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SOME TRIALS FOR INCREASING COTTON YIELD BY APPLICATION OF SOME MICRONEUTRIENTS

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ABSTRACT

Two experiments were carried out at Sakha Agric. Res. Station during 2005 and 2006 seasons to study the effect of foliar spraying cotton plants (Giza 86) with zinc, manganese, iron at concentration of 2000 ppm and boron at concentration of 1000 ppm besdies two of soil nitrogen fertilizer rates i.e. (45 and 65 kg N/fed) on yield, yield components, seed oil and protein percentage and chlorophyll content. Cotton plants were sprayed three times, at the beginning of flowering stage and the following two sprays were done every 15 days. Complete Randomized blocks design with four replications was used. The results could be summarized as follows:

1. Increasing soil nitrogen fertilizer up to 65 kg N/fed and spraying cotton plants with zinc, manganese (2000 ppm), boron (1000 ppm) and iron (2000 ppm) increased significantly final plant height (cm), number of flowers, number of open bolls, boll weight, seed cotton yield per plant and feddan, seed index, seed oil and protein percentages in seed and total chlorophyll content in leaf while it decreased shedding and earliness percentage but lint percent did not affected by spraying micro-elements and nitrogen fertilizer levels.
2. Increasing soil nitrogen fertilizer levels from 45 up to 65 kg N/fed significantly decreased earliness while, spraying Zn, Mn, Fe and B at concentration of 2000 ppm and 1000 ppm, respectively promoted earliness to some extent.
3. Foliar spraying of micronutrients and soil of nitrogen fertilization were more effective than nitrogen fertilizer alone and possibly better than each microelements alone.

The objective of this research was to study the possibility of increasing yield of cotton by spraying cotton plants with Zn, Mn, Fe (2000 ppm) and B (1000 ppm) under two levels of soil nitrogen fertilization and their effect on growth, yield and yield components seed, oil and protein percentages and chlorophyll content.

INTRODUCTION

Every plant needs micronutrients such as iron, zinc, boron and manganese beside to their requirements of main nutrients i.e. N, P and K. These form the basic components of key enzymes and their physiological activity depends partly upon their ability to switch valence.

Although spraying fertilizers are sometimes useful in correcting N and micronutrients deficiencies in cotton (Halevy and Markovitz, 1988), little is known about the effects of combining nitrogen and micronutrients, especially on new cotton cultivars. Since many recently released higher yielding cotton cultivars exhibit a relatively short reproductive period, they may potentially benefit from both conventional preplant fertility and foliar fertilization even when soil N and micronutrients appear adequate. The quantity of nitrogen required to produce high yielding cotton often varies with factors such as soil type and climate. Nitrogen is considered the conventional nutritional elements for monitoring cotton growth and development (Abd El-Malik and Abd El-Aal, 1998). Ali and El-Sayed (2001) found that increasing nitrogen fertilizer levels up to 80 kg N/fed, had significantly increased plant height, number of

internodes on the main stem, number of monopodia and sympodia per plant, weight and number of open bolls/plant, seed index and seed cotton yield per plant and feddan. They added that higher N levels delayed the appearance of first flower, cracking the first boll, produced the 1st sympodium on higher node and decreased earliness percentage.

