

**EFFECT OF POTASSIUM FERTILIZER UNDER TWO PLANTING DATES ON  
 YIELD AND YIELD COMPONENTS OF GIZA 80 COTTON CULTIVAR**

**BY**

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**ABSTRACT**

**Two** field experiments were carried out at Sids Agriculture Research Station, during 2005 and 2006 seasons, to study the effect of two planting dates 15<sup>th</sup> March and 15<sup>th</sup> April and three treatments of potassium fertilizer I. 24 kg K<sub>2</sub>O/fed as soil application, II. 24 kg K<sub>2</sub>O/fed as soil application + 2.4 kg K<sub>2</sub>O/fed as foliar spraying at flowering stage, III. 2.4 kg K<sub>2</sub>O/fed spraying at squaring + 2.4 kg K<sub>2</sub>O/fed foliar spraying at flowering stage, on yield and yield components of Giza 80 cotton cultivar.

Results revealed that the early planting date (15<sup>th</sup> March) significantly increased boll weight, seed index and lint percentage in the second season. While number of open bolls/plant in the first season and seed cotton yield/feddan in the two seasons were significantly increased by late planting date on (15<sup>th</sup> April). On the other hand, number of fruiting branches/plant, seed cotton yield/plant and earliness % showed insignificant effect.

Potassium fertilizer significantly affected number of fruiting branches/plant in the first season, no. of open bolls/plant, in the second season. While, seed cotton yield/plant, earliness % and lint % were insignificantly affected. However, seed cotton yield/fed was significantly affected by potassium fertilizer in both seasons.

The interaction between planting date and potassium fertilizer treatments significantly affected the number of fruiting branches/plant and earliness in the first season. However, boll weight, seed cotton yield/fed and seed index were significantly affected in both seasons. While no. of open bolls/plant and lint percentage were significantly affected only in 2006 season.

**Key Words:** *G. barbadense*, L., planting date, potassium fertilizer, yield components, interaction.

**INTRODUCTION**

Planting date is considered the most important factor among different factors, influencing growth and yield of cotton. In Egypt, many investigations showed that early planting had favorable effect on seed cotton compared with late sowing. Many workers studied the effect of planting date on cotton plant viz.

Abd El-zaher (1995) and El-Debaby *et al.* (1995) they found that no. of open bolls/plant, boll weight, seed cotton yield and earliness increased with early planting, Assyi

and Abd El- Malak (1997) reported that early planting date increased seed cotton yield/plant, seed index and lint percentage, El-Shahawy (1999) found that early planting date increased no. of open bolls/plant, boll weight, lint percentage, seed index and seed cotton yield, El-Tabbakh (2001) found that the late sowing of 1<sup>st</sup> may significantly decreased no. of total bolls/plant, seed cotton yield/plant and fed and earliness%. However delaying planting showed significantly increased lint percentage and seed index, Kassem (1999) and Ali and El-Sayed (2001) they found that seed cotton

yield and its components increased with early planting. Regarding the growth of cotton plant, El-Sayed and El-Menshawhi(2006) mentioned that number of fruiting branches/plant, number of open bolls/plant, boll weight, lint percentage and seed index gradually decreased from early to late sowing. Killi (2005) reported that delaying sowing date lower no. of fruiting branches, no. of open bolls/plant, seed cotton yield and lint percentage compared to normal planting.

Potassium is one of the most important elements in plant nutrition. Its effect on enzyme activation, water relations, energy relations, translocation of assimilates nitrogen uptake and protein and starch synthesis was demonstrated by many workers, Makram and El-Shinawy (1995) and El-Tabbkh (2002) mentioned that lint percentage, seed index and its components increased with potassium

spraying as 1 % K<sub>2</sub>O/fed at the start flowering by two weeks, Abd El-Shafy *et al.* (2001) reported that most of yield components of cotton plant i.e. no. of open bolls/plant, boll weight and earliness % were increased with application K<sub>2</sub>O as soil after thinning, Pervez *et al.* (2002), Aneela and Ashraf(2003) and Kassem and Ahmed(2005) found that no. of open bolls/plant, boll weight and seed cotton yield were increased with application of potassium fertilizer at 48 kg/fed and Sharma and Singh(2007) showed that foliar application of potassium fertilizer 2% K<sub>2</sub>O at 15 kg/fed increased no. of open bolls/plant, boll weight and seed cotton yield by foliar application of K<sub>2</sub>O.

The aim of this investigation was to study the effect of two planting dates and three potassium fertilizer treatments on yield and yield components of Giza 80 cotton cultivar.

