RESPONSE OF LATE SOWING COTTON CULTIVAR (GIZA 88) TO TIMES OF POTASSIUM APPLICATION UNDER DIFFERENT LEVELS OF NITROGEN

El-Sayed, E. A. and M.El . El-Menshawi
Cotton Res., Inst., Agric Res. Center, Giza, Egypt.

ABSTRACT

Two field experiments were carried out at Sakha, Agricultural Research Station during 1999 and 2000 seasons to study the response of late sowing cotton cultivars (Giza 88) to three nitrogen levels (30, 45 and 60 kg N/fed) as a main plots and three timing of potassium application 24 kg K_2O/.feddan (before the first irrigation, before the second irrigation and before the third irrigation) plus unfertilized treatment with K as subplots. Combined data revealed that increasing nitrogen fertilizer levels from 30 up to 60 kg N/fed increased final plant height, main stem internodal length, number of sympodia, nodal position of the first sympodium, days to first flower and open boll, earliness percentage and dry weight of vegetative and fruiting organs, while number of main stem internodes and seed cotton yield and its components were not significantly affected by nitrogen fertilizer levels.

Comparing with unfertilized plants with K, results indicated the positive effect of potassium when it was applied at the proper time as application before the second irrigation which resulted in less number of monopodia and higher number of sympodia, higher dry weight of vegetative and fruiting organs, heavier bolls, higher number of open bolls as well as seed cotton yield per plant and per feddan. Potassium fertilization showed no effect on final plant height, number of main stem, main stem internodal length, node location of the first sympodium, days to first flower, earliness percentage, lint % and seed index.

The results indicated that increasing nitrogen fertilizer rates from 30 up to 60 kg N/fed. significantly increased plant height, main stem internodal length, number of sympodia/plant and delay in maturation. Moreover, number of open bolls, boll weight, lint percentage and seed index insignificantly affected by nitrogen levels at late sowing.

The interaction of nitrogen level by K treatments was not significant for all traits studied in this investigation.

Generally, results obtained revealed that nitrogen fertilizer levels had a little effect on yield of late sowing cotton and the soil application of potassium fertilizer before the second irrigation is the proper timing to apply this element for maximizing cotton productivity.

INTRODUCTION

It is well known that late sowing decreases seed cotton yield and most of its components. Great interest has been directed toward determining the optimum time of supplying potassium under different levels of nitrogen fertilization in late sowing cotton. Wahdan, 1980; Saker, 1983; Ragab, 1985; Abdel-Naby, 1986 and Saeed, 1989, reported that late sowing decreased plant height, number of bolls/plant, boll weight, seed index, lint percentage, as well as earliness of yield and seed cotton yield.

Nitrogen is recognized as the most important single element in crop production and is considered the first limiting element in plant growth. As for nitrogen effects, El-Shinnawy *et al*. (1984), Mohamed *et al*. (1984) and Sawan (1986) reported that increasing N rates significantly increased seed cotton yield, number of fruiting branches, boll weight, number of open bolls, lint percentage and seed index. El-Gahel *et al*. (1995) also showed that number of fruiting branches, number of open bolls, boll weight and seed cotton yield were increased as N rate increased in contrast to earliness. On the other hand, plant height, number of monopodia, number and length of main stem internodes, location of the first sympodium and seed index were unaffected by N. levels.

Potassium is a unique plant nutrient for cotton because of its continuos need through all growth stages and its relatively high uptake rate. Yet the cotton plant is a relatively inefficient as a K absorber. This might be owing to the dependence of photosynthate translocation within the plant on cell potassium concentrations. However, recently positive response of cotton plants to K fertilizer has been documented (Darwish, 1991 and Abd El-Aal *et al*., 1995). Potassium fertilization significantly increased seed cotton yield, seed index and boll weight (Hamisa and El-Mowelhi 1991).

From other point of view, Kamprathe and Welch (1968) reported that small amount of potassium is needed first 60 days of growth, while during next this period about 90 percent of potassium is taken up by the cotton plant. Makram and El-Shihawy (1995) found that potassium increased number of sympodia per plant, yield, yield components, lint percentage and seed index. On the other hand, soil application of potassium fertilizer after thinning seemed to be the proper timing to apply this element. Abou-Zeid *et al*. (1997) reported that potassium fertilizer when applied after thinning produced taller plants with higher number of fruiting branches, less number of vegetative branches, heavier bolls, higher seed cotton yield, per plant and per feddan and lint percentage.

