

RESPONSE OF COTTON CULTIVAR GIZA 90 TO DATES AND METHODS OF POTASSIUM SULPHATE APPLICATION

Ghaly, F.M., H.M. Hassan and F.S. Hamed.

ABSTRACT

The present investigation was carried out at Shandaweel Agricultural Research Station during 2005 and 2006 seasons on Egyptian cotton cultivar Giza 90. (*Gossypium barbadense* L.) to study the effect of Potassium Sulphate application methods and timing on growth and seed cotton yield as well as yield components. A randomized complete block design with four replicates was used six treatments were as follows:

K₀: Without Potassium application (control).

K₁: Potassium Sulphate (48 %K₂O) was applied at sowing.

K₂: Potassium Sulphate (48%K₂O) was applied at thinning date.

K₃: Foliar spraying with Potassium Sulphate (48 %K₂O) twice at budding and flowering stages.

K₄: Foliar spraying with Potassium Sulphate (48%K₂O) three times at budding stage, beginning of flowering and 15 days later.

K₅: Foliar spraying with citrate (Potassium -p 45% citrate) twice at budding and flowering stages.

The results of these experiments indicated that plant height at harvest, Number of fruiting branches plant, number of open bolls/plant, boll weight, seed cotton yield/plant and faddan were significantly increased by tested treatments in both seasons. While, height of first fruiting node and number of plants at harvest were not affected by tested treatments.

INTRODUCTION

Potassium is essential plant nutrient with many physiological roles in plant growth, including activation of numerous enzymes, the maintenance of charge balance of anions and an influence on their uptake and a major contribution to osmotic potential with important roles in stomatal opening and in cotton fiber development. In this respect, Darwish (1991), EL-Sayed and EL-Menshawi (2001), EL-Sayed (2005) and Hamed (2006) reported that, number of open bolls/plant, boll weight, seed cotton yield/plant and feddan were significantly increased by Potassium application. Eid *et al.*, (1995) found that spraying cotton plants with Potassium Sulphate (48%K₂O) at the rate of 9 kg/fed. due to an increase in number of open bolls plant and average boll weight. EL-Shazly and EL-Masri (2003) found that foliar application of 2% Potassium Sulphate significantly increased number of open bolls/plant, seed cotton yield/plant as well as fed. As compared with control in two seasons. Also, EL-Shazly *et al.* (2003) found that two foliar feeding with k at two levels (1% or 2% K₂O) gave significant increase in boll weight and seed cotton yield/plant as well as fed compared with the control in two seasons. El-masri *et al.* (2005) found that two foliar feedings with K at two levels (1% or 2% K₂O) gave significant plant height at harvest, number of fruiting branches/plant, boll weight, number of open bolls/plant, seed cotton yield/plant and feddan compared with the control in two seasons .

MATERIAL AND METHODS

Two field experiments were carried out at Shandweel Agricultural Research Station in 2005 and 2006 seasons to study the effect of Potassium Sulphate application methods and timing on growth, seed cotton yield and yield components of cotton cultivar Giza90. Cotton seeds were sown at the last week of March in both seasons. Thinning was done at 30 days after sowing leaving two plants per hill. Chemical analysis of soil are presented in table (1).

Table (1) Chemical analysis of soil samples at 5-30 cm depth from the surface in 2005 and 2006 seasons.

Soil characteristics	2005 season	2006 Season
Texture	Clay Loam	Loam
Calcium carbonate %	1.49	1.24
Organic matter %	0.938	1.02
PH (1:2:5 suspension NPK)	7.40	7.20
Total N (ppm)	681	702
Available P (ppm)	8.1	9.4
Available K (ppm)	410	448

The experimental design was a randomized complete block with four replicates.

Six treatments were applied as follows:

K₀: Without Potassium application (control).

K₁: Potassium Sulphate (48 % K₂O) was applied at sowing date.

K₂: Potassium Sulphate (48 % K₂O) was applied at thinning date.

K₃: Foliar spraying with Potassium Sulphate (48 % K₂O) twice at budding and flowering stages .

K₄: Foliar spraying with Potassium Sulphate (48 % K₂O) three times at budding stage, beginning of flowering and 15 days later.

K₅: Foliar spraying with citrate (Potassium -p 45 % citrate) twice at budding and flowering stages.

