

## EFFECT OF MEPIQUATE CHLORIDE AND NITROGEN FERTILIZATION APPLICATION TIMING ON COTTON CULTIVAR GIZA 80

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### ABSTRACT

This study was carried out at Sids Agric. Res. Sta., Beni-Suef governorate, Egypt, during 2003 and 2004 seasons. The experimental design was randomized complete blocks with four replications, using the Egyptian cotton cultivar Giza 80 (*G. barbadense* L.). The treatments were combinations between nitrogen fertilization in two doses (30+30 Kg N/fed.) or three doses (20+20+20 Kg N/fed.) and splitting the dose of mepiquate chloride to two doses (25+25 g a.i./fed.) or three doses (25+12.5+12.5 g a.i./fed.) or (12.5+25+12.5 g a.i./fed.). The spraying timing was at pine head square, at beginning of flowering and after flowering by two weeks. The obtained results revealed that final plant height at harvest, length of internodes, days to appearance of first flower and first boll were decreased significantly in case of treated plants by mepiquate chloride. Also, number of open bolls per plant, yield of seed cotton per plant and per feddan, micronaire reading and specific leaf weight were increased significantly by applying mepiquate chloride. Number of fruiting branches, upper half mean length and seed index were increased by mepiquate chloride in one season. Number of nodes per plant, fresh/dry weight ratio, boll weight, number of plants at harvest, lint percentage, uniformity index, fiber strength, fiber elongation percentage, reflectance and yellowness were insignificantly affected. The highest yield of seed cotton was obtained from the treatments two or three doses of nitrogen fertilization plus mepiquate chloride splitting dose (12.5+25+12.5 g a.i./fed.).  
**Keywords:** Cotton, Nitrogen fertilization, Mepiquate chloride, Growth, Earliness, Yield and Fiber quality.

### INTRODUCTION

Mepiquate chloride (Pix) partially inhibits the synthesis of the plant hormone gibberellic acid which involved in cell elongation and multiplication and generally vegetative growth (Makram *et al.*, 1981).

Concerning the effect of mepiquate chloride on plant growth, it reduced plant height without affecting number of nodes per plant, while the length of internodes increased (Makram, 1988). Abdel-Al (1998) found that mepiquate chloride had no effect on number of fruiting branches per plant. Specific leaf weight, specific leaf area and fresh/dry weight ratio were affected by mepiquate chloride treatments (York, 1983a and Munier *et al.*, 1995). Sawan *et al.* (2006) and Stephen *et al.*, (2007) revealed that mepiquate chloride increased boll number and improved the yield. However, Ibrahim & Mofteh (1997) found that application of mepiquate chloride reduced vegetative growth but increased the yield and its components.

Regarding the yield and its components, i.e, number of open bolls per plant, boll weight and yield per plant were increased by applying mepiquate chloride (Kassem & Namich 2003). Abdel-Al *et al.* (1986) showed that mepiquate chloride increased the yield, but it did not affect boll weight. El-Shahawy & Abd El-Malik (2000) found that mepiquate chloride improved the earliness of the yield.

Makram *et al.* (1981) and Johnson (2005) indicated that mepiquate chloride increased fiber length, fiber elongation, maturity ratio and micronaire reading, while Steve *et al.* (2003) found that mepiquate chloride had only a significant effect on fiber strength. Frank *et al.* (2005) reported that mepiquate chloride had non effect on fiber quality parameters.

Therefore, this investigation was carried out to achieve the effect of mepiquate chloride at different growth stages under different applications timing of nitrogen fertilization on growth, yield and fiber quality of cotton.

## MATERIALS AND METHODS

Two field experiments were carried out at Sids Agric. Res. Sta., Beni-Suef governorate, during 2003 and 2004 seasons, using the Egyptian cotton cultivar Giza 80 (*G. barbadense* L.).

The experimental design was randomized complete blocks with four replications, the size of each plot was 26 m<sup>2</sup> including eight rows each of 0.65 X 5.00 m. Distance between hills were 25 cm and leaving two plants per hill at thinning time, five week after sowing.

The mechanical and chemical analysis of the experiment site is presented in (Table 1).

Table (1): Mechanical and chemical analysis of soil samples for the experimental site in 2003 and 2004 seasons.

Soil characters		Seasons	
		2003	2004
<b>Mechanical analysis</b>			
Clay	(%)	50.84	52.69
Silt	(%)	27.21	27.89
Sand	(%)	16.39	20.9
Organic matter	(%)	1.64	1.68
Texture		Clay loam	Clay loam
<b>Chemical analysis</b>			
Ph		7.83	7.55
E. C.		0.57	0.47
Ca CO <sub>3</sub>	(%)	2.63	2.80
Available nitrogen	(ppm)	36.76	32.88
Available phosphorus	(ppm)	34.53	31.65
Available potassium	(ppm)	392	472
Fe	(ppm)	8.85	4.60
Cu	(ppm)	3.23	3.60
Zn	(ppm)	1.05	1.00
Mn	(ppm)	31	15

The experiment treatments which represented the combinations between nitrogen fertilizer treatments by using urea (46.5% N) and mepiquate chloride spraying timing (1, 1-dimethyl piperidinium chloride) at two or three growth stages, i.e., pine head of squares, beginning of flowering and after flowering by two weeks at the rate of 50 g a.i./feddan are presented in Table (2).