## MATERIALS AND METHODS

Two field experiments were conducted at Sids Agriculture Research Station (Beni-Suef Governorate) in two successive seasons (2005 and 2006), to study the effect of planting dates and potassium fertilizer on yield and its components of Giza 80 cotton cultivar. The experimental soil was clay loam with pH (7.88 and 8.00) organic matter (1.27 and 1.50 %) Ca CO<sub>3</sub> (3.2 and 2.58 %), E.C. (0.56 and 0.80 ds/m) available nutrient N (59.0 and 47.0 ppm), P (11.0 and 7.0 ppm), K (475 and 390 ppm), Ca (3.20 and 3.00 %) and Mg (3.70 and 3.60 %) in both seasons, respectively. The precedent crop was clover in both seasons. The experimental design was split plot with four replications. The main plots were devoted to the planting dates, while the potassium fertilizer treatments were randomly distributed in the sub-plots.

### Experimental factors:

#### a. Planting dates:

1. Early planting (March 15<sup>th</sup>).
2. Late planting (April 15<sup>th</sup>).

#### b. Potassium fertilizer treatments:

1. 24 kg K<sub>2</sub>O/fed as soil application after thinning.

2. 24 kg K<sub>2</sub>O/fed as soil application after thinning plus 2.4 kg K<sub>2</sub>O/fed as foliar application at flowering stage.
3. 2.4 kg K<sub>2</sub>O/fed at squaring stage and 2.4 kg K<sub>2</sub>O/fed application at flowering stage as foliar.

All normal cultural practices except the studied factors were followed as recommended for cotton production. In order to estimate the following characters, five plants were chosen randomly from each plot at harvest:

1. Number of fruiting branches/plant.
2. Number of open bolls/plant.
3. Boll weight (g): as the average weight of 25 bolls
4. Seed cotton yield/plant (g).
5. Seed cotton yield/ fed (kg) based on sub plot yield converted/fed equivalent.
6. Lint percentage.
7. Seed index (g) (wt. g/100 seeds)
8. Earliness percentage = (yield of first pick/total yield) x 100.

The obtained results were subjected to the statistical analysis as described by Snedecor and Cochran (1981) and the difference between treatments was compared by using the least significant differences at 5 % level.

RESULTS AND DISCUSSION

A. Effect of planting dates:

Results in Tables (1) and (2) revealed that the number of fruiting branches/ plant was not significantly affected by planting date in both seasons. While the number of open bolls/plant was affected by planting with the difference between means being in favor of late planting date (15<sup>th</sup> April) in the first season only.

Boll weight(g) was significantly affected by planting date in the second season Early planting (15<sup>th</sup> March) gave rather heavier bolls compared to late planting (15<sup>th</sup> April). Results also show that seed cotton yield/plant was no affected by planting date. However, seed cotton yield/fed was significantly affected by planting date in both seasons. Late planting on (15 April) gave better yield of seed cotton compared with early planting (15 March). This result could be attributed to better environmental conditions that led to greater no. of open bolls/plant, thus

better seed cotton yield /fed with regard to lint percentage, results show that it was affected by planting date in the second season with the differences between means being in favor of early planting date (15<sup>th</sup> March).

Seed index was significantly affected by planting date. However a higher seed index was observed with early planting (full season) in 2006 season only. The results is also attributed to the heavier boll weight observed for early planting.

Earliness percentage was not significantly affected by planting date. However, higher earliness percentage was observed with early planting (full season) the result is also attributed heavier earliness observed for early planting these results disagree with those reported by Abdel zahar (1995), El- Debaby *et al.* (1995) and Assyi and Abd El- Malak (1997).

Table (1): Effect of planting dates and potassium fertilizer on no. of fruiting branches/plant, no. of open bolls/plant, boll weight and seed cotton yield/plant of Giza 80 cotton cultivar in 2005 and 2006 seasons.