There are obvious parallels and interaction between the effects of nitrogen and potassium fertilization on most internal physiological process especially photosynthetic rate. Makram *et al*. (1994) reported hat applying K fertilizer especially with high rates of nitrogen increased the growth-fruiting capacity, yield components, yield, lint percentage and seed index. Hamissa and El-Mowelhi (1991) found that the proper time for applying potassium was before sowing or before first irrigation. However, Etourneand (1995) showed that K-uptake was high after flowering to a maximum where its curve was similar to that of dry matter production.

The objectives of this study was to evaluate the response of cotton plants (Giza 88 cultivar) to potassium application times and different nitrogen fertilizer levels under late sowing.

MATERIALS AND METHODS

Two field experiments were carried out at Sakha Agricultural Research Station during 1999 and 2000 seasons using the Egyptian cotton cultivar Giza 88 (*G. barbadense* L.). Cotton seed were sown at the last week of April in both seasons on hills spaced 20 cm and rows of 60 cm width. The experimental design was split plot with four replication. Whereas the main plots were allocated for the three nitrogen levels (30, 45 and 60 kg N/fed.). While the sub-plots were assigned for the application times of potassium 1-Without K application (control) 2- Soil application, 24 kg K_2O/feddan before the first irrigation (21 days after sowing). 3- Soil application 24 kg K_2O/feddan before the second irrigation (36 days after sowing). 4- Soil application 24 kg K_2O/feddan the third irrigation (50 days after sowing). The sub-plot size was 18 m^2 including 6 rows (5 m long and 60 cm width). Nitrogen fertilizer in the form of ammonium nitrate (33.5% N) was added in bands and devided in two equal doses, the first one was applied after thinning just before the first irrigation and the second part before the second irrigation. All other cultural practices were done as recommended in cotton production that is involved as basic dose of 150 kg calcium superphosphate (15.5% P_2O_5) at land preparation. Potassium application was in the form of potassium sulphate 48% K_2O. The monthly air temperature (°C) and relative humidity % for Sakha weather station through the two growing season are given in Table 1. Soil samples were taken in the two seasons before planting cotton to estimate the soil characters using the standard methods as described by Chapaman and Parker (1981). The results are shown in Table 2.

Five representative hills were chosen by random from the four inner rows in order to study the following characters:

A. **Growth characters:** Final plant height (cm), number of main stem internodel length (cm)/plant, number of monopodia/plant and number of sympodia/plant.

B. **Earliness measurements:** Nodal position of the first sympodium, days to first flower, days to first open boll and earliness percentage:

$$\frac{\text{First pick}}{1^{st} + 2^{nd}\ \text{pick}} \times 100$$

C. **Dry weight:** A random sample of five plants were taken 130 days from sowing in the two seasons. All plants were carefully uprooted, washed hard then floated in a water bath for final separation from the muddy medium. All plant parts were dried in an air forced oven at 90°C to a constant weight. The following data were recorded: Dry weight of leaves/plant (g) dry weight of stem/plant (g), dry weight of root/plant (g) and dry weight of reproductive organs of plant (squares, flowers and bolls) (g).

D. **Yield components:** Number of open bolls, boll weight (g), lint % and seed index (g/100 seeds). Seed cotton yield (kentar/feddan) were estimated from picking all plants of the four inner rows of each plot. The data obtained were subjected to statistical analysis according to procedure outlined by Snedecor and Cochran (1981) by using L.S.D. at 5% level.

Data presented above were daily taken and calculated as an average per moth (cited after Sakha Weather Station).

Table (1): Monthly air temperature (°C) and relative humidity (%) during 1999 and 2000 seasons.

Months	1999 season				2000 season			
	Air temp. ºC		R.H %		Air temp. ºC		R.H %	
	Max.	Min.	7.30	13.30	Max.	Min.	7.30	13.30
April	25.5	9.3	73.0	46.0	26.32	10.20	72.00	45.0
May	28.5	15.0	68.0	40.0	29.22	14.65	69.00	40.0
June	31.0	18.0	73.0	42.0	32.10	19.10	72.00	41.0
July	30.5	20.0	80.0	5530	30.92	19.89	79.50	49.0
Aug.	31.0	22.4	80.0	54.0	30.85	21.55	80.20	53.0
Sept.	29.0	19.0	81.10	44.0	30.00	20.60	80.00	44.0
Oct.	28.5	18.0	80.5	44.0	29.95	19.40	82.00	45.0

Table (2): Mechanical and chemical analysis of experimental soil at 30 cm depth in 1999 and 2000 seasons.