**Table (2): Nitrogen fertilization and mepiquate chloride application timing treatments.**

<b>Treatment Splitting</b>	<b>Nitrogen fertilization (60 Kg N/fed.)</b>	<b>Mepiquate chloride (50 g a.i./fed.)</b>
1 (control)	(30+30)	0.0
2	(30+30)	(25+25)
3	(30+30)	(25+12.5+12.5)
4	(30+30)	(12.5+25+12.5)
5	(20+20+20)	(25+25)
6	(20+20+20)	(25+12.5+12.5)
7	(20+20+20)	(12.5+25+12.5)

Five representative hills were chosen by random from each plot to study the following traits;

**A- Growth characters:** Final plant height (cm), number of nodes per plant, internode length (cm), number of fruiting branches per plant, specific leaf density (SLW mg/cm<sup>2</sup>), specific leaf area (SLA cm<sup>2</sup>/mg) and fresh weight/dry weight ratio (g).

**B- Yield and yield components:** Number of open bolls per plant, boll weight (g), seed-cotton yield per plant (g), number of plants remained at harvest, seed-cotton yield per feddan in Kentars, lint percentage and seed index (g).

**C- Earliness characters:** Number of days to appearance of first flower and first open boll.

**D- Fiber quality:** Measured by HVI according to (A.S.T.M. D-4605-86), upper half mean length (U.H.M) in mm, uniformity index (U.I), fiber strength (g/tex.), fiber elongation percentage, micronaire reading, reflectance (%Rd) and yellowness (+b).

The data obtained were subjected to statistical analysis according to the procedures outlined by Snedecor and Cochran (1980) using M Stat-C microcomputer program for randomized complete blocks design. L.S.D. values at 5% level of significance were used for all treatments to compare between means.

## RESULTS AND DISCUSSION

**A- Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on growth characteristics:**

**1- Effect on plant height at harvest, number of nodes per plant, length of internode and number of fruiting branches per plant:**

Results present in Table (3) and illustrate in Fig. (1) clear that final plant height at harvest was increased significantly in favour of the control plots in the two seasons. Within the mepiquat chloride the treatments of ( $\frac{1}{2}+\frac{1}{2}$  MC) with ( $\frac{1}{2}+\frac{1}{2}$  N) or ( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$  N) produced taller plants of (119.3 and 110.2 cm.

or 121.0 and 104.9 cm. in the 2003 and 2004 seasons, respectively). These results revealed that mepiquate chloride terminated plant height as compared to the control plots, beside that, partitioning the dose in three sprays seems to be better in controlling the lateral plant growth at the late season. These results are in agreement with those obtained by Makram *et al.* (1981) and Steve *et al.* (2003).

Number of nodes per plant was insignificantly affected by the application timing of nitrogen with mepiquate chloride, in both seasons (Table 3). On the other hand, the mean length of internodes was significantly increased in case of untreated plants by mepiquate chloride. These results proved that the increase in main stem length of the control plants was due to the increase in internode length rather than the increase in number of nodes per plant.

**Table (3): Effect of application timing treatments of mepiquat chloride and nitrogen fertilization on cotton plant height at harvest, number of nodes per plant, length of internode and number of fruiting branches/plant in 2003 and 2004 seasons.**

Characters	Plant height at harvest (cm)		No. of nodes/ plant		Internode length (cm)		No. of fruiting branches/plant	
	2003	2004	2003	2004	2003	2004	2003	2004
Treatments								
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	119.3	110.2	21.81	18.85	5.47	5.85	14.18	10.99
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ MC)	117.7	85.1	21.20	18.00	5.55	4.73	14.03	10.06
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	117.7	97.8	21.75	18.81	5.41	5.20	14.11	10.71
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	121.0	104.9	21.63	18.89	5.59	5.55	13.96	10.78
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ MC)	117.8	82.6	21.41	18.30	5.50	4.51	14.00	10.40
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	117.3	86.6	21.70	18.46	5.41	4.69	14.26	10.18
Control ( $\frac{1}{2}+\frac{1}{2}$ N) + ( 0.0 MC)	130.3	140.3	21.56	19.80	6.04	7.09	13.35	10.43
L.S.D at 5%	3.12	9.48	N.S	N.S	0.20	0.62	0.44	N.S

Generally, there was a tendency of decreasing internode length in favour of splitting the mepiquate chloride to two doses. These results might be an indication that splitting mepiquate chloride to three doses is better in controlling the vegetative growth than two doses. Similar results were obtained by Makram *et al.* (1981). Regarding number of fruiting branches per plant, it was insignificantly affected by nitrogen and mepiquate chloride application timing, in 2004 season, while in 2003, the effect was significant. However, in both seasons, the differences between means were slight. This could be due to the non effect on number of nodes per plant by previous treatments. Similar results were obtained by Abdel-AI (1998).

