Future of Egyptian Cotton Production in the Newly Reclaimed Desert Land of Egypt: 10- Cotton Response to Soil, Foliar Potassium Application and Potassium Dissolving Bacteria (KDB).

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ABSTRACT

Two field experiments were conducted on a highly calcareous sandy clay loam soil at Nubaria Agricultural Research Station during 2007 and 2008 seasons to study the effect of bio- and mineral potassium fertilization on growth, earliness, yield, its components and fiber properties of Egyptian cotton Giza 86 cultivar (*Gossypium barbadense, L.*). Seven K application treatments were used, namely, control without K_2O (1), hand broadcast soil application of 24 kg K_2O/fed. applied at sowing (2) and at thinning (3), foliar application of 2.4 kg K_2O/fed. at two (4) and three times (5), foliar application of 500 g potassium citrate/fed. applied twice (6) and finally seed inoculation with 400 g "Potassiomage" (*Bacillus mucilaginosus*) bio-fertilizer/fed. as a potassium dissolving bacteria (KDB), without potassium fertilizer (7). The time of potassium spray was at squaring, start and peak of flowering stages for the three times, respectively. The experimental design was randomized completely blocks (RCBD) with four replications. The most important results obtained could be given as follows: 1- The studied treatments had an insignificant effects ($P \le 0.05$) on plant height at harvest, no. of sympodia/plant, first sympodial position, earliness percentage, no. of plants/fed. at harvest, lint percentage, seed index and fiber properties in both seasons and boll age in one season only. 2- There was a significant effect ($P \le 0.05$) on days to first flower appearance as well as to first opened boll, no. of open bolls/plant, boll weight, seed cotton yield per plant and per fed. in both seasons. 3- Untreated control, (without potassium fertilizer and without KDB), exhibited significantly decreased yield and its components compared with the other studied treatments in the two seasons. 4- The differences among soil potassium application, foliar application of 2.4 kg K_2O/fed. or 500 g potassium citrate/fed. applied twice and seed inoculation with KDB on yield and its components were not significant ($P \le 0.05$) in both seasons. 5- Foliar spray of 2.4 kg K_2O/fed. three times at squaring, start and peak of flowering stages, respectively, significantly increased no. of open bolls/plant (18.98, 17.70), boll weight (2.59, 2.50 g), seed cotton yield/plant (49.23, 44.25 g) and seed cotton yield/fed. (9.54, 9.87 kent./fed.) in both 2007 and 2008 seasons, respectively.

INTRODUCTION

Cotton is one of the most important fiber crops in the world. This crop is also the second source of plant proteins after soybean, and the fifth oil producing plant after soybean, palm oil, canola and sunflower (Texier, 1993). In Egypt, cotton is an important crop that is cultivated for its fiber, seed oil and cake. Cotton fiber is the main raw material for the textile industry which is the largest industry in Egypt. Recently, Egyptian cotton is facing severe problems. Both area and production is decreasing from one year to another. The high cost of cotton production which tempted the farmer to delay cotton growing after faba bean and wheat. Two major decisions should be taken to restore the situation of the Egyptian cotton. The first is the improvement of the growing conditions of the crop or simply improving the crop management. The second is the reduction of production cost, especially cost of mineral fertilizers (Abou-Zaid, 1999). Soil fertility and crop management are the two most important factors of modern agricultural activity (Sawan *et al.,* 2006). Bio-fertilization is one of the solutions to improve the crop management, reduction of the environmental pollution and production cost.