It is well known, that nutritional state of cotton control its productivity. Supply the plants with micronutrients at critical stages in easy forms either as soil application or foliar spray is a subject of investigation. The micronutrients of boron, manganese, ferrous and zinc are commonly to several crops and play an activation role in the physiological and metabolic processes in cotton plants during different stages of growth (Abou-Khadra and Zahran, 1978). Foliar application of micronutrients: (Fe, Mn or Zn) to cotton plants increased the number of open bolls/plant (Hosny *et al.,* 1984). Monged *et al.* (1980) reported that seed cotton yield could be increased to 40% by foliar sprays of chelated iron and earliness of yield was slightly retarded by iron and manganese. Abd El-All *et al.* (1989) found that all micronutrients application significantly increased the number of harvested and total bolls/plant. They added that Fe, Zn and Mn increased seed index but it had no significant effect on lint percentage. Ghorab (1986) mentioned that seed cotton yield/fed and lint % were significantly increased by spraying with boron and/or zinc. Also, seed cotton yield/plant, seed and lint index and number of open bolls per plant were significantly increased due to such treatments. Application of trace elements on cotton plants increased seed oil and protein contents (Girgis, 1987). Also, spraying trace elements on cotton plants increased chlorophyll content in leaves (Abd El-Aal, 1989 and El-Kadi, 1986) who proved that the interaction between applying 60 kg nitrogen/fed and two doses by Mn gave the highest open bolls. There is a need for research on nitrogen rates and their possible interaction with micronutrients on cotton. Miley (1969) reported a significant N x B interaction on seed cotton yield when N and B were soil applied.

The objective of this research is to investigate the possibility of increasing yield of cotton cv. Giza 86, seed oil and protein percentage and leaf chlorophyll content throughout the application of some micronutrients (boron, manganese, zinc and iron) under two rates of nitrogen fertilizer.

MATERIALS AND METHODS

Two field experiments were conducted at Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, during 2005 and 2006 seasons using Egyptian cotton cultivar Giza 86. Each experiment was laid out in randomized complete block design with four replications. The plot size was 5 m long and 3.6 m width, including six rows of 60 cm a part with hill spacing of 25 cm with two plants per hill at thinning time (40 days after sowing). Sowing date was 28 and 29th March in 2005 and 2006 seasons, respectively. Nitrogen fertilizer in the form of ammonium sulphate (20% N) 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 part before the third irrigation. Other practices were done as recommended in cotton production that is involved a basic dose of 150 kg calcium superphosphate (15.5% P_2O_5)

during land preparation besides 50 kg potassium sulphate (48% K_2O) per feddan before the fourth irrigation for all plots. Soil samples were taken in the two seasons before planting cotton to estimate the soil characters using the standard methods as described by Chapman and Pereker (1981). The results are shown in Table (1). Each experiments included ten treatments, which were:

1. Soil application of nitrogen (45 kg N/fed) + spraying with water.
2. Soil application of nitrogen (65 kg N/fed) + spraying with water.
3. Soil application of nitrogen (45 kg N/fed) + foliar spraying with zinc sulphate ($ZnSO_4$) (2000 ppm).
4. Soil application of nitrogen (45 kg N/fed) + foliar spraying with manganese sulphate ($MnSO_4$) (2000 ppm).
5. Soil application of nitrogen (45 kg N/fed) + foliar spraying with boron (borax) (1000 ppm).
6. Soil application of nitrogen (45 kg N/fed) + foliar spraying with ferrous ($FeSO_4$) (2000 ppm).
7. Soil application of nitrogen (65 kg N/fed) + foliar spraying with zinc sulphate ($ZnSO_4$) (2000 ppm).
8. Soil application of nitrogen (65 kg N/fed + foliar spraying with manganese sulphate ($MnSO_4$) (2000 ppm).
9. Soil application of nitrogen (65 kg N/fed + foliar spraying with boron (borax) (1000 ppm).
10. Soil application of nitrogen (65 kg N/fed + foliar spraying with ferrous ($FeSO_4$) (2000 ppm).

Table 1: Chemical and physical analyses of the upper 50 cm of soil in 2005 and 2006 season.

Characters	Seasons	
	2005	**2006**
Soil texture	Clay	Clay
pH	8.2	8.1
EC mmoh/cm/25^oC	1.82	1.75
Clay %	50.10	51.35
Silt %	24.80	23.40
Sand %	23.20	23.30
Organic matter %	1.67	2.10
Calcium carbonate	2.85	3.30
Available Zn ppm	0.61	0.75
Available Fe ppm	31.90	38.60
Available Mn ppm	24.2	20.80
Available B	22.1	22.8
Available N ppm	12.4	12.60
Available P ppm	7.6	9.85
Available K ppm	162	182

The three minor elements, zinc, manganese and iron were applied in the form of zinc sulphate, manganese sulphate and ferrous sulphate. Each elements was sprayed at the concentration of 2000 ppm (2 gm/litter) and the foliar solution was 300 liter/feddan while boron was applied one gram borax per liter at the concentration of 1000 ppm. Foliar application was carried out 3

times during the growing seasons. The first was at the beginning of flowering and the following two sprays were every 15 days later.