**2- Effect on specific leaf weight, specific leaf area and fresh/dry weight ratio:**

Table (4) and Fig. (2) clear that in both seasons, specific leaf weight (SLW) was increased significantly in favour of cotton plants which treated by mepiquate chloride as compared to the control check, where nitrogen fertilization in three equal doses ( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ ) plus mepiquate chloride in three doses ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ ) gave the highest values of specific leaf weight, in both seasons. This character expressed the higher rate of photosynthetic activity for mepiquate chloride treated plants (Moursi, 1977). On the other hand, the specific leaf area (SLA) was increased in favour of control treatments, where this character measured the leaf density or thickness (Hunt, 1982).

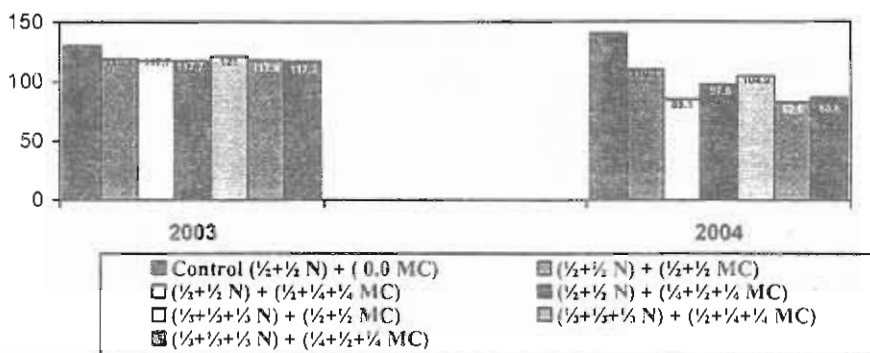


Figure (1): Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on cotton plant height at harvest (cm) in 2003 and 2004 seasons.

Previous results might be due to the effect of mepiquate chloride which terminated plant growth and increased leaf photosynthetic activity, which resulted in much formation of leaf assimilates necessary for increasing the fruiting capacity. Similar results were obtained by Munier *et al.* (1995).

With respect to fresh/dry weight ratio, it was insignificantly affected by different treatments used, in both seasons (Table 4). But, there was a tendency of increasing this ratio in case of the control plants. This increase might be an indicator that the untreated plants by mepiquate chloride tended to have more succulent leaves as a result of the increase of vegetative growth (Hunt 1982) as compared to the treated plants by mepiquate chloride.

Generally, previous results on plant growth revealed that mepiquate chloride decreased plant height by decreasing internode length without affecting number of nodes per plant and number of sympodia per plant. At the mean time, mepiquate chloride increased photosynthetic activity of the leaves and decreased leaf thickness as compared to the control. Also, mepiquate chloride depresses the succulent phenomenon which resulted from increasing plant growth. Similar results were obtained by Ibrahim and Moftah (1997).

Table (4): Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on cotton specific leaf weight, specific leaf area and fresh/dry weight ratio in 2003 and 2004 seasons.

Characters	Specific leaf weight (mg/cm <sup>2</sup> )		Specific leaf area (cm <sup>2</sup> /mg)		Fresh/Dry weight ratio (gm)	
	2003	2004	2003	2004	2003	2004
Treatments						
(1/2+1/2 N) + (1/2+1/2 MC)	0.69	0.67	1.46	1.49	2.96	2.25
(1/2+1/2 N) + (1/2+1/4+1/4 MC)	0.67	0.66	1.50	1.54	2.78	2.11
(1/2+1/2 N) + (1/2+1/2+1/4 MC)	0.68	0.69	1.47	1.47	2.74	2.10
(1/2+1/2+1/2 N) + (1/2+1/2 MC)	0.70	0.72	1.43	1.40	2.77	1.97
(1/2+1/2+1/2 N) + (1/2+1/4+1/4 MC)	0.68	0.66	1.47	1.53	2.79	2.17
(1/2+1/2+1/2 N) + (1/2+1/2+1/4 MC)	0.74	0.73	1.35	1.38	3.02	2.08
Control (1/2+1/2 N) + (0.0 MC)	0.60	0.57	1.67	1.79	3.16	2.41
L.S.D at 5%	0.05	0.07	0.10	0.17	N.S	N.S