Among the management practices, one factor is very essential, this is potassium (K) fertilizer. The importance of K fertilization in Egyptian agriculture has become more apparent since the completion of the High Dam, which resulted in the deposition of the suspended Nile silt upstream from the formed Nasser lake. This Nile silt was a source for K-bearing minerals that enriched the soil during the seasonal floods (Abd El-Hadi *et al.,* 1997). Continuous crop removal without replenishment of these nutrients can lead to an irreparable damage to soil fertility (Sawan *et al.,* 2006). Recently, K deficiencies became a problem because of K deficiency in soil due to crop uptake, runoff, leaching and soil erosion (Sheng and Huang, 2002). Potassium (K) is an important nutrient that has favorable effects on the metabolism of nucleic acids, proteins, vitamins and growth substances. Furthermore, K plays an important role in the translocation of photsynthates from sources to sinks (Bednarz and Oosterhuis, 1999). Notable improvement in cotton yield and quality resulting from K input have been reported by El-Razaz *et al.*, (1997), El-Haddad *et al.,* (2001), Khalifa and Abou-Zaid (2002), Keshavarz *et al.,* (2004), Sawan (2006) and Sawan *et al.*, (2006). Information available on K requirements of cotton plants showed better response to moderate rate of K application, i.e., 24 - 48 kg K_2O/fed. [Darwish *et al.,* (1995), Abou-Zaid and El-Haddad (1997), El-Haddad *et al.,* (2001) and Khalifa and Abou-Zaid (2002)].

With regard to bio- and mineral K fertilization effect, at present, little information about the K releasing condition by the potassium dissolving bacteria (KDB) are available. The soil under the present investigation was characterized by high calcium carbonate and low fertility status that could influence crop growth. There, it is possible to use the locally available potassium sulphate, citrate and (KDB) bio-fertilizer to replace chemical fertilizer and reduce the cost of cotton production. It is well known that many organic compounds produced by (KDB), such as acetate, citrate and oxalate can increase mineral dissolution rate (Welch and Ullman, 1993). Carboxylic acid groups shown to promote dissolution of silicates are also common in extra cellular organic materials. Badr *et al.*, (2006) showed that bacterial inoculation with (*Bacillus cereus*) combined with K and P bearing minerals gave 48, 65 and 58 % increase in dry matter yield of sorghum plants in clay, sandy and calcareous soils, respectively, compared to non-inoculated soils. The uptake of K by sorghum plants also increased by 71, 110 and 116 % in the same soils, respectively. Residual soil fertility estimated by K and P concentration after harvest also underwent an increase through inoculation of silicate dissolving bacteria (SDB) especially with mineral addition in the tested soils. Han *et al.*, (2006) inoculated PDB (*Bacillus megaterium* var. *phosphaticum*) and KDB (*Bacillus mucilaginosus*) in nutrient limited soil planted with pepper (*Capsicum annum L.*,) and cucumber (*Cucumis sativus L.*,). Results showed that integrated rock K with inoculation of KDB increased the availability of K in soil, the uptake of N, P and K by shoot and root. They added that combined together, rock materials and both bacterial strains consistently increased further mineral availability, uptake and plant growth suggesting its potential use as fertilizer. Potassium dissolving bacteria (KDB) are also known as potassium solubilizing bacteria (KSB) or silicate dissolving bacteria (SDB). Our objectives were to determine the influence of soil and foliar applied K fertilization and seed inoculation with (KDB) Potassiomage, compared to the control (without K fertilizer) on growth, earliness, yield, its components and fiber properties of Egyptian cotton Giza 86 cultivar in the newly reclaimed calcareous soil of west Nubaria and south west of Alexandria governorate.

MATERIALS AND METHODS

Two field experiments were conducted on a sandy clay loam soil (loam, mixed, calcareous, hyper thermic, typic calciorthids) at west desert road village, Mariut sector beside Nubaria Agricultural Research Station, Km 47 west south of Alexandria governorate, during 2007 and 2008 summer seasons. Cotton growth, earliness parameters, yield, its components and fiber properties were evaluated under six treatments, i.e., bio- and mineral potassium (K) fertilization, vs. control treatment (without K_2O). The mechanical and chemical soil properties were determined according to the method described by Page *et al.*, (1982) and are presented in Table (1). In both seasons, the texture was sandy clay loam and low content of organic matter. The available amounts of macro elements were poor for nitrogen (< 30 ppm), low for phosphorus and potassium. Regarding, available amounts of micro-nutrients, Fe, Cu and

Mn were of high levels in the soil; while Zn and B existed in a moderate amount.

The seven potassium application treatments were:

1- Control (without K_2O).
2- Hand broadcasting "soil application" of 24 kg K_2O/fed. at sowing.
3- Hand broadcasting "soil application" of 24 kg K_2O/fed. at thinning.
4- Foliar application of 2.4 kg K_2O/fed. sprayed two times.
5- Foliar application of 2.4 kg K_2O/fed. sprayed three times.
6- Foliar application of 0.5 kg potassium citrate/fed. sprayed two times.
7- Seed inoculation with 400 g "Potassiomage" bio-fertilizer/fed. without potassium fertilizer.

