



Arab Univ.
J. Agric. Sci.,
Ain Shams Univ.,
Cairo, 15(1), 131-139, 2007

EFFECT OF NITROGEN FERTIGATION LEVELS AND CHELATED CALCIUM FOLIAR APPLICATION ON THE PRODUCTIVITY OF SWEET CORN

[12]

Abou El-Yazied, A.¹; M.E. Ragab¹; Rawia, E. Ibrahim² and S.M. Abou El-Wafa²

1- Horticulture Department, Faculty of Agriculture, Ain Shams University, Shoubra El-Kheima, Cairo, Egypt

2- Postharvest and Handling of Vegetable Department, Horticulture Research Institute, Agricultural Research Center, Giza, Egypt

Keywords: Sweet corn, *Zea mays*, L. var. *Saccharata*, Nitrogen, Chelated calcium, Fertigation, Vegetative growth, Yield.

ABSTRACT

This study was conducted in a sandy soil at Ali Mubarak Village Research Farm, South Tahrir Horticulture Research Station, Behaira Governorate, during the two successive seasons of 2002/2003 and 2003/2004 on sweet corn Jubilee hybrid. The study aimed to determine the best treatments of nitrogen fertigation level and chelated calcium foliar application on the productivity and quality of sweet corn. The obtained results indicated that increasing nitrogen fertigation level (100, 120, 140 to 160) kg N/fed. and (or) chelated calcium (12% Ca⁺⁺) concentration (500 and 1000 ppm Ca EDTA) led to increasing the vegetative growth (leaf area, plant height, fresh and dry weight), chemical composition (total chlorophyll, nitrogen, phosphorus, potassium and calcium in leaves) and yield characters (ear length, ear diameter, weight of 1000 seed, unhusked ear, husked ear and total yield) The promising treatment was 160 kg N/Fed. combined with 1000 ppm Ca EDTA under similar prevailing conditions of the present study in a sandy soil.

INTRODUCTION

Sweet corn (*Zea mays*, L. var. *Saccharata*) is one of the most popular vegetables in many countries in the world. In Egypt, sweet corn is considered as an important crop for export in the future. Many investigators reported that sweet corn plant is highly sensitive to nitrogen fertilization during growth stages (Mullins *et al* 1999 and Nofal &

Hinar, 2003). Darwish (2003) reported that increasing nitrogen fertilization led to increases in plant height, ear diameter, leaf area, N and protein in plant. Sanchez *et al* (1989); Salardini *et al* (1992) and Raja (2001) reported that increasing nitrogen fertilization increased significantly the green ear yield and kernel weight. Abd El-Megeid (2001) and Zebarth *et al* (2002) showed that increasing nitrogen fertilization caused significant differences in chlorophyll A and B.

Calcium is essential for growth because it is needed for both cell division and cell elongation, Smith (1984) and Hunter *et al* (1995) stated that limes increased growth, yield, ear length, ear weight as well as the concentration of N, P and Ca in sweet corn plants.

This study was therefore conducted to investigate the effect of nitrogen and chelated calcium on yield and quality of sweet corn.

MATERIALS AND METHODS

The present study was conducted in the Experimental Station of the Vegetable Research Department, at Ali Mubarak Village Research Farm, Behaira Governorate, during the period from 2002 to 2004, using sugary sweet corn hybrid, namely Jubilee. The soil analysis data indicate that the soil was sandy in texture, having pH 7.91 and 7.99, Ec. 1.51 and 1.49 ds/m., organic matter 0.19 and 0.21 %, contained 18 and 20 ppm Nitrogen, 7 and 9 ppm Phosphorous, 10.5 and 10 ppm Potassium and calcium content 20 and 22 ppm, in the first and second seasons, respectively. The field experiment was performed to investigate the response of sweet corn to nitrogen fertigation and foliar application of chelated calcium on vegetative characteristics, yield and its components. The

(Received April 2, 2006)