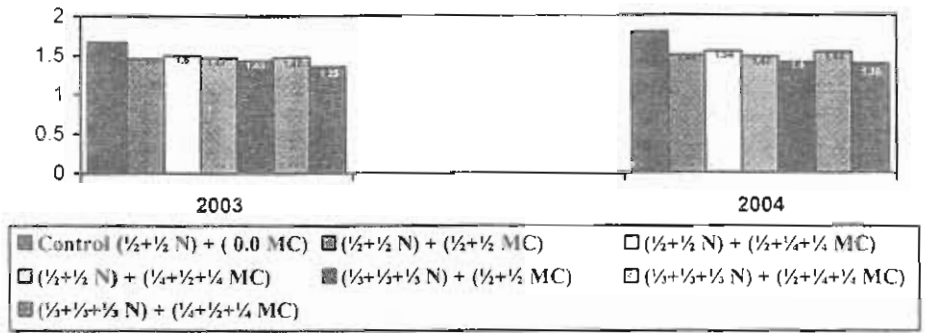


Figure (2): Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on cotton specific leaf area in 2003 and 2004 seasons.

**B- Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on yield and yield components:**

**1- Effect on number of open bolls, boll weight and seed cotton yield per plant:**

Results present in Table (5) and illustrate in Fig. (3) indicate that number of open bolls per plant was significantly increased, in both seasons, in favour of cotton plants treated by mepiquate chloride.

The maximum value of open bolls/plant was obtained when nitrogen fertilization was applied in three separate doses (1/2+1/2+1/2) plus mepiquate chloride in three doses (1/4+1/2+1/4) in 2003 season, while in 2004 season it was obtained from the treatment (1/3+1/3+1/3 N) + (1/2+1/2 MC). On the other hand, boll weight was insignificantly affected by different mepiquate chloride and nitrogen treatments. Seed cotton yield per plant was significantly affected in 2003 season only in favour of cotton plants treated by mepiquate chloride. In the second season, the same trend was obtained without significant differences between means.

Table (5): Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on number of open bolls, boll weight and seed cotton yield per plant in 2003 and 2004 seasons.

Characters	No. of open bolls/plant		Boll weight (g)		Seed cotton yield/plant (g)	
	2003	2004	2003	2004	2003	2004
(1/2+1/2 N) + (1/2+1/2 MC)	11.5	10.9	2.37	2.74	27.26	29.87
(1/2+1/2 N) + (1/4+1/2+1/4 MC)	12.1	11.4	2.27	2.67	27.47	30.44
(1/2+1/2 N) + (1/4+1/2+1/4 MC)	11.8	10.9	2.42	2.74	28.56	29.87
(1/2+1/2+1/2 N) + (1/2+1/2 MC)	11.2	12.2	2.36	2.53	26.43	30.87
(1/2+1/2+1/2 N) + (1/2+1/4+1/4 MC)	12.5	11.7	2.37	2.56	29.63	29.95
(1/2+1/2+1/2 N) + (1/4+1/2+1/4 MC)	12.8	10.8	2.32	2.71	29.70	29.27
Control (1/2+1/2 N) + (0.0 MC)	10.2	10.1	2.49	2.71	25.40	27.37
L.S.D at 5%	1.85	1.12	N.S	N.S	2.84	N.S

However, the increase in number of open bolls per plant for treated cotton plants by mepiquate chloride might be due to the effect of mepiquate chloride in terminating plant growth. At the mean time, it increased the photosynthetic activity which resulted in producing more assimilates used for producing more boll setting per plant. Therefore, seed cotton yield per plant followed the same trend of open bolls even with unaffected boll weight. Similar results were obtained by Kassem & Namich (2003).

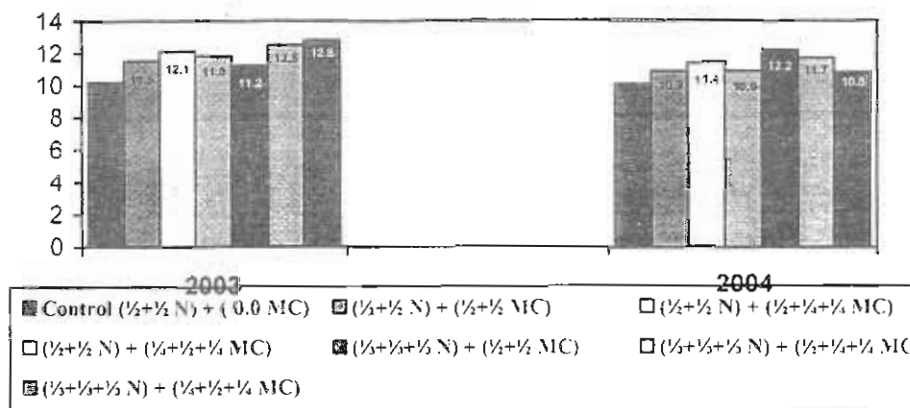


Figure (3): Effect of application timing treatments of mepiquat chloride and nitrogen fertilization on number of opened bolls/plant in 2003 and 2004 seasons.