The treatments were applied as foliar spraying s on cotton plants at the commence at budding stage, flowering stage followed by another spraying , 15 days later using hand-operated sprayer compressed at a low volume of 200 liter/fed. The area of experimental plot was 19.5 m² (5m. in length and 3.9 m. at width) included 6 rows at 65cm apart. Calcium super phosphate (15.5% P₂O₅) was applied before sowing at the rate of 150kg/fed. besides 60kg N/fed. was added in bands and divided in two equal portions, the first one was applied after thinning just before the second irrigation and the second portion was added before the third irrigation .

Five guarded hills were randomly chosen from the three inner rows in order to study the following characters:

A- Growth characters:

- 1 – Plant height at harvest (cm).
- 2 – Number of fruiting branches/plant.
- 3 – Height of the first fruiting node.

B- Yield and yield components:

1. Number of open bolls/plant.
2. Average boll weight in grams.
3. Average seed cotton yield/plant in grams.
4. Number of plants at harvest in thousands/fed., number of plants at harvest were recorded and transformed to thousands/fed.
5. Seed cotton yield in kentars/fed. seed cotton yield/plot in kilograms was recorded and transformed to kentars faddan (one kentar: 157.5kg).

The collected data were subjected to analysis of variance outlined by Snedecor and Cochran (1967) and the mean values were compared using L.S.D at 5%.

RESULTS AND DISCUSSION

A – Growth characters:

Data in table (2) show that the tested treatments exhibited significant differences in plant height at harvest in both seasons. The highest values of this trait were obtained from foliar spraying with Potassium Sulphate (48% K₂O) twice at budding stage and flowering and Potassium Sulphate (48% K₂O) Application thinning in 2005 and 2006 seasons respectively. While, the lowest values were obtained from the control. Such results may be attributed to the role of k fertilizer on plant metabolism which consequently enhancing growth habits. These results are agreement with those obtained by Eid *et al.* (1995) and Elmasri *et al.* (2005). The number of fruiting branches/plant was significantly increased by tested treatments in both seasons. The highest values of this trait were obtained from foliar spraying with Potassium Sulphate (48% K₂O) twice at budding and flowering stages and Potassium Sulphate (48% K₂O) application at thinning date or foliar spraying with citrate (Potassium .p 45% citrate) twice at budding and flowering stages in 2005 and 2006 seasons, respectively, while the lowest values were obtained from the control. These results are agreement with those obtained by El-Masri *et al.* (2005). However, height of first fruiting node was not affected by the test treatments.

B- Yield and yield components:

The results in table (3) show that the tested treatments exhibited significant differences in number of open bolls/plant in both seasons. The highest values of this characters were obtained from foliar spraying with Potassium Sulphate (48 % K₂O) three times i.e. at budding and beginning of flowering stages and 15 days later. And foliar spraying with citrate (Potassium – p 45% citrate) twice at budding and flowering stages in 2005 and 2006 seasons, respectively, while the lowest values were obtained from the control .

Similar results were obtained by Eid et al (1995) , El-Masri *et al.* (2003) and El-Masri *et al.* (2005) .

Boll weight was significantly increased by tested treatments in both seasons. The highest values of these characters were obtained from Potassium Sulphate (48 % K₂O) application at thinning date in 2005 and 2006 seasons, while the lowest values were obtained from the control. Similar results were obtained by Darwish (1991), El-Sayed El-Menshawi (2001) , El-Sayed (2005) and Hamed (2006). Seed cotton yield/plant was significantly increased by tested treatments in both seasons the highest values of this trait were obtained from Potassium Sulphate (48%K₂O) application at thinning date and foliar spraying with Potassium Sulphate (48% K₂O) three times at budding stage, beginning of flowering stage and 15 days later in 2005 and 2006 seasons, while the lowest values were obtained from the control. Similar results were obtained by Darwish (1991), Eid *et al.* (1995), El-Shazly and El-Masri . (2003) El-Shazly *et al.* (2003) and El-Masri *et al.* (2005). Seed cotton yield/fed. was significantly increased by tested treatments in both seasons the highest values of this trait were obtained from Potassium Sulphate (48% K₂O) application at thinning date in 2005 and 2006 seasons. While the lowest values were obtained from the control.

Table (2) Effect of Potassium Sulphate application methods and dates on growth traits in 2005 and 2006 seasons.