A random sample of five representative guarded hills (ten plants) was taken from the four inner rows of each plot in order to study the following characters:

A. Growth attributes: final plant height (cm), numbers of flowers during the flowering period and shedding % =

$$\frac{\text{Total No. of flowers - Total No. of green bolls}}{\text{Total No. of flower}} \times 100$$

B. Earliness of yield % = $\frac{\text{Yield of the first picking}}{\text{Total yield}} \times 100$

C. Yield and yield components: number of open bolls per plant, boll weight (g), seed cotton yield per plant (gm) and seed cotton yield in kentars per feddan.

D. Oil and protein percentages were determined in the seed by the method described by A.O.A.C. (1975), leaf chlorophyll content was determined according to Arnon (1949) at plant age of 150 days.

The data obtained were subjected to statistical analysis according to procedure outlined by Snedecor and Cochran (1967) by using LSD at 5% level.

RESULTS AND DISCUSSION

A. Effect on plant growth characters:

The results in Table 2 cleared that increasing the nitrogen fertilizer from 45 to 65 kg N/fed increased gradually and significantly plant height and number of flowers while shedding percentage was decreased. These results may be due to the lack of nitrogen in the experimental soil in the two seasons in addition to the photosynthetic rate and accumulation of carbohydrates. Similar results were obtained by Makram 1977. With regard to micronutrients, the results in both seasons indicated clearly that foliar spraying with Zn, Fe, Mn and B significantly increased plant height and number of flowers, while decreased shedding percentage as shown in Table 2. In addition, Mn was more effective than Zn, Fe and B in stimulating plant growth and number of flowers. The increases in plant height and number of flowers and decreases of shedding percentages due to zinc effects in the synthesis of indole acetic acid, and important growth hormones in plant (Meyer, 1961). As for iron it is a indispensable element for the synthesis of chlorophyll on green plants and as a part of the porphyrin compounds, cytochrome enzyme system (Ferry and Ward, 1969). Concerning manganese, it acts as an activator of many enzymes and it is essential for formation of chlorophyll (Pandy and Sinha, 1978). The marked effect of B on growth may be due to the influence of B on auxin metabolism (Coke and Whittington, 1968).

It is clear from the previous results that the foliar spraying of micronutrients with soil application of nitrogen were more effective than nitrogen alone and possibly better than each microelement alone. Similar results was found by Miley *et al.* (1969).

Table 2: Plant height, number of flowers per plant and shedding percentage in 2005 and 2006 seasons as affected by different treatments.

Growth	Plant height (cm)		No. of flowers		Shedding %	
Characters	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**
N (45 g/fed)	95.5	97.0	16.2	17.1	21.5	19.7
N (65 kg/fed)	99.6	104.3	19.7	20.0	19.7	18.2
N (45 kg/fed) + Z	98.9	100.2	17.3	18.1	18.1	17.3
N (45 kg/fed) + Mn	96.4	99.2	17.2	18.3	18.3	17.0
N (45 kg/fed) + B	96.2	99.0	17.2	19.2	18.2	16.9
N (45 kg/fed) + Fe	96.4	98.9	17.5	18.1	18.1	17.9
N (65 kg/fed) + Z	107.8	107.8	19.9	21.0	17.3	17.0
N (65 kg/fed) + Mn	110.3	106.3	20.8	22.2	17.2	16.5
N (65 kg/fed) +B	106.2	105.2	20.1	21.0	17.3	16.3
N (65 kg/fed) + Fe	106.2	106.4	20.0	21.9	17.3	17.3
F-test	*	*	*	*	*	*
L.S.D.	2.5	3.5	1.8	2.1	2.2	1.8

b. Effect on earliness, yield and yield components:

Results presented in Table 3 cleared that the earliness percentage was significantly affected by N fertilizer rates. In general, increasing nitrogen from 45 to 65 kg N/fed decreased earliness percentage in the two seasons. These results could be explained on the fact that excess application of N-fertilizer causes excessive vegetative growth consequently resulting into higher node location of first sympodium as well as delay boll set and maturation (Bulch *et al.,* 1982). The obtained results are in agreement with those conduced by Abd El-Aal (1997). As for earliness (Table 3) Z, Mn, B and iron hastened significantly earliness percent in both seasons. The increase in earliness percentage with the application effect of these minor elements upon percentage of open bolls which resulted in increased seed cotton yield of the first picking, showing thereby a major role in boll ripening (El-Hamawi, 1977). These results are in agreement with those of Girgis (1982) and Ziadah (1991). It is evident that nitrogen fertilization and spraying micronutrients i.e., Zn, Mn, B and iron had significant effects on seed cotton yield and its components, whereas increasing N-level up to 65 kg N/fed significantly increased number of open bolls, boll weight and seed cotton yield per plant and feddan in both seasons. The increase in boll weight, number of open bolls per plant, seed cotton yield per plant and feddan due to zinc may be to its action in accelerating protein synthesis and its relation with tryptophan synthesis and encouraging phosphorlization and green plastides enzymes (Tsui, 1948). Iron is essential for chlorophyll synthesis and for some enzymes and carriers in the respiratory mechanism of living cells (Epstein, 1972). concerning Mn it is known that it serves as an activator of many enzymes and it is an essential element in chlorophyll synthesis, thus affecting photosynthesis processes (Heath and Hind, 1969). Similar finding were obtained by El-Sayed (1996). Abdrabu *et al.* (1995) reported that the increases of seed cotton yield caused by foliar application by Zn may be due to the relationship between Zn and nitrogen metabolism and its translocation

through plants which affected seed filling and cotton seed yield. El-Kadi (1986) who proved that the interaction between applying 60 kg N/fed and two doses by Mn gave the highest open bolls.

Table 3: Earliness %, number of open bolls/plant, boll weight, seed cotton yield/plant and seed cotton yield pier feddan as affected by the different treatments.

Earliness and seed cotton yield	Earliness %		No. of open bolls		Boll weight (g)		Seed cotton yield/plant (g)		Seed cotton yield/feddan	
Treatment	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**
N (45 g/fed)	52.1	51.8	10.0	10.2	2.1	2.0	21.0	20.4	6.4	6.2
N (65 kg/fed)	50.3	51.0	11.8	11.7	2.7	2.6	31.8	30.4	9.7	9.3
N (45 kg/fed) + Z	53.0	52.0	10.3	10.6	2.6	2.2	26.8	23.3	8.2	7.1
N (45 kg/fed) + Mn	52.8	52.1	10.5	10.7	2.4	2.3	25.2	24.6	7.7	7.5
N (45 kg/fed) + B	52.4	52.0	10.4	10.6	2.6	2.2	27.1	23.3	8.2	7.1
N (45 kg/fed) + Fe	53.0	51.9	10.6	10.5	2.7	2.4	28.6	25.2	8.7	7.7
N (65 kg/fed) + Z	51.2	51.4	11.9	11.9	2.9	2.8	34.5	33.3	10.5	10.2
N (65 kg/fed) + Mn	51.0	51.6	11.9	11.9	2.9	2.7	33.3	32.1	10.2	9.8
N (65 kg/fed) +B	50.9	52.0	12.1	12.0	2.8	2.8	33.9	33.6	10.4	10.2
N (65 kg/fed) + Fe	50.7	51.8	12.2	12.1	2.9	2.8	35.4	33.9	10.8	10.3
F-test	*	*	*	*	*	*	*	*	*	*
L.S.D.	1.7	0.8	1.2	0.8	0.2	0.3	3.9	5.2	2.1	2.2

C. Effect on seed index and lint percentage:

The resaults in Table 4 proves that nitrogen fertilizer levels and trace elements showed non significant effect on seed index and lint percentage in both seasons. All these results are in harmony with those of Abd El-Aal *et al.* (1989) and Ziadah (1991).