2- Effect on number of plants at harvest, seed cotton yield per feddan, lint percentage and seed index:

Table (6) reveal that the number of plants at harvest was insignificantly affected by different treatments under study. This means that this factor had non effect on the yield per feddan rather than the previous treatments. Similar results were obtained by Makram *et al* (1981).

Table (6): Effect of application timing treatments of mepiquat chloride and nitrogen fertilization on number of plants at harvest, seed cotton yield per feddan, lint percentage and seed index in 2003 and 2004 seasons.

Characters	No. of plants at harvest (1000 plant/fed.)		Seed cotton yield ken./fed.		Lint percentage (%)		Seed index (g)	
	2003	2004	2003	2004	2003	2004	2003	2004
Treatments								
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	56.59	60.96	9.38	9.02	39.3	39.1	10.33	10.89
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ MC)	56.12	61.18	9.35	8.89	39.2	38.3	10.25	11.27
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	56.34	61.41	9.58	9.01	39.1	38.4	10.29	10.99
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	55.25	60.92	9.14	8.99	39.3	39.1	10.23	10.89
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ MC)	55.35	59.71	9.18	8.66	39.2	38.0	10.59	11.19
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	55.35	61.55	9.45	9.43	38.9	38.4	10.17	11.04
Control ( $\frac{1}{2}+\frac{1}{2}$ N) + (0.0 MC)	55.86	57.65	8.58	7.89	38.9	38.6	10.12	10.41
L.S.D at 5%	N.S	N.S	0.48	0.78	N.S	N.S	N.S	0.42

Table (6) and Fig. (4) show also that the yield of seed cotton per feddan was increased significantly in case of treated cotton plants by mepiquate chloride, where the maximum value was obtained when nitrogen fertilization (N) was applied in two separate doses ( $\frac{1}{2}+\frac{1}{2}$ ) plus mepiquate chloride (MC) in three doses ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ ) in 2003 season.

In 2004 season, the maximum value was obtained from nitrogen fertilization (N) treatment ( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ ) plus mepiquate chloride (MC) in three doses ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ ). These results are reasonably agreed with the results of number of open bolls per plant and yield per plant. Similar results were obtained by Makram *et al.* (1981), Sawan *et al.* (2006) and Stephens *et al.* (2007).

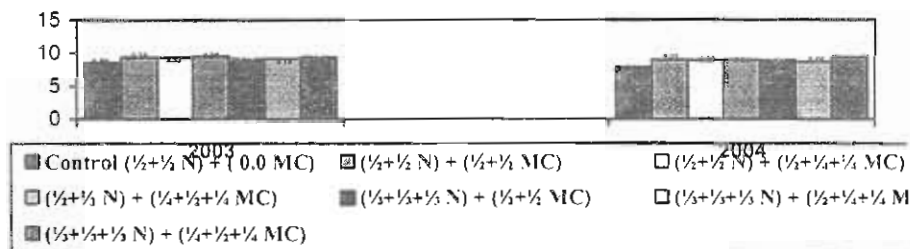


Figure (4): Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on seed cotton yield per feddan in 2003 and 2004 seasons.

The data present in Table (6) clear that lint percentage was insignificantly affected by mepiquate chloride treatments, in both seasons. On the other hand, seed index was significantly affected in one season out of two where the highest seed index value was obtained with the application of nitrogen fertilizer in two separate doses ( $\frac{1}{2}+\frac{1}{2}$ ) plus mepiquate chloride in three doses ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ ).

However, there was a tendency of increasing both characters in favour of mepiquate chloride treatments. This could be due to more maturation of seed and lint quality. These results are in line with those obtained by Abdel-Al *et al.* (1986), Makram (1988).

#### C- Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on earliness characters:

The data present in Table (7) and Fig. (5) clear that number of days from sowing date to first flower appearance and first boll opening was significantly increased in favour of control treatment, in both seasons.

The shortest periods for previous treatments were obtained from the ( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$  N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$  MC), which seemed to terminate the vegetative growth early rather than other treatments. These results might be due to the controlling effect of the little dose of mepiquate chloride, a.i. 12.5g per feddan at squaring stage which induced the better balance between vegetative growth and fruiting capacity. Therefore, the treated cotton plants were brought to early maturity in the season rather than untreated plants. Similar results were obtained by El-Shahawy & Abd El-Malik (2000).