Table (1): Mechanical and chemical analysis of soil samples for the experimental site in 2007 and 2008 seasons.

Soil properties		Mean	
		2007	2008
Mechanical analysis:			
Clay	**(%)**	22.86	23.64
Silt	**(%)**	29.33	28.25
Sand	**(%)**	47.81	48.11
Texture class		**Sandy clay loam**	**Sandy clay loam**
Chemical analysis:			
pH		8.40	8.42
E.C.	**(m.moh)**	1.47	1.52
Ca CO_3	**(%)**	25.42	23.14
HCO_3^-	**(%)**	12.71	13.11
Organic matter	**(%)**	0.53	0.49
Available N	**(ppm)**	23.02	28.8
Available P	**(ppm)**	4.55	4.49
Available K	**(ppm)**	204.21	201.15
Available B	**(ppm)**	0.85	0.97
Available Zn	**(ppm)**	0.96	0.95
Available Fe	**(ppm)**	9.0	7.3
Available Cu	**(ppm)**	4.5	3.8
Available Mn	**(ppm)**	7.0	11.0

Treatments were allocated at random in the each block. The time of potassium spray was at squaring, start and peak of flowering stages for the three times, respectively. Treatments were arranged in a randomized completely block design (RCBD) in four replicates.

The bio-fertilizer "Potassiomage" contains (*Bacillus mucilaginosus*) as a potassium dissolving bacteria (KDB) or potassium solubilizing bacteria (KSB). Such product is produced by the General Organization for Agricultural Equalization Fund (GOAEF), Ministry of Agriculture, Egypt, (Abou El-Naga, 1993). The inoculation of "Potassiomage" was performed by coating cotton seed at the rate of 400 g/fed. using a sticking substance (Arabic gum 5%) just before sowing. Cotton seeds were sown in dry soil and then immediately irrigated.

The plot area was 16.25 m^2, which accommodated five ridges, each 5 m long, 0.65 m apart and the distance between hills was 25 cm. Seeds of Egyptian long staple cotton cultivar Giza 86 (*Gossypium barbadense, L.*) were planted on 16 and 23 April after Egyptian clover (*Trifolium alexandrinum, L.*) in 2007 and 2008 seasons, respectively. Cotton was irrigated, during the whole growing season, eight times in addition to planting irrigation. The first irrigation was applied after 21 days from planting irrigation, while the other seven irrigation were given at 15-days interval. Before the second irrigation, the plants were thinned to two plants/hill. Hand hoeing was carried out three times during the season before the first, second and third irrigations, respectively. A preplant application of 31 kg P_2O_5/fed., as super phosphate (15.5 % P_2O_5), was incorporated into the soil each year. Potassium sulphate (48 % K_2O) was added according to the experimental treatments (type, rate and date of application).

Average yearly nitrogen fertilizer rate for cotton was 75 kg N/fed. as ammonium nitrate (33.5 % N). Nitrogen was split into two equal portions, one half applied after thinning before the second irrigation while, the other installment was added before the third irrigation. The first pick of cotton yield was performed by, hand, on October 5, while the second pick was on October 30 for the first season. The respective dates of picking for the second season were October 18 and November 10. The standard commercial management practices for west Nubaria region were followed.

Five representative hills were taken at random from each plot to study the following traits: days from sowing to the first flower appearance (DFF) as well as to the first opened boll (DFB), plant height at harvest (PH), first sympodial position (FSP), number of sympodia/plant (NSP), number of opened bolls/plant (NOB), boll weight (BW), seed cotton yield/plant (SCYP), earliness percentage (E %), lint percentage (L %), seed index (SI) and fiber properties measured by HVI apparatus according to (A.S.T.M. D-4605.,1986) that included upper half mean length (UHM) in mm, uniformity index (UI), fiber strength in g/tex. (FS), fiber elongation percentage (FE %), micronaire reading (MR), reflectance (Rd %) and yellowness (+b). Also, number of plants/fed. at harvest (NPF) was determined. Seed cotton yield/plot was calculated from the three inner ridges in each plot and was converted to kentar/fed. (SCYF).