(Accepted January 22, 2007)

seeds were sown directly in the soil on September 15 in both seasons. A split-plot system with three replicates was adopted where the studied nitrogen fertilization was situated in the main plots, and the foliar spray treatments were randomly distributed in the sub-plots. The plot area was 24 m² consisted of 3 lines x 10 m length x 0.80 m width. Four nitrogen fertilization rates (100, 120, 140 and 160 kg nitrogen / fed.) were used in the form of ammonium sulphate (20.5%) at four equal doses with drip irrigation system starting after 21 days from sowing. Chelated calcium foliar applications were applied after 30 days from sowing (at the five-leaf stage) in eight sprays until maturity stage. Three levels of chelated calcium (12% Ca⁺⁺) (Chelated calcium by EDTA produced by U.A.D. Co. Egypt) were studied: check (distilled water), 500 and 1000 ppm chelated calcium. The other Agricultural management "cultivation, manuring, fertigation, irrigation, pest and disease control were conducted, according to the recommendation of the Egyptian Ministry of Agriculture.

Data recorded

Vegetative growth measurements: Sixty plants were randomly taken at harvest time from each plot to record the leaf area (LA) per plant (cm²), using the disk method, plant height (cm) from the base to tassel top, plant fresh and dry weight (g).

Yield and ear parameters: Sixty ears from randomly plants of each plot were taken at harvest stage (milky stage) to determine ear length (cm) (ear base to top) and diameter (cm), number of rows/ear, number of kernels/row, un-husked and husked ear weight (g), fresh and dry weight of 1000 kernels and total yield (g). All ears which were harvested from each plot were weighed to calculate the total yield.

Total chlorophyll was measured in fifth leaf by using Minolta chlorophyll meter model (SPAD-502 instrument) from recently fully expanded mature leaf. Total nitrogen, phosphorus, potassium and calcium were determined in dry fifth leaf. Total nitrogen was determined by Nesler method described in **A.O.A.C. (1992)**. Phosphorus was colorimetrically determined as described by **Jackson (1973)** while potassium and calcium were measured by using flame photometer according to **Brown and Lilliand (1946)**. Total nitrogen content was determined in kernels by using the modified micro kjeldhal apparatus of Parnus and Wagner and modified by **Pregl (1945)**, then the ob-

tained values were multiplied by 6.25 to calculate protein content.

Data obtained were statistically analyzed, according to **Snedecor and Cochran (1989)**.

RESULTS AND DISCUSSION

Vegetative growth

Data presented in **Table (1)** indicated that in both seasons, increasing of the nitrogen applied levels increased the height, leaf area and fresh and dry weight of sweet corn plants. The addition of 160 kg N/ fed gave the highest values of these growth parameters compared with the other studied levels. Similar results were obtained by **Mullins et al (1999)**, **Nofal & Hinar (2003)** and **Grazia et al (2003)** on sweet corn and maize. This favorable effect of N may be due its effective role in many biochemical processes within plants as it is necessary for cell protoplasm formation, photosynthesis activity in all plants and necessary for division and merestimic activity in plant organs, (**Russel, 1973**).

The data in the same Table showed that increasing of chelated calcium foliar application increased all tested plant growth characters. The applied calcium EDTA at 1000 ppm gave the most vigorous plants compared with the other foliar applications. These results were true in both seasons. These results may be attributed to the vital role of calcium inside plant tissues, as regulates plant activities, especially through protein phosphorylation, and it has major role in cell function and signal transduction (**Poovaiah, 1986**).

The obtained results agree with those of **Kamel et al (1986)**; **Salardini et al (1992)**; **Hunter et al (1995)**; **Padmaja et al (1999)** and **Hassan (2004)**.

As for the effect of interaction between nitrogen fertilization and chelated calcium foliar application, the application of 160 kg N/fed. with 1000 ppm calcium EDTA gave the highest value, while the lowest value was obtained from 100kg N/fed. without chelated calcium foliar application.

Chemical composition

A- Total Chlorophyll

Data presented in **Table (2)** indicated that applying nitrogen levels led to significant increase in the total chlorophyll content in both seasons. The addition of 160 kg N/ fed gave the greatest total chlorophyll compared with the other levels.

Table 1. Effect of nitrogen fertigation level and chelated calcium foliar application on vegetative growth of sweet corn plants in 2002/2003 and 2003/2004 seasons.