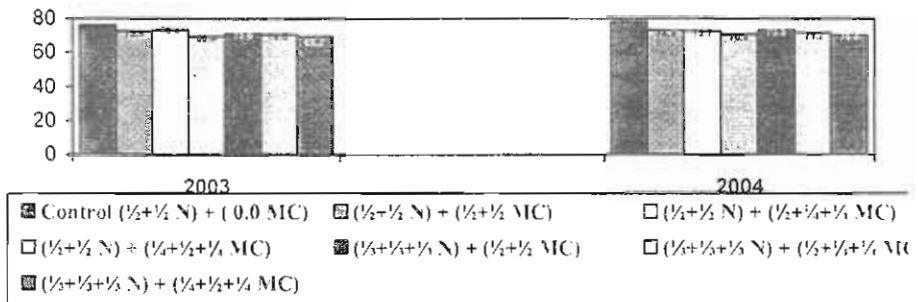


**Table (7): Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on number of days to first flower and number of days to first opened boll in 2003 and 2004 seasons.**

Characters	No. of days to first flower		No. of days to first opened boll	
	2003	2004	2003	2004
Treatments				
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	72.6	73.3	122.2	126.6
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ MC)	73.4	72.7	123.2	126.1
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	69.4	70.8	120.5	123.6
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	70.9	73.3	121.9	126.4
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$ MC)	70.5	71.7	122.9	125.7
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	69.2	70.4	119.7	123.3
Control ( $\frac{1}{2}+\frac{1}{2}$ N) + (0.0 MC)	76.1	77.9	126.9	128.9
L.S.D at 5%	1.82	1.80	2.13	1.64

**D- Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on fiber quality:**

Table (8) clear that upper half mean was significantly increased in 2004 season only. Generally, there was a tendency of increasing this character by mepiquate chloride treated plants. The most pronounced treatment was ( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$  N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$  MC), in both seasons. These results might be an indication of that mepiquate chloride increased the fiber length. Similar results were obtained by Nawar *et al.* (1986).



**Figure (5): Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on number days to first flower in 2003 and 2004 seasons.**

On the other hand, uniformity index, fiber strength and fiber elongation percentage were insignificantly affected by mepiquate chloride, in both seasons. Similar results were obtained by Frank *et al.* (2005).

Table (9) reveal that micronaire value was increased significantly in both seasons in favour of treated plants by mepiquate chloride. The highest micronaire value in 2003 season was obtained from nitrogen fertilization (N) when applied in two separate doses ( $\frac{1}{2}+\frac{1}{2}$ ) plus mepiquate chloride (MC) in three doses ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ ), while in 2004 season it was obtained from nitrogen fertilization (N) in three separate doses ( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ ) plus mepiquate chloride (MC) in three doses ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ ). This could be due to more maturation of cotton fiber. These results are in agreement with those obtained by Nawar *et al.* (1986) and Johnson (2005). While Steve *et al.* (2003) reported that

mepiquate chloride did not affect micronaire value. With respect to colour characters reflectance and yellowness (Table 9), both were not affected by mepiquate chloride in both seasons and the differences between means were very slight. Similar results were obtained by Frank et al. (2005).

**Table (8): Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on upper half mean length, uniformity index, fiber strength and fiber elongation in 2003 and 2004 seasons.**

Characters	Fiber Length parameters				Fiber bundle tensile properties			
	Upper half mean		Uniformity		Fiber strength.		Fiber	
	(mm)		index (U.I)(%)		(g/tex)		elongation (%)	
Treatments	2003	2004	2003	2004	2003	2004	2003	2004
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	31.8	31.8	88.1	87.7	41.7	40.5	7.19	6.61
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ MC)	31.6	32.5	87.8	88.0	41.6	40.4	7.11	6.68
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	31.7	31.6	88.2	87.4	41.9	40.3	7.13	6.63
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	31.7	31.8	88.2	88.0	41.5	40.5	7.09	6.73
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ MC)	31.6	32.1	87.9	87.7	40.8	39.8	7.10	6.76
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	31.9	32.5	88.1	87.1	41.1	39.8	7.08	6.73
Control ( $\frac{1}{2}+\frac{1}{2}$ N) + (0.0 MC)	31.5	31.2	87.9	87.6	41.7	39.7	7.06	6.66
L.S.D at 5%	N.S	0.66	N.S	N.S	N.S	N.S	N.S	N.S

**Table (9): Effect of application timing treatments of mepiquate chloride and nitrogen fertilization on reflectance, yellowness and micronaire value in 2003 and 2004 seasons.**

Characters	Colour characters				Micronaire value	
	Reflectance		Yellowness			
	(Rd %)		(+b)		2003	2004
Treatments	2003	2004	2003	2004	2003	2004
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	65.6	65.8	12.5	12.5	5.09	4.83
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ MC)	65.7	66.1	12.7	12.5	5.10	4.94
( $\frac{1}{2}+\frac{1}{2}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	65.7	66.3	12.8	12.6	5.11	4.95
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{2}+\frac{1}{2}$ MC)	66.0	66.3	12.8	12.5	5.03	4.86
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$ MC)	65.7	66.1	12.6	12.6	5.10	4.98
( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ N) + ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ MC)	65.7	66.4	12.6	12.6	5.08	4.99
Control ( $\frac{1}{2}+\frac{1}{2}$ N) + (0.0 MC)	65.3	65.7	12.7	12.4	4.94	4.64
L.S.D at 5%	N.S	N.S	N.S	N.S	0.12	0.14

### Conclusion

The results obtained in this study could lead us to a package of recommendations which seemed to be useful for increasing the cotton yield production in quantity and quality.