Table 4: Seed index, lint percentage, seed oil percentage, protein percentage and chlorophyll content as affected by different treatments.

Treatment	Seed index		Lint percetnage		In seed				In leaf	
					Oil %		Protein %		Total chlorophyll content (mg/g dry wt).	
	2005	**2006**	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**
N (45 g/fed)	9.90	9.85	32.2	32.0	23.0	22.6	19.5	19.8	4.22	4.30
N (65 kg/fed)	10.20	10.10	32.4	32.1	23.5	22.9	20.5	20.4	5.51	5.60
N (45 kg/fed) + Z	9.80	9.80	32.1	32.5	23.2	22.8	20.3	20.1	5.60	5.70
N (45 kg/fed) + Mn	9.70	9.80	32.2	32.4	23.3	22.8	20.3	21.3	5.40	6.00
N (45 kg/fed) + B	9.8	9.75	32.0	32.2	23.3	22.9	20.5	20.7	4.90	5.95
N (45 kg/fed) + Fe	9.9	9.85	32.2	31.8	23.4	22.8	22.6	20.4	6.10	6.10
N (65 kg/fed) + Z	10.32	10.20	32.5	32.0	23.6	22.9	22.8	21.8	6.65	6.20
N (65 kg/fed) + Mn	10.41	10.10	33.0	32.4	23.6	23.4	21.9	22.0	6.78	6.70
N (65 kg/fed) +B	10.31	10.30	32.7	32.6	23.7	23.3	22.7	21.7	6.00	6.81
N (65 kg/fed) + Fe	10.35	10.10	32.6	32.5	23.6	23.2	22.8	22.0	6.20	6.95
F-test	*	*	NS	NS	*	*	*	*	*	*
L.S.D.	0.3	0.2	-	-	0.05	0.2	1.3	0.8	1.60	1.30

D. Seed oil and protein percentage and chlorophyll content:

It is clear from data in Table 4 that there was a significant effect on seed oil percentage due to nitrogen fertilizer and foliar application of Zn, Mn, B and iron on total chlorophyll content in leaf, oil and protein percentage in

seeds. Increasing nitrogen level/fed increased this content as a result for the high vegetative growth, accompanied by reducing in fruiting growth. These results are in agreement with results obtained by El-Sayed and El-Menshawi (2005). Results in the same table indicated that Zn, Mn, B and Fe significantly increased seed oil and protein percentage in both seasons. The increases in cotton seed oil and protein contents due to the application of these elements might be attributed to the promotion effect on seed weight, thus affecting the various constituents of the seeds including the foil and protein quantity (El-Hmawi, 1977). These results are in agreement with Girgis (1987). It is evident that plants received high rate of nitrogen fertilizers (65 kg N/fed) and sprayed with Zn, Mn and Fe at concentration of 2000 ppm and B at concentration of 1000 ppm produced the highest value of total chlorophyll in leaf, soil and protein percentages. These results are in agreement with results obtained by Hefni and El-Kholany (1981).

It is worthy to mention that there are several factors and relationships affecting the flowering, earliness, yield, plant growth, enzyme activity, chlorophyll content and hormonal balance in the plant, thus it could be concluded that trace elements at a certain balance play an important role in this repeitand the extravagance in using one element more than the others can effect on or more than physiological function. It could be concluded from the present results that the foliar spraying of microelements (Z, Mn, B and Fe) and nitrogen fertilization at a rate of 65 kg N/fed were more effective than nitrogen alone and possibly better than each microelements alone to increase seed cotton yield, yield components and some chemical constituents (Chlorophyll content and seed oil and protein %).