The collected data of the two seasons were subjected to statistical analysis according to Gomez and Gomez (1984). L.S.D. values at 5% level of significance were used for comparison between means.

RESULTS AND DISCUSSION

Large areas of calcareous soils in west Nubaria and south west of Alexandria governorate are deficient in potassium (K) nutrient; therefore, in our experiment we have included soil and foliar K application, with the different sources, and their solubilizing bacteria to increase the available K in this soil. The results are presented and discussed in the following sequence:

1. Growth attributes and earliness parameters:

The results record in Table (2) showed that the six treatments vs the control had an insignificant effects on plant height at harvest (PH), no. of sympodia/plant (NSP), first sympodial position (FSP), earliness percentage (E %) for the two seasons and boll age (BA) for one season only. While, days to first flower appearance (DFF) and days to first opened boll (DFB) for the two seasons were significantly ($P \leq 0.05$) affected by the seven treatments. Foliar application of 2.4 kg K_2O/fed. sprayed three times at squaring, start and peak of flowering stages, respectively, significantly decreased DFF (73.83, 73.00 days) and DFB (119.55, 120.55 days) during 2007 and 2008 seasons, respectively (Table, 2) compared with the untreated control. These results were in agreement with Abou-Zaid and El-Haddad (1997), Gwathmey and Howard (1998), El-Sayed and El-Menshawi (2001), Kalifa and Abou-Zaid (2002) and Sawan *et al.*, (2006).

2. Yield and its components:

Data presented in Table (3) showed that lint percentage (L %) and seed index (SI) for the two seasons were not significantly affected ($P \leq 0.05$) by the studied treatments. Also, no. of plants/fed. at harvest (NPF) was not significantly affected by the studied treatments (Table, 3). This result was expected since the same planting method and management practices were followed for all studied treatments during both seasons. On the other hand, Table (3) also illustrated that no. of opened bolls/plant

(NOB), boll weight (BW), seed cotton yield/plant (SCYP) and seed cotton yield/fed. (SCYF) were significantly affected by the studied treatments in both seasons. The data given in Table (3) showed that foliar application of 2.4 kg K_2O/fed. which sprayed three times at squaring, start and peak of flowering stages, respectively, significantly increased NOB (18.9, 17.7), BW (2.59, 2.50 g), SCYP (49.23, 44.25 g) and consequently SCYF (9.54, 9.87 kent./fed.) in both 2007 and 2008 seasons, respectively. The increase in SCYF and its components due to foliar application of 2.4 kg K_2O/fed. which sprayed at three times treatment, compared to the other studied treatments and the control, may be attributed to the increase in earliness parameters i.e., the decrease in DFF and DFB in the two seasons due to this treatment (Table, 2).

Data in Table (3) also showed that the same trend was obtained for the two treatments of (Foliar application of 500 g K citrate sprayed twice and KDB of Potassiumage) on SCYF and its components, in the two seasons, compared with the untreated control treatment (without K fertilizer and without KDB bio-fertilizer). Foliar application of 2.4 kg K_2O/fed. which sprayed three times, saved about 16.8 kg K_2O/fed. (70 %) as compared with soil K application (24 kg K_2O/fed.). While, cotton seed inoculation with KDB bio-fertilizer saved about 24 kg K_2O/fed. (100 %) compared to soil K fertilization. These results are in accordance with those outlined by El-Razaz *et al.,* (1997), Howard *et al.*, (1998), Coker *et al.,* (2000), Howard *et al.*, (2000), El-Haddad *et al.,* (2001), Keshavarz *et al.*, (2004), Badr *et al.,* (2006), Han *et al.,* (2006), Sawan (2006) and Sawan *et al.,* (2006).