Characters	1999	2000
Soil structure	Clay	Clay
pH	8.29	8.40
Organic matter %	1.65	1.70
Total S.S. %	0.62	0.64
Bicarbonate %	1.80	1.82
Chloride %	7.25	7.39
Sulfuric %	5.95	6.10
Ca %	1.96	2.00
Mg %	1.90	1.86
Na %	5.11	4.96
Available N (ppm)	11.85	10.52
Available P (ppm)	9.21	9.31
Available K (ppm)	200	280

RESULTS AND DISCUSSION

1. Effect of nitrogen levels:

A. growth characters:

The data presented in Table 3 cleared that final plant height, main stem internodal length and number of sympodia/plant were significantly increased in favour of nitrogen increase up to 60 kg/feddan, while number of main stem internodes and number of monopodia/plant were not affected by nitrogen fertilizer levels. The observed results obtained may be due to the late sowing (last week of April) in which cotton pants were subjected to higher temperature led to encourage plants to form excessive vegetative growth with few fruiting forms through short plant life (Ali and El Sayed, 2001). However, the above increment in some growth characters may be due to the importance of nitrogen for many basic physiological processes in cotton plants such as photosynthetic rate and accumulation of carbohydrates. Similar results were obtained by Makram (1977) for plant height, El-Gahel (1987) and El-Gahel *et al*. (1989) for number of main stem internodes and number of monopodia/plant and El-Kadi (1986); El-Bana *et al*. (1988) for number of fruiting branches.

B. Earliness:

Combined data presented in Table (4) show the effect of nitrogen fertilizer levels on some earliness measurements, where it was varied significantly among nitrogen levels studied indicating pronounced delay in maturation due to increase in nitrogen fertilizer levels up to 60 kg/fed. based on higher node location of the first sympodium, longer periods from planting date to both first open flower and boll as well as decreasing earliness percentage. These results possibly may be due to that higher nitrogen level causes excessive vegetative growth consequently resulted in higher node location of first sympodium as well as delay the first flower appearance and first open boll and decreases earliness percentage (Bulch *et al*., 1982). The obtained results are in agreement with those conducted by Eweida *et al*. (1983) and Abd El-Aal (1997) (nodal position of first sympodium), Kater *et al*. (1991), Boquet *et al*. (1993), El-Debaby *et al*. (1995) and Abd El-Malik and Abd El-Aal (1998) (days to first flower and boll and earliness percentage).

C. Dry matter weight (g):

Means of dry weight are given in Table 5 indicating that increasing nitrogen fertilizer levels significantly increased both vegetative and fruiting organs i.e. leaves, stems as well as root system and reproductive organs (squares, flowers and bolls) in both seasons. The presentation of the previous trend ensures the observation confirmed by numerous scientists that nitrogen is the most important nutrient element for monitoring many basic physiological processes in cotton plant such as: 1) photosynthetic rate and accumulation of carbohydrates, 2) leaf expansion (leaf area index) resulting from change in hydraulic conductivity of leaf tissues (Mauney and Stewart, 1986). Similar findings were reported by Ghorab (1986) and El-Shahawy *et al*. (1999).

D. Seed cotton yield and its components:

The data presented in Table 6 cleared that number of open bolls, boll weight, lint %, seed index, seed cotton yield per plant and feddan were insignificantly affected by nitrogen level at late sowing. These results could be ascribed on the bases that excessive vegetative growth due to high temperature in late sowing in addition to high level of N may be led to more abscission of small fruiting organs of cotton plants . El-Hamawy (1978) and El-Gahel *et al*. (1989) came to similar conclusion.

2. Effect of potassium application times:

A. Growth characters:

The data given in Table 3 cleared that final plant height, number of main stem internodes and main stem internodal length were insignificantly affected by potassium treatments in both seasons as well as in combined data. On the other hand, it is apparent that potassium application treatments had a significant effect on number of monopodia and sympodia per plant.

Comparing with the unfertilized plants, adding potassium produced the tallest plants with less number of monopodia and high number of sympodia. Halevy (1976) demonstrated that maximum amount of the K is taken up by cotton plants between the period of 57 to 84 days after emergence (from early squaring to early blooming stage). Similar results were obtained by Makram *et al*. (1994), Makram and E-Shihawy (1995) and Abou-Zeid *et al*. (1997).

B. Earliness:

Data presented in Table 4 showed that nodal position of the first sympodium, days to first flowers and earliness percentage were insignificantly affected by potassium treatments, in both seasons. On the other hand, days to the first open boll were significantly affected by potassium application on time. The results in the same table indicate that the early K application (before the first and second irrigation) relatively prolonged the vegetative growth period and consequently delayed flowering of plants and cracking of bolls. Halevy (1976) demonstrated that maximum amount of the K is taken up by cotton plants between the period of 57 to 84 days after emergence (from early squaring to early blooming stage). These results may suggest that there is a considerable time after planting in which K fertilizer can be added and still be in time to supply the needs of cotton plants. Similar results were obtained by El-Sayed (1996).