REFERENCES

Abd El-Aal, M.H.; M.S. Ismail; A.S.M. Azab and F.M. Ahmed (1989). Response of three Egyptian cotton varieties to some micronutrients application. Agric., Res., Review, 65:1-10.

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

Abd El-Malik, R.R. and S.A. I. Abd El-All (1998). Effect of thinning dates and nitrogen levels under late sowing of Giza 89 cotton cultivar. J. Agric. Sci. Mansoura, 23(1): 27-34.

Abdrabou, R.Th.; M.A. Hamad and M.T. Abdel-Fattah (1995). Effect of ridge width, potash fertilization and zinc foliar application on yield and quantity of cotton cv. Mubarak. Annals of Agric. Sci. Moshtohor, 33(3): 933-946.

Abou Kadrah, S.H.Y. and M. Zahran (1978). Effect of foliar spray with microelements on yield and yield components of cotton. J. Agric. Res., Tanta Univ., 4(2): 52-59

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. J. Agric. Res., 79(1): 221-231.

A.O.A.C. (1975). Official Methods of Analysis of Official Agricultural Chemists. 12th ed. Washington, D.C. pp. 94-117.

Arnon, D.I. (1999). Copper enzymes in isolated chloroplast plant physiol., 24: 1-15.

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

Chapman, H.D. and F.P. Paker (1981). Methods of analysis of soil, plants and water 2nd Ed. Univ. California.

Coke, L. and W.J. Whittington (1968). The role of boronine plant growth IV-Interrelationships between boron and indol-3-yl-acetic acid in the metabolism of bean radicals. J. Expt. Bot., 19: 295-308.

El-Hamawi, H.A. (1977). Problems in plant nutrition with special references to trace element nutrition of cotton plants. Agric. Res. Rev., Cairo, 46(1): 122-128.

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

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

El-Sayed, E.A. and M. El-Menshawi (2005). Response of the promising hybrid cotton Giza 89 x 86 to hill spacing and nitrogen fertilizer level. J. Agric. Res. Tanta Univ., 31(3): 436-456.

Epstein, E. (1972). Mineral nutrition of plants principles and perspectives. Copyright by John Wiley & Sons. Inc. USSA.

Ferry, J.F. and H.S. Ward (1969). Fundamental of plant physiology. The McMillan Co-New York. pp. 70-72.

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

Girgis, E.A. (1982). Physiological response to some cultural practices in Egyptian cotton. Ph.D. Thesis Fac. of Agric., Mansoura Univ., Egypt.

Girgis, E.A. (1987). Effect of foliar spraying with some trace elements on cotton. Comm. in Sci. & Dev., Res., 20(4): 20-27.

Halevy, J. and T. Markovitz (1988). Foliar NPKS application in cotton from full flowering to boll filling. Fert. Res. 15: 247-252.

Heath, R.L. and G. Hind (1969). The functional site of manganese in photosynthetic oxygen evolution. Biochim. Biophys. Acta. 189: 222-233.

Hefni, E.H.M. and A.E. El-Kholani (1981). Effect of nitrogen fertilizer and some micronutrients on the yield, oil content and viability of cotton seed (*G. barbadense* L.)., Acta. Agronomica. Acad. Sci. Hungariae, 30: 67-72.

Hosny, A.A.; W. Kadry and H.M.H. Mohamed (1984). Effect of plant density, manganese and iron foliar application on yield and yield components of Giza 80 cotton variety, Agric, Res. Rev., Egypt, 62: 147-156.

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.

Meyer, B.S. and D.B. Anderson (1961). Plant Physiology. Sec. Ed. Seventh Printing Gh. 25 pp. 483-486.

Miley, W.N.; G.W. Hardy; M.B. Sturgis and J.E. Sedberry, Jr. (1969). Influence of boron, nitrogen and potassium on yield, nutrient uptake, and abnormalities of cotton. Agron. J., 61: 9-13.