N level (kg/fed.)	Ca-EDTA (ppm)	Plant height (cm)	Leaf area (cm ²)	Fresh weight (g)	Dry weight (g)
2002/2003 seasons					
100	0	163.32 j	313.58 k	261.20j	98.71i
	500	164.85 i	318.58 j	265.85i	103.71k
	1000	167.68 h	322.55i	271.24g	107.18j
Mean		165.28 D	318.24 D	266.10D	103.20D
120	0	167.88 g	322.92 h	267.33h	108.58i
	500	168.58 f	323.48 g	284.42f	109.40h
	1000	169.80 e	328.49 e	292.54e	113.29g
Mean		168.75 C	324.97 C	281.43C	110.42C
140	0	170.31 d	325.24 f	323.09cd	116.56f
	500	169.93 e	331.58 d	327.44b	118.72e
	1000	170.24 d	332.91 c	256.78k	120.16d
Mean		170.16 B	329.91 B	302.44B	118.48.B
160	0	171.33 c	332.59 c	322.67d	121.38c
	500	173.93 b	334.92 b	323.88c	125.38b
	1000	175.58 a	335.91 a	365.52a	128.38a
Mean		173.62 A	334.48 A	334.35A	125.05A
Average Ca	0	168.21 C	323.58 C	293.57C	111.31C
	500	169.32 B	327.14 B	300.40A	114.30B
	1000	170.82 A	329.97 A	296.52B	117.25A
2003/2004 seasons					
100	0	165.95 k	314.99 h	260.55j	104.34k
	500	166.10 k	319.39 g	265.90k	108.24j
	1000	167.29 j	323.91 f	270.94i	110.23i
Mean		166.45 D	318.24 D	265.80D	17.60D
120	0	167.88 h	323.25 f	276.75h	110.24i
	500	167.62 i	325.51 e	283.35g	112.64h
	1000	168.08 g	329.38 d	290.04f	118.58f
Mean		167.86 C	324.97 C	283.38C	113.82C
140	0	169.28 e	329.99 d	321.75e	117.96g
	500	168.98 f	331.98 c	325.76c	120.24e
	1000	169.75 d	335.93 b	353.00i	121.43d
Mean		169.34 B	329.91 B	333.50B	119.88B
160	0	172.71c	332.34 c	324.67d	122.41c
	500	173.62 b	336.39 b	329.22b	126.95b
	1000	174.41a	337.97 a	365.04a	128.93a
Mean		173.58 A	334.48 A	339.64A	126.10A
average Ca	0	168.96 C	323.58 C	295.93C	113.41C
	500	169.08 B	327.14 B	301.06B	117.02B
	1000	169.88 A	329.97 A	319.76A	119.79A

*Any values within the column followed by the same letter are not statistically different; at the 0.05 level (Duncan's multiple range), small letters (interaction)

Table 2. Effect of nitrogen fertigation level and chelated calcium foliar application on chemical contents of sweet corn leaves in 2002/2003 and 2003/2004 seasons.