C. Dry matter weight:

Data presented in Table 5 show that potassium application had a significant effect on the dry matter of different plant organs in the two seasons, whereas, early fertilized plants with potassium (before the first and second irrigation increased the dry matter of plant organs. Dry weight production as well as K absorption was affected in all plant parts. The dry matter accumulation is a good result to the favourable effect of this element on the photosynthesis activity of leaves, promotion of CO_2 assimilation and the translocation of carbohydrates from the leaves to the reproductive organs (Hartt, 1969). It is worth to be mentioned here that Halevy (1976) reported that the maximum K^+ uptake rate in cotton plants occurred at 57 to 84 days after emergence (early squaring to early blooming stage). Thus, the period of peak K^+ uptake preceded the peak rate of dry matter production. Basset *et al*. (1970) came to same conclusion. This may explain why K application before the second was found to be the proper time to provide the plant with K for building up the maximum dry matter.

D. Yield and its components:

Data in Table 6 show that number of open bolls, boll weight, seed cotton yield per plant and per feddan were affected significantly by time of potassium application while lint percentage and seed index were not significantly affected by time of K fertilization in the two seasons. Data of seed cotton yield and its components showed that the early application before the second irrigation in the late sowing versus unfertilized treatment were high significant. Meanwhile, the effect of late K application before the third irrigation was somewhat higher than the unfertilized treatment. The increment in the two characters, i.e., seed cotton yield/plant and boll weight may be due to the role of potassium fertilizer in encouraging root hairs to grow early and increasing its elongation as well as early appearance of bolls of cotton plants.

Regarding the proper time for potassium application, it had been found that before the second irrigation seemed to be the best timing (Table 6). This might be due to the fact that most amount of potassium which needed by cotton plant is laying after flowering, while at early stages of growth, the seedling requirements is very low (Etourneand, 1995). These reported by Hamissa and El-Mowelhi (1991) and Makram and El-Shahawy (1995). Eatone and Ergle (1957) proved that total amount of K needed by cotton plants early in its growth is small. This might explain why K-soil application before first irrigation was the least effective of all treatments.

Lint percentage and seed index were not significantly affected by potassium treatments in the two seasons. Similar **re**sults were obtained by Makram *et al*. (1994), and Makram and El-Shahawy (1995).

The interaction between nitrogen levels and potassium application time had no significant effect on all traits under study in both seasons.

Generally, it could be concluded that the late sowing date of Giza 88 cotton variety did not exhibit any response to nitrogen fertilizer levels increase but there was a response towards potassium application before the second irrigation under this study for obtain higher productivity.

REFERENCES

Abd El-Aal, H.A.; E.A. Makram and A.A. Darwish (1995). Effect of soil and foliar application potassium fertilizer timing on growth and yield of cotton (cultivar Giza 75). J. Agric. Sci., Mansoura Univ., 20(5): 1997-2004.

Abd El-Aal, S.A.I. (1997). Effect of ridging rates in combination with hill spacings and nitrogen levels on growth, earliness, yield components of Giza 86 cotton cultivar. J Agric. Res., Tanta Univ., 23(1): 9-17.

Abdel-Malik, R.R. and S.A.I. Abdel-Aal (1998). Effect of thinning dates and nitrogen levels under late sowing on Giza 89 cotton cultivars. J. Agric. Mansoura Univ., 233(1): 27-34.

Abdel-Naby, H.M. (1986). Effect of some growth regulators and sowing date on some morphological characters, yield components and fiber properties of Egyptian cotton and upland cotton cultivars. Ph.D. Dissertation, Fac. Agric. Cairo Univ., Egypt.

Abou Zeid, H.M.; S.A.I. Abdel-All and R.R. Abd El-Malik (1997). Effect of potassium sulphate application methods and timing on growth and productivity of the cotton cultivar Giza 77. Agric. Res. Rev., 75(2): 495-503.

Ali, S.A. and A.E. El-Sayed (2001). Effect of sowing dates and nitrogen levels on growth, earliness and yield of Egyptian cotton cultivar Giza 88. Agric. Res. Rev., 79(1): 221-232.

Basset, D.M.; W.D. Anderson and C.H.E. Werkhoven (1970). Dry matter production and nutrient uptake in irrigated cotton (*G. hirsutum*). Agron. J., 62: 299-303.

Boquet, D.J.; E.B. Moser and G.A. Breitenbeck (1993). Nitrogen effects on boll production of field grown cotton. Agron. J., 85: 34-39.

Bulch, A.J.; H. Colakoglu and I. Karanmic (1982). Relationship between yield and yield components influenced by different levels of nitrogen fertilizers in cotton Ege Universities Ziraat Fakultsi Degrgisi, 19(3): 147-154 (C.F. Field Crop Abst. 38, 6378, 1984).