Coker *et al.,* (2000) reported that there was trend for slightly increased lint yield, NOB and BW due to foliar K under the low soil K condition. Howard *et al.*, (2000) found that foliar K and/or boron (B) solution buffered to pH 4 increased first harvest and total lint yields more than unbuffered or solutions buffered to pH 6. Keshavarz *et al.,* (2004) reported that the use of K increased cotton yield significantly (13 %, 6 % for saline and non-saline soil, respectively). Sawan (2006) showed that SCYP and SCYF were increased at the rate of 319 g K/ha. with foliar k application for the cultivar Giza 86. As for KDB, Badr *et al.,* (2006) illustrated that it is possible to use the locally available K mineral in combination with silicate dissolving bacteria (SDB) as bio-fertilizer to replace mineral fertilizer and reducing the cost of crop production. Finally, Han *et al.,* (2006) showed that inoculation with PSB or KSB significantly increased N, P and K uptake in pepper and cucumber plants, especially when the respective rock P or rock K were added. Increasing N uptake with inoculation with *Bacillus sp.* may be related to the fact that *Bradyrhizobium sp.*, a genus which fixes

atmospheric N in symbiosis with legume, is phyllogentically closer to *Bacillus* than to the other rhizobial genera (Zakhia and Lajudie, 2001).
Therefore, *Bacillus* strain used in this study might have the capacity to fix atmospheric nitrogen.

3. Fiber properties:

All studied treatments did not exhibit any significant effect on all fiber properties in both seasons (Table 4). This may be attributed to the realization that these characteristics were less affected by the environmental factors. The obtained results were in close agreement with those reported by El-Razaz *et al.,* (1997), Khalifa and Abou-Zaid (2002) and Sawan *et al.,* (2006).

Hence, it might be concluded that the highest yield of seed cotton/fed. (9.54, 9.87 Kent./fed.) in 2007 and 2008 seasons, respectively, under the newly reclaimed desert land of west Nubaria and south west Alexandria governorate, were obtained by foliar application of 2.4 kg K_2O/fed. which sprayed three times at squaring, start and peak of flowering stages, respectively, compared with the other studied treatments and this treatment is promising for growing cotton in calcareous soil.

Table 2. Means of growth attributes and earliness parameters as affected by mineral- and bio-potassium fertilization (methods, rates and time) for Giza 86 cotton cultivar during 2007 and 2008 seasons.

Characteristics / Treatments	Plant height at harvest (cm)		No. of sympodia/plant		First sympodial position (Node)		Days to the first flower appearance		Days to the first open boll		Boll age (Day)		Earliness percentage (%)	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
1- Control (without K_2O).	113.1	140.0	12.93	12.82	8.20	6.90	79.05	80.02	125.83	132.95	46.78	52.80	52.14	52.50
2- 24 kg K_2O/fed. at sowing.	113.3	139.4	14.13	13.85	8.00	6.50	74.45	79.60	120.28	129.05	45.83	49.45	52.33	52.45
3- 24 kg K_2O/fed. at thinning.	114.0	138.4	14.43	13.97	8.07	6.30	76.33	73.30	122.53	119.15	46.20	45.85	51.78	53.74
4- 2.4 kg K_2O/fed. sprayed 2 times.	114.8	139.1	14.50	13.70	8.05	6.40	75.18	75.10	121.63	123.00	46.95	47.80	51.87	52.49
5- 2.4 kg K_2O/fed. sprayed 3 times.	113.1	135.8	15.67	14.57	7.80	6.20	73.83	73.00	119.55	120.55	45.73	47.15	52.76	53.50
6- 0.5 kg potassium citrate/fed. sprayed 2 times.	114.3	136.1	13.47	13.17	7.77	6.40	78.10	77.35	125.63	126.15	47.53	48.80	52.77	51.52
7- Potassiomage 400g/fed. at sowing.	115.6	138.3	13.75	13.15	7.95	6.20	77.28	73.45	124.30	119.90	47.03	46.45	52.94	53.58
L.S.D. at 5 % level	N.S	N.S	N.S	N.S	N.S	N.S	1.09	2.20	1.53	2.61	N.S	1.90	N.S	N.S
Grand mean	114.1	138.2	14.13	13.61	7.58	6.43	76.38	76.10	122.82	128.42	46.58	48.33	52.37	52.83

Table 3. Means of yield and its components as affected by mineral- and bio- potassium fertilization (methods, rates and time) for Giza 86 cotton cultivar during 2007 and 2008 seasons.