N level (kg/fed.)	Ca-EDTA (ppm)	Total chloro- phyll (SPAD)	Nitrogen percentage	Phosphorus percentage	Potassium percentage	Calcium percentage
2002/2003 seasons						
100	0	44.38 f	1.41 f	0.452i	1.02d	0.50 e
	500	43.86 g	1.41 f	0.458g	1.06cd	0.61 a-e
	1000	44.80 e	2.06 c	0.475d	1.11b-c	0.65 a-d
Mean		44.35 D	1.62 D	0.475D	1.06C	0.59 C
120	0	46.65 d	1.80 e	0.455h	1.09cd	0.53 de
	500	46.31 d	1.92 d	0.462f	1.12b-d	0.66 a-d
	1000	47.26 c	2.11 c	0.478c	1.16a-d	0.68 a-c
Mean		46.74 C	1.95 C	0.465C	1.12BC	0.62 BC
140	0	49.49 a	1.91 d	0.458g	1.14a-d	0.56 c-e
	500	47.61 c	2.09 c	0.463f	1.15a-d	0.69 a-c
	1000	47.38 c	2.21 b	0.484b	1.18a-c	0.71ab
Mean		48.49 B	2.07 B	0.468B	1.16B	0.65 AB
160	0	49.22 a	2.10 c	0.469e	1.20a-c	0.58 b-e
	500	48.69 b	2.25 b	0.474d	1.24ab	0.70a-c
	1000	49.25 a	2.31 a	0.492a	1.28a	0.73 a
Mean		49.05 A	2.22 A	0.478A	1.24A	0.67 A
Average Ca	0	47.43 A	1.81 C	0.459C	1.11A	0.54 C
	500	46.62 B	1.92 B	0.464B	1.14A	0.66 B
	1000	47.42 A	2.18 A	0.482A	1.18A	0.69 A
2003/2004 seasons						
100	0	42.78 h	1.70 j	0.450h	1.06e	0.51 e
	500	43.71 g	1.91 h	0.452g	1.09de	0.62 b-d
	1000	44.43 f	2.05 f	0.471d	1.12c-e	0.66 a-c
Mean		43.64 D	1.88 C	0.458D	1.09C	0.60 B
120	0	46.26 d	1.78 i	0.458f	1.09de	0.54 de
	500	45.85 e	1.95 g	0.457f	1.14b-e	0.67 a-c
	1000	46.48 d	2.15 e	0.475c	1.17a-d	0.69 a-c
Mean		46.20 C	1.96 A	0.463C	1.13BC	0.63 B
140	0	47.90 b	1.21 k	0.458f	1.15b-d	0.59 c-e
	500	46.63 d	2.18 d	0.461e	1.16a-d	0.70 a-c
	1000	47.53 bc	2.27 c	0.481b	1.19a-c	0.72 ab
Mean		47.35 B	1.89 B	0.467B	1.17B	0.67 A
160	0	48.32 a	1.19 l	0.461e	1.19a-c	0.62 b-d
	500	47.38 c	2.32 b	0.471d	1.22ab	0.72 ab
	1000	48.33 a	2.37 a	0.486a	1.24a	0.74 a
Mean		48.01 A	1.96 A	0.473A	1.22A	0.69 A
average Ca	0	46.32 B	1.47 C	0.457C	1.12A	0.56 C
	500	45.89 C	2.09 B	0.460B	1.15A	0.68 B
	1000	46.70 A	2.21 A	0.478A	1.18A	0.70 A

*Any values within the column followed by the same letter are not statistically different; at the 0.05 level (Duncan's multiple range), small letters (interaction).

Table 3. Effect of nitrogen fertigation level and chelated calcium foliar application on ear characters of sweet corn in 2002/2003 and 2003/2004 seasons.

N level (kg/fed.)	Ca-EDTA (ppm)	Total chloro- phyll (SPAD)	Nitrogen percentage	Phosphorus percentage	Potassium percentage	Calcium percentage
2002/2003 seasons						
100	0	44.38 f	1.41 f	0.452i	1.02d	0.50 e
	500	43.86 g	1.41 f	0.458g	1.06cd	0.61 a-e
	1000	44.80 e	2.06 c	0.475d	1.11b-c	0.65 a-d
Mean		44.35 D	1.62 D	0.475D	1.06C	0.59 C
120	0	46.65 d	1.80 e	0.455h	1.09cd	0.53 de
	500	46.31 d	1.92 d	0.462f	1.12b-d	0.66 a-d
	1000	47.26 c	2.11 c	0.478c	1.16a-d	0.68 a-c
Mean		46.74 C	1.95 C	0.465C	1.12BC	0.62 BC
140	0	49.49 a	1.91 d	0.458g	1.14a-d	0.56 c-e
	500	47.61 c	2.09 c	0.463f	1.15a-d	0.69 a-c
	1000	47.38 c	2.21 b	0.484b	1.18a-c	0.71ab
Mean		48.49 B	2.07 B	0.468B	1.16B	0.65 AB
160	0	49.22 a	2.10 c	0.469e	1.20a-c	0.58 b-e
	500	48.69 b	2.25 b	0.474d	1.24ab	0.70a-c
	1000	49.25 a	2.31 a	0.492a	1.28a	0.73 a
Mean		49.05 A	2.22 A	0.478A	1.24A	0.67 A
Average Ca	0	47.43 A	1.81 C	0.459C	1.11A	0.54 C
	500	46.62 B	1.92 B	0.464B	1.14A	0.66 B
	1000	47.42 A	2.18 A	0.482A	1.18A	0.69 A
2003/2004 seasons						
100	0	42.78 h	1.70 j	0.450h	1.06e	0.51 e
	500	43.71 g	1.91 h	0.452g	1.09de	0.62 b-d
	1000	44.43 f	2.05 f	0.471d	1.12c-e	0.66 a-c
Mean		43.64 D	1.88 C	0.458D	1.09C	0.60 B
120	0	46.26 d	1.78 i	0.458f	1.09de	0.54 de
	500	45.85 e	1.95 g	0.457f	1.14b-e	0.67 a-c
	1000	46.48 d	2.15 e	0.475c	1.17a-d	0.69 a-c
Mean		46.20 C	1.96 A	0.463C	1.13BC	0.63 B
140	0	47.90 b	1.21 k	0.458f	1.15b-d	0.59 c-e
	500	46.63 d	2.18 d	0.461e	1.16a-d	0.70 a-c
	1000	47.53 bc	2.27 c	0.481b	1.19a-c	0.72 ab
Mean		47.35 B	1.89 B	0.467B	1.17B	0.67 A
160	0	48.32 a	1.19 l	0.461e	1.19a-c	0.62 b-d
	500	47.38 c	2.32 b	0.471d	1.22ab	0.72 ab
	1000	48.33 a	2.37 a	0.486a	1.24a	0.74 a
Mean		48.01 A	1.96 A	0.473A	1.22A	0.69 A
average Ca	0	46.32 B	1.47 C	0.457C	1.12A	0.56 C
	500	45.89 C	2.09 B	0.460B	1.15A	0.68 B
	1000	46.70 A	2.21 A	0.478A	1.18A	0.70 A