Monged, N.O.; E.T. Eid and A. Mawardi (1980). some trials for increasing seed cotton yield by the application of micronutrients. Agric. Res. Rev., 5: 131-151.

Pandy, S.N. and B.R. Sinha (1978). Plant Physiology. 2nd Revised Edition. Ch. 6. pp. 116-118.

Snedecor, G.W. and W.G. Cochran (1981). Statistical analysis methods. Seventh Edition, Iowa State Univ. Ames. Iowa, U.S.A.

Tsui, C. (1948). The role of zinc in auxin synthesis. Amer, J. Bot, 35: 173-179.

بعض المحاولات لزيادة إنتاج محصول القطن بإضافة بعض العناصر الصغرى

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معهد بحوث القطن ـ مركز البحوث الزراعية ـ الجيزه ـ القاهرة

أقيمت تجربتين حقليتين بمحطة البحوث الزراعية بسخا بمحافظة كفرالشيخ خلال موسمى ٢٠٠٥، ٢٠٠٦م لدراسة تأثير رش نباتات القطن جيزه ٨٦ بمحاليل عناصر كل من الزنك والمنجنيز والحديد (بتركيز ٢٠٠٠ جزء فى المليون) والبورون (بتركيز ١٠٠٠ جزء فى المليون) وذلك تحت معدلين من التسميد الآزوتى (٤٥ ، ٦٥كجم نيتروجين للفدان) على محصول القطن ومكوناته ومحتوى البذور من الزيت والبروتين ومحتوى الكلورفيل فى الورقة. ولقد أجرى رش النباتات ثلاث مرات (عند بداية التزهير والثانية بعد التزهير بـ ١٥ يوم والثالثة بعد الرشة الثانية بـ ١٥ يوم). وصممت كل من التجربتين فى تصميم القطاعات الكاملة العشوائية ذات أربعة مكررات.

وكانت أهم النتائج المتحصل عليها كالآتى:

١- أوضحت النتائج ان زياة معدل السماد النتروجينى حتى ٦٥ كجم نتروجين للفدان مع رش النباتات بعناصر الزنك أو المنجنيز او الحديد بمعدل ٢٠٠٠ جزء فى المليون او البورون بمعدل ١٠٠٠ جزء فى المليون إلى زيادة معنوية فى طول النبات النهائى وعدد الأزهار وعدد اللوز المتفتح ووزن اللوزة ومحصول القطن للنبات والفدان ووزن ١٠٠ بذرة وكذلك نسبة الزيت والبروتين فى البذرة ومحتوى الورقة من الكلوروفيل بينما قلت نسبة التساقط والنسبة المئوية للتبكير ولم تتأثر النسبة المئوية للشعر فى كلا موسمى الزراعة.

٢- اشارت النتائج الى ان زيادة معدل التسميد النتروجينى حتى ٦٥كجم نيتروجين للفدان إلى خفض النسبة المئوية للتبكير بينما أدى رش النباتات بالعناصر الصغرى الزنك ـ المنجنيز ـ الحديد بمعدل ٢٠٠٠ جزء فى المليون او البورون بمعدل ١٠٠٠ جزء فى المليون إلى زيادة التبكير.

٣- كان لإضافة العناصر الصغرى (زنك ـ منجنيز ـ بورون ـ حديد) مع إضافة السماد النيتروجينى سواء ٤٥كجم نيتروجين للفدان أو ٦٥كجم نيتروجين للفدان الى زيادة المحصول ومكوناته ونسبة الزيت والبروتين ونسبة الكلوروفيل أكثر من إضافة كل من السماد النيتروجينى أو العناصر الصغرى كل على حده.

٤- يوصى برش نباتات القطن بالعناصر الصغرى وزيادة معدل التسميد النتروجينى حتى ٦٥ جكم نتروجين للفدان لزيادة انتاجيه محصول القطن جيزه ٨٦ تحت ظروف محافظة كفرالشيخ.