Planting dates (A)	Potassium fertilizer (kg K <sub>2</sub> O/fed) (B)	No. of fruiting branches/plant		No. of open bolls/plant		Boll weight (g)		Seed cotton yield/plant (g)	
		2005	2006	2005	2006	2005	2006	2005	2006
15 March	I	14.42	14.78	11.14	11.69	2.42	3.19	35.33	38.23
	II	14.70	15.19	12.17	11.96	2.61	3.21	37.60	37.94
	III	14.96	15.29	13.41	11.54	2.63	3.26	37.57	40.23
Mean		14.69	15.09	12.24	11.73	2.56	3.22	36.90	38.81
15 April	I	14.54	14.83	13.21	12.20	2.44	3.11	30.35	38.19
	II	14.79	15.08	13.50	13.50	2.61	2.95	39.91	38.64
	III	16.02	15.02	13.81	13.81	2.58	3.07	37.64	44.77
Mean		15.12	14.98	13.51	13.17	2.54	3.04	35.97	40.53
Mean of potassium fertilizer	I	14.48	14.81	12.18	11.95	2.43	3.15	32.84	32.21
	II	14.75	15.14	12.89	12.73	2.61	3.08	38.86	38.29
	III	15.49	15.16	13.61	12.68	2.61	3.17	37.61	42.50
L.S.D. at 0.05									
Planting dates (A)		N.S.	N.S.	1.24	N.S.	N.S.	0.08	N.S.	N.S.
Potassium fertilizer (B)		0.31	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
A X B		0.44	N.S.	N.S.	2.03	0.16	0.24	N.S.	N.S.

- I. 24 kg after thinning.
- II. 24 kg after thinning + 2.4 kg spray at flowering stage.
- III. 2.4 kg spray at squaring stage + 2.4 kg spray at flowering stage..

Table (2): Effect of planting dates and potassium fertilizer on seed cotton yield/fed, lint percentage, seed index and earliness percentage of Giza 80 cotton cultivar in 2005 and 2006 seasons.

Planting dates (A)	Potassium fertilizer (kg K <sub>2</sub> O/fed) (B)	Seed cotton yield / fed (kg)		Lint %		Seed index (g)		Earliness %	
		2005	2006	2005	2006	2005	2006	2005	2006
15 March	I	1253.35	1301.35	41.98	39.59	9.60	12.21	65.23	61.50
	II	1296.19	1357.26	41.27	39.81	9.71	12.19	69.68	62.82
	III	1334.76	1418.69	42.27	39.89	9.76	12.34	67.28	62.41
Mean		1294.76	1359.10	41.84	39.76	9.69	12.25	67.39	62.24
15 April	I	1305.37	1349.87	41.40	37.80	9.80	11.72	52.32	53.70
	II	1313.76	1387.26	41.33	38.56	9.59	11.14	56.34	62.38
	III	1596.61	1609.26	41.50	38.57	9.49	11.53	55.48	59.35
Mean		1405.25	1448.80	41.41	38.31	9.62	11.46	54.71	58.48
Mean of potassium fertilizer	I	1279.40	1325.61	41.69	38.70	9.70	11.96	58.77	60.10
	II	1304.97	1372.26	41.30	39.18	9.65	11.66	63.01	62.60
	III	1465.68	1513.97	41.89	39.23	9.63	11.93	61.38	60.88
L.S.D. at 0.05									
Planting dates (A)		50.17	66.53	N.S.	1.44	N.S.	0.43	N.S.	N.S.
Potassium fertilizer (B)		61.47	81.47	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
A X B		86.92	115.23	N.S.	1.33	0.24	0.68	7.82	N.S.

I. 24 kg after thinning.

II. 24 kg after thinning + 2.4 kg spray at flowering stage.

III. 2.4 kg spray at squaring stage + 2.4 kg spray at flowering stage.

#### B. Effect of potassium fertilizer:

With respect to the effect of potassium fertilizer on yield and yield components, results in Tables (1 and 2) show that the number of fruiting branches/plant was significantly affected by potassium fertilizer as could be detected in the first season only. Higher values are concomitant with third treatment (2.4kg at squaring + 2.4kg at flowering) while number of open bolls/ plant was not affected by potassium fertilizer in both seasons.

Boll weight and seed cotton yield/plant were insignificant affected by potassium fertilizer in both seasons.

Concerning potassium application results in Table (2) show that this factor had significant effect on seed cotton yield/fed in both Seasons. Higher seed cotton yield was recorded for treatments III. 465.68 and 151.97 kg/fed, II. While there were insignificant differences between treatments on lint percentage were detected seed index and

earliness percentage by potassium addition in both seasons. similar results were obtained by Pervez *et al.* (2002) and Sharma and Singh (2007).

#### C. Interaction between planting dates and potassium fertilizer treatment:

Regarding the effect of the interaction between planting dates and potassium fertilizer, from the results in Tables (1 and 2) it is evident that higher values of fruiting branches/plant were associated with treatment III where all potassium was given in the form of foliar spraying in both seasons. While number of open bolls/plant was significant in the second season. It is also clear that treatment late planting and treatment and III gave better effect than other interactions.