**These recommendations could be summarized in the following points:**

1. Spraying mepiquate chloride on cotton plants terminated lateral plant growth, hastened the yield maturity which enabled the cotton plants to escape from boll worms infections at late season.
2. The best application of mepiquate chloride is splitting the dose of 50 g. a.i./feddan at different plant stages i.e., pinhead square, beginning of flowering and after flowering by two weeks where each stage received 12.5, 25 and 12.5 g. a.i./feddan, respectively.
3. It is profitable to split the nitrogen fertilization dose (60 Kg/feddan) to three equal doses (20+20+20 Kg N) applied before the second, third and fourth irrigations. This application maximizes the efficiency use of mepiquate chloride.

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## تأثير مواعيد اضافة المبيكوات كلوريد و التسميد النيتروجيني علي صنف القطن جيزة ٨٠

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اجريت تجربتان حقليتان بمحطة البحوث الزراعية بسدس بمحافظة بنى سويف فى موسمى ٢٠٠٣، ٢٠٠٤ لدراسة تأثير بعض المعاملات الزراعية وهي: (مواعيد اضافة التسميد النيتروجينى و الرش بالمبيكوات كلوريد (Pix) على النمو والمحصول والتبكير والصفات التكنولوجية للتيلة باستخدام صنف القطن المصري جيزة ٨٠. وكان التصميم التجريبي المستخدم هو القطاعات الكاملة العشوائية فى اربعة مكررات. وتتلخص اهم النتائج المتحصل عليها فيما يلى:

١- صفات النمو الخضري:

زاد طول النبات عند الجني وبشكل معنوي في معاملة المقارنة (بدون اضافة ال-Pix) في موسمي ٢٠٠٣، ٢٠٠٤، وفيما بين معاملات المبيكوات كلوريد فقد اعطت المعاملة (1/2+1/2) مبيكوات كلوريد مع (1/2+1/2) او (1/3+1/3+1/3) نتروجين نباتات اطول عن بقية المعاملات، في حين اعطت المعاملة اضافة النتروجين على ثلاث دفعات متساوية (1/3+1/3+1/3) مع المبيكوات كلوريد على ثلاث دفعات (1/4+1/4+1/4) اقصر النباتات طولاً في موسم ٢٠٠٣، بينما اعطت المعاملة اضافة النتروجين على ثلاث دفعات متساوية (1/3+1/3+1/3) مع المبيكوات كلوريد على ثلاث دفعات (1/4+1/4+1/2) اقصر النباتات طولاً في موسم ٢٠٠٤. زاد الوزن النوعي للورقة معنوياً في النباتات المعاملة بالمبيكوات كلوريد مقارنة بالنباتات غير المعاملة في كلا الموسمين حيث اعطت معاملة اضافة النتروجين على ثلاث دفعات متساوية (1/3+1/3+1/3) مع المبيكوات كلوريد على ثلاث دفعات (1/4+1/2+1/4) أعلى قيم للوزن النوعي للورقة في كلا الموسمين. بالنسبة للمساحة النوعية للورقة فقد زادت معنوياً في معاملة المقارنة بينما اعطت معاملة اضافة النتروجين على ثلاث دفعات متساوية (1/3+1/3+1/3) مع المبيكوات كلوريد على ثلاث دفعات (1/4+1/2+1/4) أقل القيم. وبالنسبة لصفة الوزن الغض الى الوزن الجاف للورقة فانها لم تتأثر معنوياً بالمعاملات المختلفة المستخدمة في كلا الموسمين.