Chapman, H.D. and F.P. Parker (1981). Methods of analysis of soil, plants and water. Univ. California, August, 1981, second printing.

Darwish, A.A. (1991). Effect of plant density , potassium fertilizer and micronutrient on the cotton yield and quality. Ph.D. Thesis, Fac. Agric., Al-Azhar Univ., Egypt.

Eatone, F.M. and D.R. Ergle (1957). Mineral nutrition of the cotton plant. Plant Physiology, 32: 169-175.

El-Bana, M.H.; S.M. El-Gahel and A.M. El-Shinnawy (1988). Effect of nitrogen levels and topping dates on yield of late sown Giza 81 cotton. Proc. 3rd Egyptian Conf. Agron., Kafr El-Sheikh, 5-7 Sept., 11: 65-72.

El-Debaby, A.S.; G.Y. Hammam and M.A Nagib (1995). Effect of planting date, N and P application level on the yield of Giza 80 cotton cultivar. Annals of Agric. Sci. Moshtohor, 33(2): 465-481.

El-Gahel, S.M.F. (1987). Studies on overlapping between onion and cotton. Ph.D. Thesis, Fac. Agric., Tanta Univ. Egypt.

El-Gahel, S.M.F.; M.I. El-Shahawy and H.M. Abou-Zeid (1995). Response of new hybrid cotton (Giza 77 x Giza 45 "A") to different stands under different nitrogen levels. J. Agric. Res. Tanta Univ., 21(1): 91-100.

El-Gahel, S.M.F.; M.M. El-Razaz and A.M. El-Shinnay (1989). Effect of dates and levels of N application at late sowing of cotton. Menoufia, J. Agric. Res., 14 (2): 875-884.

El-Hamawy, H. (1978). Climatic relationships of cotton plant. Agric. News. Paper, Feb., 1978, 38: 10-14 (in Arabic).

El-Kadi, M.B.M. (1986). Effect of macro-and micronutrients on yield, yield components and quality of cotton plants. Ph.D. Thesis, Fac. Agric. Ain Shams Univ., Egypt.

El-Sayed, E.A. (1996). Studies on cotton requirements of some nutrients. Ph.D. Thesis, Fac. Agric. Minufiya Univ., Egypt.

El-Shahawy, M.I.M. (1999). Effect of sowing date and pix (Mepquate chloride) treatment on growth, earliness and yield of Giza 87 cotton cultivar (*Gossypium barbadense* L.). J. Agric. Res., 77(2): 829-840.

El-Shinnawy, A.; F.M. Ghaly and A.A. Hosny (1984). Effect of hill spacing and nitrogen levels on Giza 80 cotton variety. Agric. Rev. Cairo, 62(6): 101-111.

Etourneand, F. (1995). Potassium nutrition to cotton yield and quality. Workshop meeting plant nutrition fertilizers use and growth regulators in cotton FAO, March 20-23, Egypt, pp. 15-16.

Eweida, M.H.T.; A.I. El-Agamy; A.M. Hassanein and F.M. Ghaly (1983). The effect of distance between hills and herbicides on yield of Egyptian cotton and associated weeds. Proc. 1st Conf. Agron., Egypt Soc. Crop Sci., 2: 289-298.

Ghorab, M.H.M. (1986). Effect of nitrogen fertilization and micro-elements on yield, yield components and quality of Egyptian cotton. Ph.D. Thesis, Fac. Agric., Ain Shams Univ., Egypt.

Halevy, J. (1976). Growth rate and nutrient uptake of the cotton plant. Plant Physiology, 32: 169-175.

Hamissa, M.R. and N.M. El-Mowelhi (1991). Cotton fertilization. Soil & Water Res. Instit., Agric. Res. Centre, Ministry Agric., Cairo, Egypt. p. 62.

Hartt, C.E. (1969). Effect of potassium deficiency upon translocation of G14 in attached blades and entire plants of sugar cane. Plant Physiol., 44: 1461-1469.

Kamprath, E.J. and C.D. Welch (1968). Potassium nutrition. In Elliot. F.C., M. Hoover and W.K. Porter: Advances in production and utilization of quality cotton: Principles and Practices. Iowa State Univ. Press, U.S.A. pp. 256-275.

Kater, H.; K. Cassman and W. Ebelhar (1991). Cotton nutrition-N, P and K-Physiology today, News letter of the cotton physiology Education program-National Cotton Council of America, 2(3): 2014.

Makram, E.A. and M.I. El-Shahawy (1995). The effect of potassium fertilization on growth and yield of cotton (Giza 76) grown in saline soils. Annals Agric. Sci. Ain Shams Univ., Cairo 40(2): 621-628.