Potassium Sulphate application methods and timing									
	Seasons	K0	K 1	K2	K3	K4	K5	F.Test	L.S.D 5%
Plant height at harvest (cm)	2005	101.7	115.5	117.5	121.2	116.5	102.2	*	1.7
	2006	123.5	136.5	140.7	127.0	134.5	140.2	*	2.5
No. of fruiting branches/plant	2005	14.7	15.9	17.1	17.1	15.6	15.2	*	0.7
	2006	17.6	19.5	20.1	19.5	18.2	20.1	*	0.8
Height of first fruiting node	2005	6.65	6.20	6.25	6.45	6.65	6.80	NS	-
	2006	7.40	7.20	7.05	6.95	7.15	6.85	NS	-

Table (3) Effect of methods of Potassium Sulphate and its date application on yield and its components in 2005 and 2006 seasons .

Potassium Sulphate application methods and timing									
	Seasons	K0	K 1	K2	K3	K4	K5	F . Test	L.S.D 5 %
No. of open bolls/plant	2005	11.8	13.9	13.3	11.8	13.9	12.5	*	0.8
	2006	8.2	10.4	9.7	9.7	10.5	11.5	*	0.5
Boll weight(gm)	2005	1.75	1.91	1.99	1.93	1.87	1.86	*	0.02
	2006	1.74	1.84	2.59	2.01	1.74	1.86	*	0.04
Seed cotton yield (gm/plant)	2005	20.65	26.55	26.57	22.87	25.99	23.34	*	1.65
	2006	14.35	19.14	20.27	19.50	21.94	21.48	*	0.93
No. of plants at harvest/fed.	2005	45969	48856	43821	48536	45070	49352	NS	-
	2006	46230	44230	44768	44230	45691	43422	NS	-
Seed cotton yield(kentar/fed)	2005	4.12	5.52	6.38	4.93	4.54	4.71	*	0.82
	2006	3.71	4.63	4.73	4.62	3.93	4.44	*	0.50

These results may be due to the role of k fertilizer encouraging early appearance of bolls of cotton plants. Similar results were obtained by Darwish(1991),El-Sayed·El-Menshawi. (2001), El-Sayed (2005) and Hamed (2006). On the other hand, number of plants at harvest/faddan was not affected by the tested treatments in both seasons.

The greatest values of these studied characters were obtained from Potassium Sulphate (48 % K₂O) application at thinning or foliar spraying with Potassium Sulphate (48 % K₂O) twice at budding and flowering stages.

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استجابة صنف القطن جيزة 90 لطرق ومواعيد إضافة البوتاسيوم

فوزى محمد غالى حسن محمد حسن فكرى سيد حامد

معهد بحوث القطن - مركز البحوث الزراعية - جيزة - مصر .

أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بشندويل خلال الموسمين الصيفيين 2005 - 2006 م لدراسة تأثير طرق ومواعيد إضافة البوتاسيوم علي النمو والمحصول ومكوناته علي صنف القطن جيزة 90 ، تم تنفيذ التجارب في تصميم قطاعات كاملة العشوائية في أربعة مكررات وكانت المعاملات كما يأتي :-

- 1- بدون إضافة البوتاسيوم (مقارنة) .
 - 2- إضافة البوتاسيوم عند الزراعة .
 - 3- إضافة البوتاسيوم عند الخف .
 - 4- رش البوتاسيوم عند مرحلتى تكوين الوسواس والتزهير .
 - 5- ثلاث رشات عند مراحل (الوسواس + عند التزهير + بعد التزهير بـ 15 يوم) .
 - 6- رش سترات مرتين (الرشة الأولى عند مرحلة الوسواس والثانية عند التزهير)
- وكانت النتائج كما يلي :-

أعطت المعاملات المختبرة تأثيراً معنوياً علي طول النبات ، عدد الأفرع الثمرية ، عدد اللوز المتفتح / نبات، ووزن اللوزة، ومحصول النبات الفردي ، ومحصول القطن الزهر (قطار/ فدان) في كلا الموسمين، بينما لم يكن هناك تأثير معنوي علي صفة عدد النباتات/ فدان في كلا الموسمين. وكانت أفضل النتائج في معظم الصفات عند إضافة سلفات البوتاسيوم (48% بو2أ) عند الخف أو رش سلفات البوتاسيوم (48% بو2أ) مرتين عند مرحلتى تكوين الوسواس والتزهير .