*Any values within the column followed by the same letter are not statistically different; at the 0.05 level (Duncan's multiple range), small letters (interaction).

Table 4. Effect of nitrogen fertigation level and chelated calcium foliar application on yield characters of sweet corn plants in 2002/2003 and 2003/2004 seasons.

N level (kg/fed.)	Ca-EDTA (ppm)	Ear length (cm)	Ear diameter (cm)	Number of rows/ear	Number of kernels/row
2002/2003 seasons					
100	0	18.19 e	3.89 i	33.93 l	16.28f
	500	18.49 d	3.99 h	34.76i	16.32ef
	1000	18.76 c	4.19g	34.54j	16.44d
Mean		18.48 D	4.02 D	34.41D	16.35D
120	0	18.25 e	4.21 f	34.33k	16.35e
	500	18.71 c	4.24 e	35.72g	16.48cd
	1000	19.10 b	4.20 fg	35.60h	16.49cd
Mean		18.69 C	4.22 C	35.21C	16.44C
140	0	18.69 c	4.23 e	36.07f	16.42d
	500	19.45 a	4.32 d	36.91b	16.52bc
	1000	19.45 a	4.34 c	36.42e	16.58b
Mean		19.20 B	4.30 B	36.47B	16.50B
160	0	19.11 b	4.24 e	36.67d	16.44
	500	19.19 b	4.43 a	37.06a	16.74a
	1000	19.49a	4.37 b	36.82c	16.68a
Mean		19.26 A	4.32 A	36.85A	16.62A
Average Ca	0	18.56 C	4.14 C	35.25C	16.37B
	500	18.96B	4.22 B	36.11A	16.51A
	1000	19.20 A	4.28 A	35.84B	16.55A
2003/2004 seasons					
100	0	17.73 j	3.91 g	34.24k	16.05h
	500	18.21 i	4.05 f	34.92j	16.67f
	1000	18.85 g	4.17 e	36.67h	16.72ef
Mean		18.26 D	4.04 D	35.28D	16.48D
120	0	18.67 h	4.19 d	35.74i	16.51g
	500	18.69 h	4.24 c	36.89g	16.69f
	1000	19.10 f	4.20 d	37.31f	16.77de
Mean		18.82 C	4.21 C	36.64C	16.66C
140	0	19.24 e	4.21 d	38.08e	16.67f
	500	19.52 d	4.20 d	38.24d	17.06c
	1000	19.77 b	4.35 a	36.64h	17.21b
Mean		19.51 B	4.25 B	37.65B	16.98B
160	0	19.66 c	4.24 c	38.41c	16.81d
	500	19.75 b	4.31 b	39.14a	17.52a
	1000	19.97 a	4.36 a	38.74b	17.52a
Mean		19.79 A	4.30 A	38.77A	17.28A
average Ca	0	18.82 C	4.14 C	36.62C	16.51C
	500	19.04 B	4.20 B	37.30B	16.99B
	1000	19.42 A	4.37 A	37.34A	17.05A

*Any values within the column followed by the same letter are not statistically different; at the 0.05 level (Duncan's multiple range), small letters (interaction)

Similar results are reported by **Abd El-Megeid (2001) and Zebarth *et al* (2002)**.

