a
3.0 ml L ⁻¹ MC spray at 75 DAE	11.45 e
4.0 ml L ⁻¹ MC spray at 75 DAE	12.26 cd
LSD	0.729
CV (%)	2.86

Table 3. Combined effect of plant spacing and MC level along with application time on seed index of cotton

Treatments	Seed index (g)		
	60 cm × 30 cm	45 cm × 30 cm	75 cm × 30 cm
Control (water spray)	15.01 a	12.54 ef	12.99 c-e
1.0 ml L ⁻¹ MC spray at 25 DAE	14.00 a-c	14.90 ab	12.54 ef
2.0 ml L ⁻¹ MC spray at 25 DAE	13.69 b-e	10.44 h	14.69 ab
3.0 ml L ⁻¹ MC spray at 25 DAE	10.33 h	12.56 d-f	10.44 g-h
4.0 ml L ⁻¹ MC spray at 25 DAE	11.66 fg	13.78 a-d	12.56 d-f
1.0 ml L ⁻¹ MC spray at 50 DAE	12.55 d-f	11.44 f-h	13.78 a-d
2.0 ml L ⁻¹ MC spray at 50 DAE	10.99 gh	13.63 b-e	11.44 f
3.0 ml L ⁻¹ MC spray at 50 DAE	14.99 a	14.96 a	13.63 b-e
4.0 ml L ⁻¹ MC spray at 50 DAE	13.55 b-e	10.89 gh	14.96 a
1.0 ml L ⁻¹ MC spray at 75 DAE	15.00 a	12.53 ef	10.99 gh
2.0 ml L ⁻¹ MC spray at 75 DAE	10.34 h	13.98 a-c	14.99 a
3.0 ml L ⁻¹ MC spray at 75 DAE	11.44 f-h	14.98 a	13.55 b-e
4.0 ml L ⁻¹ MC spray at 75 DAE	13.66 b-e	11.60 fg	12.56 d-f
LSD	1.23		
CV (%)	2.86		

In a column, figure(s) followed by same letter do not differ significantly at 5% level.

Conclusion

Seed index of cotton was maximum (12.96 g) at spacing 60 cm × 30 cm and it was the lowest seed index (11.93 g) was recorded from spacing 45 cm × 30 cm. The highest seed index (13.62 g) was obtained from control and the lowest (11.26 g) at 1 ml MC L⁻¹ water at 50 DAE treatments. SI observed highest (15.01 g) from water sprayed with 60 cm × 30 cm spacing and it was marked lowest (10.33 g) at 3 ml MC L⁻¹ water at 25 DAE with 60 cm × 30 cm spacing treatment combinations. So, plant spacing of 60 cm x 30 cm can be practiced for profitable cotton production in Sreepur, Gazipur areas of Bangladesh.

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