Characteristics / Treatments	No. of opened bolls/plant		Boll weight (g)		Seed cotton yield/plant (g)		No. of plants (1000 plants/fed.)		Seed cotton yield (Kentar/fed.)		Lint percentage (%)		Seed index (g)	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
1- Control (without K_2O).	16.3	15.5	2.36	2.27	38.35	35.19	44.27	43.29	8.18	7.97	40.6	39.1	11.04	11.65
2- 24 kg K_2O/fed. at sowing.	18.3	16.3	2.48	2.48	45.30	40.42	44.33	43.29	9.29	8.97	40.3	39.7	11.21	11.58
3- 24 kg K_2O/fed. at thinning.	18.8	16.3	2.50	2.53	46.86	41.24	44.40	43.55	9.14	9.02	39.4	39.5	10.93	11.75
4- 2.4 kg K_2O/fed. sprayed 2 times.	18.7	16.5	2.5	2.50	47.67	41.25	44.33	43.74	9.27	9.05	40.2	39.7	10.91	11.86
5- 2.4 kg K_2O/fed. sprayed 3 times.	18.9	17.7	2.59	2.50	49.23	44.25	44.46	43.81	9.54	9.87	39.5	39.5	11.09	11.79
6- 0.5 kg potassium citrate/fed. sprayed 2 times.	16.8	17.1	2.48	2.37	41.76	40.53	44.27	43.29	8.93	8.85	40.1	39.1	11.04	11.91
7- Potassiomage 400g/fed. at sowing.	16.8	17.0	2.50	2.52	42.28	42.84	44.27	43.03	8.96	8.83	40.2	39.6	10.80	11.95
L.S.D. at 5 % level	1.45	1.21	0.07	0.12	4.67	2.63	N.S	N.S	0.50	0.54	N.S	N.S	N.S	N.S
Grand mean	17.82	16.63	2.49	2.45	44.49	40.74	44.33	43.43	9.05	8.93	40.0	39.5	11.00	11.78

Table 4. Means of fiber quality propertels as affected by mineral- and bio- potassium fertilization (methods, rates and time) for Giza 86 cotton cultivar during 2007 and 2008 seasons.

Characteristics / Treatments	Fiber Length parameters				Fiber bundle tinsel				Micronaire reading		Colour			
	Upper half mean (mm)		Uniformity index (%)		Fiber strength (g/tex)		Fiber elongation (%)				Reflectance (Rd %)		Yellowness (+b)	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
1- Control (without K_2O).	32.3	33.0	86.4	89.2	45.2	41.1	6.40	7.93	4.86	5.40	78.2	76.7	8.4	8.8
2- 24 kg K_2O/fed. at sowing.	32.2	32.7	87.0	88.3	45.1	38.4	6.06	7.36	4.90	5.13	78.7	76.6	8.6	8.8
3- 24 kg K_2O/fed. at thinning.	32.8	33.6	86.1	88.6	46.5	41.7	5.96	7.80	4.83	5.13	79.2	76.9	8.8	8.9
4- 2.4 kg K_2O/fed. sprayed 2 times.	32.4	33.2	86.7	89.0	46.8	40.0	5.73	7.93	4.86	5.30	79.1	75.7	8.7	9.1
5- 2.4 kg K_2O/fed. sprayed 3 times.	32.5	32.9	87.1	88.3	46.3	39.9	5.96	7.93	4.80	5.26	78.1	76.0	8.6	9.2
6- 0.5 kg potassium citrate/fed. sprayed 2 times.	32.1	33.7	86.1	89.1	46.4	41.0	5.63	7.86	4.90	5.33	79.0	75.8	8.4	9.4
7- Potassiomage 400g/fed. at sowing.	32.2	33.6	86.0	88.7	45.0	38.9	6.30	7.76	4.70	5.33	78.3	76.2	8.6	9.2
L.S.D. at 5 % level	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S
Grand mean	32.4	33.2	86.5	88.7	45.9	40.1	6.01	7.80	4.84	5.27	78.7	76.3	8.6	9.1

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الملخص العربي

مستقبل إنتاج القطن المصري في الأراضي الصحراوية المستصلحة حديثاً بمصر.