Data indicated also that the spraying of chelated calcium at 1000 ppm gave the greatest total chlorophyll compared with the other foliar applications. These results were true in both seasons.

The interaction between nitrogen fertilization and chelated calcium foliar application showed that applying 160kg N/fed. combined with 1000ppm chelated calcium gave the highest chlorophyll value, while the lowest values were obtained from 100kg N/fed. without chelated calcium foliar application.

B- Mineral content

Data shown in **Table (2)** indicted that the applied nitrogen levels caused significant increment in percentage of nitrogen, phosphorus, potassium, calcium in the fifth leaf. The most effective level in increasing N, P, K and Ca contents was 160 kg N/ Fed. in both seasons. Similar results were obtained by **Taber & Cox (1983); Smith (1984); Thiraporn *et al* (1992) and Hassan (2004)**.

Concerning the effect of chelated calcium, data showed that chelated calcium applied at 1000 ppm gave the highest percentage of N, P and Ca in the fifth leaf, compared with the other foliar applications. These results were true in both seasons. The results agree with those obtained by **Smith (1984)**. Whereas, data showed that foliar application of chelated calcium did not significantly affect potassium percentage, in the two tested seasons. The obtained results agree with those of **Smith (1984) and Hunter *et al* (1995)**.

The interaction between nitrogen application levels and chelated calcium foliar sprays was significant in both seasons. The addition of 160kg N/fed combined with 1000ppm chelated calcium showed the highest values of N, P, K and Ca, while the lowest values of these nutrients were obtained from 100kg N/fed. without chelated calcium addition in both seasons.

The satisfactory obtained effects on plant growth (**Table 1**) as a result of applying the highest level of N fertigation and Ca foliar application may be also attributed to the increasing the concentration of N, P, K and Ca chelated as well as chlorophyll in leaf tissues.

Yield and its components

A- Ear characters

Data shown in **Table (3)** indicated that each increase in the applied nitrogen level (100, 120,

140 and 160 kg N/ Fed.) caused significant increase in the ear length, ear diameter, number of rows/ear and number of kernels/row in both seasons. These results may be due to the numerous effects of nitrogen fertilizer on plant growth. Several investigators reached to the same results **Smith, 1984; Raja, 2001; Darwish, 2003; Oraby *et al* 2003 and Hassan, 2004**.

The increasing of chelated calcium foliar application increased the ear length, ear diameter, number of rows/ear and number of kernels/row. The spraying of chelated calcium at 1000 ppm gave the highest values compared with the other foliar applications. These results were true in both seasons. The results are agree with those obtained by **Smith (1984) and Hunter *et al* (1995)**.

As to the effect of interaction between nitrogen fertilization and foliar application, the addition of 160kg N/fed. combined with spraying with 1000ppm chelated calcium gave the highest values of ear length, ear diameter, number of rows/ear and number of kernels/row, while the lowest values were obtained from 100kg N/fed. without chelated calcium foliar application.

B- Yield characters

Data presented in **Table (4)** indicated that each increase in the applied nitrogen level caused significant increase in weight of 1000 seed, unhusked ear, husked ear and yield of ears in both seasons. The application of 160 kg N/ fed gave the greatest ear yield compared with the other levels. Similar results are reported by **Sanchez *et al* (1989); Salardini *et al* (1992); Stone *et al* (1998); Saied & Gaber (1999); Raja (2001); Grazia *et al* (2003) and Oraby *et al* (2003)**.

As for chelated calcium effects, spraying with chelated calcium at 1000 ppm produced the greatest weight of 1000 seed, unhusked ear, husked ear and ear yield compared with the other foliar application levels. These results were true in both seasons. The results are in agreement with those obtained by **Smith (1984) and Hunter *et al* (1995)**.

The interaction between nitrogen fertilization and foliar application was significant in both seasons. The application of 160kg N/fed. combined with 1000ppm calcium EDTA resulted in the highest weight of 1000 seed, unhusked ear, husked ear and ear yield value, while the lowest value was obtained from 100kg N/fed. without chelated calcium foliar application. The obtained increase in ear yield as well the improvement in ear characters with resulted from applying the highest levels

of N fertigation and Ca foliar application may be attributed to their stimulating influences on plant growth (Table 1) as well as chemical composition (Table 2).