Makram, E.A.; M.I. El-Shahawy; S.F. El-Gahel and R.R. Abd El-Malik (1994). Effect of hill spacing, soil fertilization and its interaction on growth, yield and earliness in Egyptian cotton cultivar. Giza 70. J. Agric. Sci. Mansoura Univ., 19(1): 1-13.

Makram, E.A.O. (1977). Effect of plant density under different nitrogen rates on growth, yield and some fiber properties in cotton. Ph.D. Thesis, Fac. Agric. Al-Azhar Univ. Egypt.

Mauney, J.R. and J.M.D. Stewart (1986). Cotton physiology. No. 1st Cott. Found-Reference Book Series. Memphis, Tennessess, U.S.A.

Mohamed, H.M.H.; A.A. Hosny and W. Kadry (1984). Effect of irrigation intervals and nitrogen levels on yield and yield components of Giza 75 cotton variety. Agric. Res. Egypt, 62(6): 113-121.

Ragab, M.Z.M. (1985). Response of Egyptian cotton to some management practices under different level of irrigation. Ph.D. Thesis, Fac. Agric Zagazig Univ., Egypt.

Saeed, M.S.S. (1989). Effect of some chemical compounds on growth and yield in Egyptian cotton. Ph.D. Dissertation, Fac. Agric., Al-Azhar Univ., Egypt.

Saker, I.A.E. (1983). Physiological response of some Egyptian cotton varieties to plant population. Ph.D. Dissertation Fac. Agric., Ain-Shams Univ., Egypt.

Sawan, Z.M. (1986). Effect of nitrogen, phosphorus fertilization and growth regulators on cotton yield and fiber properties. J. of Agron. and Crop Sci. 156(4): 237-254. (C.F. Field Crop Abst. 4(2): 1071).

Snedecor, G.W. and W.G. Cochran (1981). Statistical Analysis Methods, 7th Ed. Iowa State Univ. Press, Iowa, U.S.A.

Wahdan, G.A. (1980). Studies on the growth of cotton plant in relation to date of planting and nitrogenous fertilizer level. M.Sc. Thesis, Fac. Agric., Minufia Univ., Egypt.

إستجابة صنف القطن جيزه 88 المنزرع متأخرا لمواعيد إضافة السماد البوتاسى تحت مستويات مختلفة من التسميد النيتروجينى

عزت عبدالسلام السيد ، محمد المنشاوى المنشاوى
معهد بحوث القطن ، مركز البحوث الزراعيه ، الجيزه ، مصر

أجريت تجربتان حقليتان بمحطة البحوث الزراعية بسخا خلال الموسمين 2000/1999 لدراسة إستجابة مواعيد إضافة السماد البوتاسى بمعدل 24كجم أكسيد بوتاسيوم للفدان [بدون إضافة - إضافة قبل الرية الاولى (21 يوم من الزراعة) - اضافة قبل الرية الثانية (36 يوم من الزراعة) - اضافة قبل الرية الثالثة (50 يوم من الزراعة)] وذلك تحت 3 مستويات مختلفة من التسميد الآزوتى (30 ، 45 ، 60 كجم للفدان على نمو ومحصول القطن المنزرع متأخرا فى الاسبوع الاخير من شهر ابريل. وتم تنفيذ التجارب فى تصميم القطع المنشقة.
وكانت أهم النتائج المتحصل عليها كما يلى:

1- أدت زيادة معدل التسميد الأزوتى حتى 60 كجم/ف عند الزراعة المأخرة إلى زيادة طول النبات النهائى وطول سلاميات الساق الرئيسية وعدد الأفرع الثمرية وإلى زيادة الوزن الجاف لأجزاء النبات المخلفة - أيضا أدت زيادة معدل التسميد الآزوتى إلى تأخير النضج نتيجة ارتفاع عقدة أول فرع ثمرى وعدد الأيام حتى تفتح أول زهرة وأول لوزة ونقص النسبة المئوية للتبكير - بينما لم يتأثر عدد سلاميات الساق الرئيسية أو محصول القطن الزهر.
2- لم تؤثر مواعيد إضافة السماد البوتاسى عند الزراعة المتأخرة على طول النبات النهائى وعدد وطول سلاميات الساق الرئيسية وعقدة أول فرع ثمرى وعدد الأيام حتى تفتح أول زهرة ونسبة التبكير والنسبة المئوية للشعر ومعامل البذرة بينما أعطت معاملة الإضافة بعد خف النباتات أكبر عدد من الأفرع الثمرية والخضرية وأكبر وزنا للمادة الجافة لأجزاء النبات المختلفة وكذلك على عدد كبير من اللوز المتفتح الأكبر وزنا بالإضافة إلى اكبر محصول زهر للنبات أو الفدان وذلك عند المقارنة بالنباتات التى لم يضاف إليها سماد بوتاسى.
3- لم يكن للتفاعل بين معدلات إضافة النيتروجين أو مواعيد إضافة السماد البوتاسى تأثير معنوى على الصفات تحت الدراسة.