١٠ – أستجابة القطن للتسميد البوتاسي الأرضي والورقي والتلقيح بالبكتريا المذيبة للبوتاسيوم.

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أجريت تجربتان حقليتان بمحطة البحوث الزراعية بالنوبارية – في أرض جيرية – خلال موسمي النمو ٢٠٠٧، ٢٠٠٨ وذلك لدراسة أستجابة صنف القطن المصري جيزة ٨٦ للتسميد البوتاسي الأرضي والورقي والتلقيح بالبكتريا المذيبة للبوتاسيوم. وأثر ذلك علي دلائل النمو، قياسات التبكير، المحصول ومكوناته وجودة التيلة. وقد إستخدم في هذه التجربة تصميم القطاعات كاملة العشوائية في أربع مكررات.

وقد احتوي كل قطاع من قطاعات التجربة علي سبع معاملات كالتالي:

١) الكنترول (بدون سماد بوتاسي).

٢) إضافة أرضية بمعدل ٢٤ كجم أكسيد بوتاسيوم بو٢أ/فدان (عند الزراعة).

٣) إضافة أرضية بمعدل ٢٤ كجم أكسيد بوتاسيوم بو٢أ/فدان (عند الخف).

٤) رش علي الأوراق بمعدل ٢,٤ كجم أكسيد بوتاسيوم بو٢أ/فدان (مرتين).

٥) رش علي الأوراق بمعدل ٢,٤ كجم أكسيد بوتاسيوم بو٢أ/فدان (ثلاث مرات).
٦) رش علي الأوراق بمحلول سترات البوتاسيوم بمعدل ٥٠٠ جم/فدان (مرتين).
٧) تلقيح بذور القطن بالمخصب الحيوي "بوتاسيوماج" بمعدل ٤٠٠ جم/فدان (بدون سماد بوتاسي).

وكانت أهم النتائج المتحصل عليها كما يلي:

١) لم تختلف معاملات الإضافة الأرضية أو الرش الورقي للبوتاسيوم أو التلقيح بالمخصب الحيوي "بوتاسيوماج" - مقارنة بالكنترول - معنوياً في صفات طول النبات عند الجني، عدد الأفرع الثمرية/نبات، أرتفاع أول عقدة ثمرية، نسبة التبكير، عدد النباتات/فدان عند الجني، تصافي الحليج، دليل البذرة وخواص التيلة في كلا الموسمين، وصفة عمر اللوزة في موسم واحد فقط.
٢) أعطت معاملات التجربة فروقاً معنوية لصفات عدد الأيام من الزراعة حتى ظهور أول زهرة، وتفتح أول لوزة، عدد اللوز المتفتح/نبات، متوسط وزن اللوزة، محصول النبات الفردي ومحصول الفدان من القطن الزهر في كلا الموسمين.
٣) أدت معاملة الكنترول (بدون سماد بوتاسي، بدون مخصب حيوي) إلي انخفاض معنوي في محصول القطن الزهر/فدان ومكوناته مقارنة بمعاملات التجربة الأخري في كلا الموسمين.
٤) الاختلافات ما بين الإضافة الأرضية (٢٤ كجم بو٢أ/فدان) والرش الورقي بمحلول سلفات البوتاسيوم (٢,٤ كجم بو٢أ/فدان) أو سترات البوتاسيوم (٥٠٠ جم/فدان) مرتين والتلقيح للبذرة بالمخصب الحيوي "بوتاسيوماج" علي محصول القطن الزهر ومكوناته لم تكن معنوية خلال موسمي النمو.
٥) أعطت معاملة الرش الورقي لنباتات القطن بسلفات البوتاسيوم (٢,٤ كجم بو٢أ/فدان) ثلاث مرات زيادة معنوية لعدد اللوز المتفتح علي النبات (١٨,٩٨ و ١٧,٧٠ لوزة/نبات)، متوسط وزن اللوزة (٢,٥٩ و ٢,٥٠ جرام) و محصول النبات الفردي (٤٩,٢٣ و ٤٤,٢٥ جرام) وأعلي إنتاجية من القطن الزهر (٩,٥٤ و ٩,٨٧ قنطار/فدان) وذلك خلال موسمي الزراعة ٢٠٠٧ و ٢٠٠٨ علي الترتيب.