REFERENCES

- Abd El-Megeid, M.A. (2001). **Effect of Different NP Levels on the Chemical Composition of Maize Plant**. P. 142. Ph.D. Thesis, Fac. Agric., Cairo Univ.
- A.O.A.C. (1992). **Official Methods of Analysis, of Agricultural Chemists 12th Ed.** Washington, D.C., USA.
- Brown, J.D. and O. Lilliand (1946). Rapid determination of potassium and sodium in plant material and soil extracts by flame photometry, **Proc. Amer. Soc. Hort. Sci.**, (48): 341-346.
- Darwish, A.A. (2003). The yield and yield components of maize as influenced by nitrogen, zinc and boron fertilization. **J. Agric. Sci., Mansoura Univ.**, 28(2): 799-810.
- Grazia, J.D.; P.A. Tiftonell; D. Germinara and A.D. Chiesa (2003). Phosphorus and nitrogen fertilization in sweet corn (*Zea mays* L.var. saccharata bailey). **Spanish J. Agri. Res.** 1(2):103-107.
- Hassan, M.M. (2004). **Response Yellow Maize to Nitrogen Potassium Fertilization and Plant Density**. P. 172. Ph. D. Thesis, Fac. Agric., Al-Azhar Univ., Cairo, Egypt.
- Hunter, D.J.; L.G. Yapa; N.V. Hue and M. Ea-qub (1995). Comparative effects of green manure and lime on the growth of sweet corn and chemical properties of an acid Oxisol in Western Samoa Corn. **Commu. Soil. Sci. and Plant Anal.** 26 (3&4): 375-388.
- Jackson, M.L. (1973). **Soil Chemical Analysis**. Prentice- Hall of India Private. Limited. New Delhi.
- Kamel, M.S.; S.A. Shaban; A.I. Ashour and E.M. Abdel-Lateef (1986). Soil and foliar fertilization studies on maize yield and yield components. **Proc. 2nd Conf. Agron.**, 1: 247-261.
- Mullins, C.A.; R.A. Straw; B. J. Pitt; D.O. Onks; M.D. Mullen; J. Reynolds and M. Kirchner (1999). Response of selected sweet corn cultivars to nitrogen fertilization. **Hort-Technology** 1 (9): 32-35.
- Nofal, A. and A.S. Hinar (2003). Growth and chemical properties of maize grains of some single crosses as affect by nitrogen fertilization and manure under sprinkler irrigation in a sandy soil. **Egypt. J. Appl. Sci.**, 18(58): 583-596.
- Oraby, F.T.; A.A. Sarhan, M.F. Abdel-Maksoud and A.H. Bassiouny (2003). Proper agronomic practices required to maximize productivity of some maize varieties in old and reclaimed soils. Effect of sowing dates on response of two maize hybrids to nitrogen fertilization. **Egypt. J. Appl. Sci.**, 18: (58): 597-618.
- Padmaja, M.; D. Sreelatha and K.L. Roa (1999). Effect of nitrogen on nutrient uptake in maize (*Zea mays* L.) Types. **J. Res. Angraun.**, 27 (4): 112-114.
- Poovaiah, B.W. (1986). Role of calcium in prolonging storage life of fruits and vegetable. **Food Technol.**, 40: 86-89.
- Pregl, F. (1945). **Quantitive Organic Micro Analysis 4th Ed.** J. and A. Churchill LTD., London.
- Raja, V. (2001). Effect of nitrogen and plant population on yield and quality of super sweet corn (*Zea mays*). **Indian J. Agron.**, 46 (2): 264-269.
- Russel, E.W. (1973). **Soil Condition and Plant Growth.** 10th Ed. Longman Group Limited, London.
- Saied E.M. and E.M.E. Gaber (1999). Response of some maize varieties to nitrogen fertilization and plant density. **J. Agric. Sci. Mansoura Univ.**, 24(4): 1665-1675.
- Salardini, A.A.; L.A. Sparrow and R.J. Holloway (1992). Sweet corn responses to basal and top-dressed and sources of nitrogenous fertilizers. **Aust. J. Agric. Res.**, 43 (1): 171-180.
- Sanchez, C.A.; R.T. Nagata and V.L. Guzman (1989). Response of sweet corn to nitrogen source and rate on Histosols. **HortScience** 24 (6): 925-927.
- Smith, C.B. (1984). Sweet corn growth responses and leaf concentrations as affected by lime types and fertilizer treatments in a five- year study. **J. Amer. Soc. Hort. Sci.**, 109(4): 572-577.
- Snedecor, G.W. and W.G. Cochran (1989). **Statistical Methods.** 8th Ed. Iowa State Univ. Press, Ames, Iowa, USA.
- Stone, P.J.; I.B. Sorensen and J.B. Reid (1998). Effect of plant population and nitrogen fertilizer on yield and quality of super sweet corn. **Proc. Annual Conf. Agro. Soci. New. Zealand** 28: 1-5.
- Taber, H.G. and D.F. Cox (1983). Nitrogen effect on yield and kernel protein content of sweet corn grown on sandy soils. **Comm. Soil Sci. and Plant Anal.** 14 (7): 585-599.
- Thiraporn, R.; B. Feil and P. Stamp (1992). Effect of nitrogen fertilization on yield and accumulation of nitrogen, phosphorus and potassium in

