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EFFECT OF NITROGEN FERTIGATION LEVELS AND CHELATED CALCIUM FOLIAR APPLICATION ON THE PRODUCTIVITY OF SWEET CORN [12]

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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 studying 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

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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 m^2 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 21days 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 (cm^2), 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 expended 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 obtained 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 of160 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); Palmaja *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 plan s in 2002/2003 and 2003/2004 seasons.

N level (kg/fed.)	Ca-EDTA (p pm)	Plant height (cm)	Leaf area (cm^2)	Fresh weight (g)	Dry weight (g)
		2002/2003 seasons			
	)	163.32 j	313.58 k	261.20j	98.711
100	5)0	164.85 i	318.58 j	265.85i	103.71k
	1(00	167.68 h	322.55i	271.24g	107.18j
Mean		**165.28 D**	**318.24 D**	**266.10D**	**103.20D**
	)	167.88 g	322.92 h	267.33h	108.58i
120	5)0	168.58 f	323.48 g	284.42f	109.40h
	1(00	169.80 e	328.49 e	292.54e	113.29g
Mean		**168.75 C**	**324.97 C**	**281.43C**	**11042C**
	)	170.31 d	325.24 f	323.09cd	116.56f
140	5)0	169.93 e	331.58 d	327.44b	118.72e
	1( )0	170.24 d	332.91 c	256.78k	120.16d
Mean		**170.16 B**	**329.91 B**	**302.44B**	**118.48.B**
	0	171.33 c	332.59 c	322.67d	121.38c
160	5)0	173.93 b	334.92 b	323.88c	125.38b
	1)00	175.58 a	335.91 a	365.52a	128.38a
Mean		**173.62 A**	**334.48 A**	**334.35A**	**125.05A**
	0	168.21 C	323.58 C	293.57C	111.31C
Average Ca	5 00	169.32 B	327.14 B	300.40A	114.30B
	1)00	170.82 A	329.97 A	296.52B	117.25A
		2003/2004 seasons			
	0	165.95 k	314.99 h	260.55j	104.34k
100	5 00	166.10 k	319.39 g	265.90k	108.24j
	1)00	167.29 j	323.91 f	270.94i	110.23i
Mean		**166.45 D**	**318.24 D**	**265.80D**	**17.60D**
	0	167.88 h	323.25 f	276.75h	110.24i
120	5 00	167.62 i	325.51 e	283.35g	112.64h
	1)00	168.08 g	329.38 d	290.04f	118.58f
Mean		**167.86 C**	**324.97 C**	**283.38C**	**113.82C**
	0	169.28 e	329.99 d	321.75e	117.96g
140	5 00	168.98 f	331.98 c	325.76c	120.24e
	1)00	169.75 d	335.93 b	353.00i	121.43d
Mean		**169.34 B**	**329.91 B**	**333.50B**	**119.88B**
	0	172.71c	332.34 c	324.67d	122.41c
160	5 00	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**
	0	168.96 C	323.58 C	295.93C	113.41C
average Ca	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 colu n followed by the same latter 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			
	0	44.38 f	1.41 f	0.452i	1.02d	0.50 e
100	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**
	0	46.65 d	1.80 e	0.455h	1.09cd	0.53 de
120	500	46.31 d	1.92 d	0.462f	1.12b-d	066 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**
	0	49.49 a	1.91 d	0.458g	1.14a-d	0.56 c-e
140	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**
	0	49.22 a	2.10 c	0.469e	1.20a-c	0.58 b-e
160	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			
	0	42.78 h	1.70 j	0.450h	1.06e	0.51 e
100	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**
	0	46.26 d	1.78 i	0.458f	1.09de	0.54 de
120	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**
	0	47.90 b	1.21 k	0.458f	1.15b-d	0.59 c-e
140	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. 7B**	**0.67 A**
	0	48.32 a	1.19 l	0.461e	1.19a-c	0.62 b-d
160	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	1.13A	0.70 A

*Any values within the column followed by the same latter 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			
	0	44.38 f	1.41 f	0.452i	1.02d	0.50 e
100	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**
	0	46.65 d	1.80 e	0.455h	1.09cd	0.53 de
120	500	46.31 d	1.92 d	0.462f	1.12b-d	066 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**
	0	49.49 a	1.91 d	0.458g	1.14a-d	0.56 c-e
140	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**
	0	49.22 a	2.10 c	0.469e	1.20a-c	0.58 b-e
160	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			
	0	42.78 h	1.70 j	0.450h	1.06e	0.51 e
100	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**
	0	46.26 d	1.78 i	0.458f	1.09de	0.54 de
120	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**
	0	47.90 b	1.21 k	0.458f	1.15b-d	0.59 c-e
140	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**
	0	48.32 a	1.19 l	0.461e	1.19a-c	0.62 b-d
160	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 latter 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 applic: tion 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)	Numl er of rows /ear	Number of kernels/row
		2002/2003 seasons			
	0	18.19 e	3.89 i	33.93 l	16.28f
100	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**	**34.4 D**	**16.35D**
	0	18.25 e	4.21 f	34.38k	16.35e
120	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**
	0	18.69 c	4.23 e	36.07f	16.42d
140	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**	**36.47 B**	**16.50B**
	0	19.11 b	4.24 e	36.67d	16.44
160	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**
	0	18.56 C	4.14 C	35.25C	16.37B
Average Ca	500	18.96B	4.22 B	36.11A	16.51A
	1000	19.20 A	4.28 A	35.84B	16.55A
		2003/2004 seasons			
	0	17.73 j	3.91 g	34.24k	16.05h
100	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**
	0	18.67 h	4.19 d	35.74i	16.51g
120	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**
	0	19.24 e	4.21 d	38.08e	16.67f
140	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**
	0	19.66 c	4.24 c	38.41c	16.81d
160	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**
	0	18.82 C	4.14 C	36.62C	16.51C
average Ca	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 latter 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 & Co) (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 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 of160 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**).

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

[١٢]

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أجريت هذه الدراسة بالمزرعة البحثية بقرية على مبارك (ارض رملية) التابعة لمحطة بحوث البساتين بجنوب التحرير- محافظة البحيرة في الموسم الخريفي لعامي ٢٠٠٢/٢٠٠٣ و٢٠٠٣/٢٠٠٤ 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 (صفر، ٥٠٠ ، ١٠٠٠ ملجم/لتر) على محصول الذرة السكرية هجين جوبيلى. وأوضحت النتائج انه بزيادة مستوى التسميد بعنصر النيتروجين وكذا الرش الورقي بالكالسيوم (١٢% كالسيوم مخلبي) أدى إلى زيادة في القياسات الخضرية للنبات (مساحة اورقة، 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 الكلى). ويمكن الإستنتاج بأن المعاملة بإستخدام ١٦٠ كجم/ فدان من السماد النيتروجيني و١٠٠٠ ملجم / لتر من الكالسيوم المخلبي أدت إلى أفضل النتائج في هذه الدراسة تحت ظروف الأراضي الرملية.

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