٢- المحصول ومكوناته:

تأثر عدد اللوز المتفتح على النبات معنوياً خلال موسمى الدراسة ٢٠٠٣، ٢٠٠٤ في حالة النباتات المعاملة بالمبيكوات كلوريد حيث اعطت المعاملة اضافة النتروجين على ثلاث دفعات متساوية (1/3+1/3+1/3) مع المبيكوات كلوريد على ثلاث دفعات (1/4+1/2+1/4) أعلى عدد من اللوز المتفتح على النبات مقارنة بالنباتات غير المعاملة في موسم ٢٠٠٣، بينما اعطت المعاملة اضافة النتروجين على ثلاث دفعات متساوية (1/3+1/3+1/3) مع المبيكوات كلوريد على دفعتين (1/2+1/2) أعلى عدد من اللوز المتفتح مقارنة بالنباتات غير المعاملة في موسم ٢٠٠٤. زاد عدد اللوز غير المتفتح على النبات معنوياً في حالة النباتات غير المعاملة بالمبيكوات كلوريد في كلا الموسمين، كان هناك ميل لزيادة عدد اللوز المتفتح في نباتات القطن المعاملة بالمبيكوات كلوريد بالنسبة لمعاملة المقارنة ولكنها زيادة غير معنوية. لم يتأثر محصول النبات الفردي معنوياً بالمعاملات المختلفة لإضافة النتروجين والمبيكوات كلوريد في موسم ٢٠٠٤ بينما كان معنوياً في موسم ٢٠٠٣ حيث كان أقل ما يمكن في النباتات غير المعاملة بينما اعطت المعاملة اضافة النتروجين على ثلاث دفعات متساوية (1/3+1/3+1/3) مع المبيكوات كلوريد على ثلاث دفعات (1/4+1/2+1/4) أعلى وزن لمحصول النبات الفردي. زاد محصول القطن الزهر بالفتطار للقدان معنوياً في حالة نباتات القطن المعاملة بالمبيكوات

كلوريد حيث تم الحصول على أعلى قيمة عند إضافة السماد النتروجيني على دفتين متساويتين ( $\frac{1}{2}+\frac{1}{2}$ ) مع المبيكوات كلوريد على ثلاث دفعات ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ ) في موسم الزراعة ٢٠٠٣، وفي موسم الزراعة ٢٠٠٤ تم الحصول على أعلى قيمة عند إضافة السماد النتروجيني على ثلاث دفعات متساوية ( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ ) مع المبيكوات كلوريد على ثلاث دفعات ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ ). لم يتأثر تصافى الحليج معنويا بالمعاملات تحت الدراسة في كلا الموسمين.

٣- صفات التبيكير:

زاد عدد الأيام من الزراعة وحتى ظهور أول زهرة وتفتح أول لوزة معنويا في معاملة المقارنة (بدون رش) في كلا الموسمين حيث أعطت معاملة المقارنة أعلى عدد أيام من الزراعة وحتى ظهور أول زهرة، وتفتح أول لوزة في كلا الموسمين وأعطت المعاملة إضافة النتروجين على ثلاث دفعات متساوية ( $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ ) مع المبيكوات كلوريد على ثلاث دفعات ( $\frac{1}{4}+\frac{1}{2}+\frac{1}{4}$ ) أقل عدد من الأيام في كلا الموسمين.

٤- جودة البذور والتيلة:

بالنسبة لصفة متوسط طول التيلة تأثرت معنويا بالمعاملات المستخدمة في موسم واحد فقط من موسمي الزراعة (٢٠٠٤) حيث كانت نباتات الكنترول أقصر في طول التيلة بصفة عامة عن النباتات المعاملة بالنتروجين والرش بالمبيكوات كلوريد، بالنسبة لصفات معامل الانتظام في الطول والمتانة والاستطالة ونسبة الانعكاس ودرجة الاصفار في اللون لم يتأثروا معنويا بواسطة معاملات المبيكوات كلوريد في كلا الموسمين. بالنسبة لصفة الميكرونيير زادت معنويا في كلا الموسمين في النباتات المعاملة بالمبيكوات كلوريد حيث كانت أكثر نضجا عن النباتات غير المعاملة خلال موسمي الدراسة. ومن النتائج المتحصل عليها والموضحة في هذه الدراسة فإنه يمكننا استخلاص مجموعة من التوصيات التي قد تكون مفيدة في زيادة إنتاج محصول القطن كما وجودة:

- ١) يؤدي رش نباتات القطن بالمبيكوات كلوريد (Pix) الى وقف نمو النباتات الخضرى وتحسين نضج المحصول والذي يمكن نباتات القطن من الهروب من الإصابة بالآفات.
- ٢) أفضل إضافة للمبيكوات كلوريد (Pix) هي الرش بـ ٥٠ جم مادة فعالة للفدان مع تقسيمها على ثلاث دفعات مختلفة وذلك عند بداية ظهور الوسوس وبداية التزهير وبعد التزهير بأسبوعين حيث تتلقى كل مرحلة (١٢,٥ - ٢٥ - ١٢,٥) جم مادة فعالة للفدان على الترتيب.
- ٣) من الأقتصادي تقسيم السماد النتروجيني 60 كجم أزوت للفدان على ثلاث دفعات متساوية (٢٠ + ٢٠ + ٢٠) كجم تتم إضافتها قبل الري الثانية والثالثة والرابعة على الترتيب، تقسيم الإضافة هذا يعظم من كفاءة استخدام والاستفادة من المبيكوات كلوريد.