grains of tropical maize. *J. Agron. Crop Sci.*, **169** (1-2): 9-16.
Zebarth, B.J.; M. Younie; J.W. Paul and S. Bittman (2002). Evaluation of leaf chlorophyll

index for making fertilizer nitrogen recommendation for silage corn in high fertility environment. *Commun. Soil Sci. Plant. Anal.* **33(5&6): 665-684.**



مجلة اتحاد الجامعات العربية
للدراستات والبحوث الزراعية
جامعة عين شمس ، القاهرة
مجلد (١٥)، عدد (١)، ١٣١-١٣٩، ٢٠٠٧

تأثير معدلات التسميد النيتروجيني مع ماء الري والرش الورقي بالكالسيوم المخلبي على إنتاجية محصول الذرة السكرية

[١٢]

أحمد أبو اليزيد^١ - محمد إمام رجب^١ - رابوية البسيوني ابراهيم^٢ - صالح محمد أبو الوفا^٢

١- قسم البساتين- كلية الزراعة- جامعة عين شمس- شبرا الخيمة- القاهرة- مصر

٢- قسم تداول الخضراوات- معهد بحوث البساتين- مركز البحوث الزراعية- الجيزة- مصر

(١٢% كالسيوم مخلبي) أدى إلى زيادة في القياسات الخضرية للنبات (مساحة الورقة، طول النبات، الوزن الطازج والجاف للنبات) وبعض المكونات الكيميائية (الكلوروفيل الكلي ونسبة النيتروجين والفوسفور والبوتاسيوم والكالسيوم في الأوراق) وتحسين الصفات الثمرية بصورة معنوية مقدرة على أساس (طول الكوز، قطر الكوز، المحصول الكلي). ويمكن الإستنتاج بأن المعاملة باستخدام ١٦٠ كجم/ فدان من السماد النيتروجيني و ١٠٠٠ ملجم / لتر من الكالسيوم المخلبي أدت إلى أفضل النتائج في هذه الدراسة تحت ظروف الأراضي الرملية.

أجريت هذه الدراسة بالمزرعة البحثية بقرية على مبارك (ارض رملية) التابعة لمحطة بحوث البساتين بجنوب التحرير- محافظة البحيرة في الموسم الخريفي لعامي ٢٠٠٢/٢٠٠٣ و ٢٠٠٣/٢٠٠٤ لدراسة تأثير أربعة معدلات من السماد النيتروجيني (١٠٠، ١٢٠، ١٤٠، ١٦٠ كجم/ فدان) في صورة سلفات نشادر (٢٠،٥% نيتروجين) وكذلك الرش الورقي بالكالسيوم المخلبي بتركيزات (٥٠٠، ١٠٠٠ ملجم/لتر) على محصول الذرة السكرية هجين جوبيلي. وأوضحت النتائج انه بزيادة مستوى التسميد بعنصر النيتروجين وكذا الرش الورقي بالكالسيوم

تحكيم: ا.د إبراهيم إبراهيم العكش
ا.د عبد المنعم عامر