ويتم التوصيه تحت ظروف هذه الدراسة بأن الزراعة المتأخرة لا تستجيب لمعدل التسميد الآزوتى المرتفع وهناك استجابة لاضافة البوتاسيوم قبل الريه الثانية. لتحسين إنتاجية القطن.

Table 3: Means of some growth characters as affected by times of K application, nitrogen fertilizer levels and their interaction of both and combined data of 1999 and 2000 seasons.

Treatments	Nitrogen levels (kg/fed.) (N)						Application time of potassium (P)						N X P
growth characters	Season	Sig.	L.S.D.	30	45	60	Sig.	L.S.D.	Without K	Before first irrig.	Before second irrig.	Before third irrig.	
Final plant height (cm)	1999	*	4.32	110.25	123.34	128.48	NS	-	110.22	128.35	125.95	118.24	NS
	2000	*	3.81	107.35	122.11	127.87	NS	-	108.21	127.33	125.42	115.48	NS
Comb		*	4.10	108.80	122.73	128.18	NS	-	109.21	127.84	125.68	116.86	NS
Number of main stem internodes	1999	NS	-	18.62	19.25	20.04	NS	-	18.74	19.21	20.61	18.56	NS
	2000	NS	-	19.66	20.56	21.15	NS	-	19.89	21.15	21.36	19.57	NS
Comb.		NS	-	19.14	19.90	20.59	NS	-	19.31	20.18	20.98	19.07	NS
Main stem internodal length (cm)	1999	*	0.02	5.92	6.41	5.94	NS	-	5.88	6.68	6.11	6.37	NS
	2000	*	0.06	5.46	5.94	6.02	NS	-	5.44	6.02	5.87	5.90	NS
Comb.		*	0.07	5.69	6.17	6.23	NS	-	5.66	6.35	5.99	6.13	NS
Number of monopodia/plant	1999	NS	-	1.59	1.85	2.00	*	0.11	2.10	1.80	1.50	1.84	NS
	2000	NS	-	1.20	1.75	1.95	*	0.21	1.95	1.80	1.35	1.43	NS
Comb.		NS	-	1.40	1.80	1.98	*	0.30	2.03	1.80	1.43	1.63	NS
Number of sympodia/plant	1999	*	1.10	12.11	12.57	13.29	*	*	12.14	12.62	14.00	11.78	NS
	2000	*	0.95	13.24	13.96	14.42	*	*	13.33	14.54	14.79	12.98	NS
Comb.		*	1.10	12.67	13.26	13.85	*	1.3	12.73	13.58	14.39	12.38	NS

Table 4: Means of some earliness measurements as affected by times of K application, nitrogen fertilizer levels and their interaction of both and combined data of 1999 and 2000 seasons.

Treatments	Nitrogen levels (kg/fed.) (N)						Application time of potassium (P)						N X P
	Season	Sig.	L.S.D.	30	45	60	Sig.	L.S.D.	Without K	Before first irrig.	Before second irrig.	Before third irrig.	
Nodal/position of the first sympodium	1999	*	0.07	6.51	6.68	6.75	NS	-	6.60	6.59	6.61	6.78	NS
	2000	*	0.18	6.42	6.60	6.73	NS	-	6.56	6.61	6.57	6.59	NS
Comb		*	0.08	6.47	6.64	6.74	NS	-	6.58	6.60	6.59	6.69	NS
Days to first flower	1999	*	1.23	77.37	79.71	81.22	NS	-	77.50	79.60	81.12	79.51	NS
	2000	*	2.15	76.51	78.23	80.85	NS	-	76.61	78.10	81.31	78.10	NS
Comb.		*	2.10	76.94	78.97	81.03	NS	-	77.05	78.85	81.21	78.80	NS
Days to first open boll	1999	*	2.02	126.47	129.50	131.58	*	1.10	128.50	130.60	130.12	127.52	NS
	2000	*	2.15	125.61	127.25	130.60	*	0.92	127.71	128.70	128.12	126.75	NS
Comb.		*	2.00	126.04	128.38	131.09	*	1.32	128.11	129.65	129.12	127.13	NS
Earliness percentage	1999	*	2.81	70.65	66.52	62.82	NS	-	62.51	64.58	69.34	70.22	NS
	2000	*	1.96	68.74	65.35	61.72	NS	-	60.87	63.85	68.50	67.86	NS
Comb.		*	2.71	69.69	65.93	62.27	NS	-	61.69	64.22	68.92	69.04	

Table 5: Means of dry weight of vegetative and fruiting organs as affected by times of K application, nitrogen fertilizer levels and their interaction of both and combined data of 1999 and 2000 seasons.