Boll weight was significantly affected by planting date x potassium fertilizer in both seasons. Seed cotton yield/plant was not affected by interaction planting date x potassium fertilizer, with the highest cotton seed/plant being obtained from treatment 15<sup>th</sup> April,

III. The interaction of planting date x potassium fertilizer significantly affected seed cotton yield/fed in both seasons. Late planting (15 April) and treatment III gave the highest yield

The interaction of planting date x potassium fertilizer significantly affected lint percentage in the second season, early plan-

ting (15 March) and treatment III gave the better lint %. Seed index was affected by the interaction of planting date x potassium fertilizer in both seasons, early planting (15 March) and treatment III gave the higher seed index. The interaction of planting date x potassium fertilizer significantly affected earliness percentage in the first season.

### CONCLUSION

It is evident from the results obtained that the no. of fruiting branches/plant and earliness % characters are not prone to be altered by planting dates. Also as seed cotton yield/plant concerns us most, it is clear that better seed cotton yield/fed, for this particular cultivar (Giza 80) could be achieved by April 15 (late planting) in order to ensure higher no. of open bolls/plant and higher seed cotton yield/plant (shorter growing season). Or, through up grading the two minor entities of seed cotton yield, namely lint % and seed index by early planting on 15<sup>th</sup> March (full season). The first approach is more appropriate and manageable than the second one.

Application of potassium treatments indicated the presence of some stimulatory effects on fruiting branches/plant, boll weight, seed cotton yield/fed, yet results are irresolute.

With regard to the interaction of planting date x potassium fertilizer it was apparent that of all treatments. The third rate of 2.4 kg K<sub>2</sub>O/fed as foliar application at squaring stage + 2.4 kg K<sub>2</sub>O/fed as foliar application at flowering stage seems the best treatments under the late time of planting (15 April). and, it seems to be a suitable procedure of cotton growing under the conditions of the experiment at Sids.

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#### تأثير السماد البوتاسي تحت موعدين للزراعة على المحصول ومكوناته لصنف القطن جيزة ٨٠

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أقيمت تجربتان حقليتان بالمزرعة البحثية لمحطة البحوث الزراعية بسدس – محافظة بنى سويف في موسمي ٢٠٠٥، ٢٠٠٦، بهدف دراسة تأثير موعدين للزراعة (١٥ مارس، ١٥ أبريل)، مع ثلاث معاملات من السماد البوتاسي (٢٤ كجم/فدان إضافة أرضية بعد الخف و ٢٤ كجم/فدان إضافة أرضية بعد الخف + ٢,٤ كجم/فدان رشاً في بداية التزهير و ٢,٤ كجم/فدان رشاً في بداية الوسواس + ٢,٤ كجم رشاً في بداية التزهير).

أوضحت النتائج أن الزراعة المبكرة (١٥ مارس) أدت إلى زيادة معنوية في كل من متوسط وزن اللوزة، ومعامل البذرة، وتصافي الحليج. بينما أدت الزراعة المتأخرة (١٥ أبريل) إلى زيادة عدد اللوز المتفتح/نبات، ومحصول القطن الزهر/فدان. بينما لم يتأثر معنوياً كلاً من عدد الأفرع الثمرية/نبات ومحصول القطن الزهر/نبات والنسبة المئوية للتبكير.

كما أوضحت النتائج أيضاً أن السماد البوتاسي له أثر معنوي على عدد الأفرع الثمرية/نبات، وعدد اللوز المتفتح/نبات في موسم واحد من الدراسة. بينما لم يتأثر معنوياً كلاً من محصول القطن الزهر/نبات، والنسبة المئوية للتبكير، وتصافي الحليج. في حين تأثر معنوياً محصول القطن الزهر/فدان في موسمي الزراعة.

وأوضحت النتائج أن التفاعل بين مواعيد الزراعة ومعاملات البوتاسيوم كان معنوياً على عدد الأفرع الثمرية/نبات، وعدد اللوز المتفتح/نبات، وتصافي الحليج، والنسبة المئوية للتبكير في موسم واحد. في حين تأثر كل من وزن اللوزة ومعامل البذرة، ومحصول القطن الزهر/فدان معنوياً في كلا الموسمين.

#### التوصية :-

للحصول على أفضل النتائج كما جاء في البحث يفضل زراعة صنف القطن جيزة ٨٠ بمنطقة سدس في منتصف أبريل مع استخدام معدل التسميد البوتاسي بمعدل ٢,٤ كجم/فدان رشاً عند بداية الوسواس و ٢,٤ كجم/فدان رشاً عند بداية التزهير.