Treatments	Seasons	Nitrogen levels (kg/fed.) (N)					Application of potassium (P)						N X P
		Sig.	L.S.D.	30	45	60	Sig.	L.S.D.	Without K	Before first irri.	Before second irrig.	Before third irri.	
Dry weight of leaves/plant (g)	1999	**	2.82	17.52	22.63	26.35	*	3.51	17.38	22.11	26.85	22.32	NS
	2000	**	3.72	18.35	24.11	27.35	*	2.82	18.22	23.31	26.12	24.95	NS
Comb.		**	3.82	17.94	23.37	26.85	*	2.91	17.80	22.71	26.49	23.64	
Dry weight of stem/plant (g)	1999	**	1.96	23.51	26.22	28.85	*	2.51	23.32	25.10	29.00	27.35	NS
	2000	**	3.12	24.27	26.11	29.00	*	1.95	24.35	26.51	28.86	26.11	NS
Comb.		**	2.75	23.89	26.17	28.93	*	2.61	23.84	25.81	28.93	26.73	
Dry weight of root/plant (g)	1999	**	1.37	6.85	8.80	9.82	*	1.73	6.75	8.95	9.92	8.34	NS
	2000	**	1.10	5.92	7.35	9.00	*	1.36	6.00	7.37	8.82	7.50	NS
Comb.		**	1.82	6.39	8.08	9.41	*	1.51	6.38	8.16	9.37	7.92	
Dry weight of reproductive organs of plant (squares) flowers and bolls (g)	1999	*	1.31	9.53	11.23	12.52	*	2.10	9.63	10.85	13.51	10.38	NS
	2000	*	2.10	8.86	10.51	11.89	*	2.51	9.10	11.11	12.31	9.16	
Comb.		*	2.20	9.10	10.87	12.21	*	2.41	9.37	10.98	12.91	8.27	

Table 6: Means of seed cotton yield (kentar/fed.) and yield components as affected by times of K application, nitrogen fertilizer levels and their interaction of both and combined data of 1999 and 2000 seasons.

Treatments growth characters	Nitrogen levels (kg/fed.) (N)						Application time of potassium (P)						N X P
	Season	Sig.	L.S.D.	30	45	60	Sig.	L.S.D.	Without K	Before first irrig.	Before second irrig.	Before third irrig.	
Number of open bolls	1999	NS	-	7.12	7.30	7.35	*	0.12	7.00	7.36	7.50	7.20	NS
	2000	NS	-	8.32	8.65	8.60	*	0.20	8.20	8.48	8.59	8.81	NS
Comb		NS	-	7.72	7.98	7.98	*	0.19	7.60	7.92	8.05	8.01	
Boll weight (g)	1999	NS	-	1.85	1.86	1.82	*	0.03	1.64	1.85	1.97	1.91	NS
	2000	NS	-	1.90	1.91	1.88	*	0.07	1.80	1.86	1.92	1.98	NS
Comb.		NS	-	1.88	1.89	1.85			1.72	1.86	1.95	1.95	
Lint %	1999	NS	-	38.10	38.43	38.85	NS	-	36.72	38.81	39.32	39.00	NS
	2000	NS	-	38.21	38.41	38.90	NS	-	37.40	38.95	39.10	38.87	NS
Comb.		NS	-	38.15	38.42	38.88			37.06	38.83	39.21	38.94	
Seed index (g)	1999	NS	-	9.39	9.38	9.44	NS	-	9.20	9.46	9.81	9.15	NS
	2000	NS	-	9.42	9.43	9.40	NS	-	9.30	9.45	9.40	9.51	NS
Comb.		NS	-	9.41	9.41	9.42			9.25	9.45	9.61	9.33	
Seed cotton yield/plant	1999	NS	-	12.81	13.22	13.67	*	1.51	10.70	12.89	14.95	14.39	NS
	2000	NS	-	14.29	15.29	16.75	*	1.30	14.00	15.10	16.52	16.26	NS
Comb.		NS	-	13.55	14.25	15.21	*	1.10	12.35	13.99	15.73	15.32	
Seed cotton fed (kentar)	1999	NS	-	4.36	4.75	5.01	*	0.22	4.0	4.68	4.95	5.07	NS
	2000	NS	-	4.21	4.91	5.42	*	0.13	4.11	4.93	5.26	5.06	NS
Comb.		NS	-	4.29	4.83	5.22	*	0.30	4.05	4.87	5.11	5.06	