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EFFECT OF NITROGEN FERTILIZER RATES AND SOME GROWTH REGULATORS TREATMENTS ON SUGAR BEET

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ABSTRACT

Two field experiments were carried out at El – Hamoul, Kafr El – Sheikh Governorate in 2009 / 2010 and 2010 / 2011 seasons to study the effect of four nitrogen fertilizer rates (0, 70, 90 and 110 kg N / fed) and five growth regulators treatments (sprayed plants with tap water (control), Mepiquate Chloride (pix) at the concentration of 1000 and 2000 ppm and Indole acetic acid (IAA) at the concentration of 100 and 200 ppm on yield of sugar beet. The experiments were laid out in split plot design.

The obtained results showed clearly that average root / top ratio, sucrose %, potassium %, sodium %, top yield / fed, root yield / fed and sugar yield / fed were significantly affected by nitrogen fertilizer rates in both seasons. Increasing nitrogen fertilizer from 0 to 110 kg N / fed caused 102.14 and 103.53 %, 112.55 and 118.18 % as well as 136.70 and 142.60 % increases in top yield / fed, root yield / fed as well as sugar yield / fed compared to plants grown on the control treatment (no added nitrogen) in 2009 / 2010 and 2010 / 2011 seasons, respectively.

Results recorded indicated that all studied traits were significantly affected by growth regulators treatments in both seasons. Sugar beet plants sprayed with IAA at the concentration of 200 ppm gave the highest top yield / fed 5.75 and 5.86 tons, root yield / fed 27.65 and 28.98 tons as well as sugar yield / fed 4.46 and 4.70 tons compared to other treatments in 2009 / 2010 and 2010 / 2011 seasons, respectively.

The interaction effect between nitrogen fertilizer rates and growth regulators treatments was significant on all studied traits in both seasons, except sodium % in 2009 / 2010 seasons. Fertilizing sugar beet plants by nitrogen fertilizer at the rate of 110 kg N / fed and sprayed with IAA at the concentration of 200 ppm gave the highest top yield / fed 7.73 and 7.83 tons, root yield / fed 36.90 and 39.84 tons as well as sugar yield / fed 5.65 and 6.13 tons as compared to all other this interaction treatments in 2009 / 2010 and 2010 / 2011 seasons, respectively.

Generally, it could be recommended that fertilized sugar beet plants with 110 kg N / fed and sprayed by IAA at the concentration of 200 ppm increased root and sugar yields/ fed at El-Hammoul, Kafer El-Sheikh Governorate conditions.

INTRODUCTION

Sugar beet (*Beta vulgaris* L.) ranks as second important sugar crop in the worlds. The Egyptian Government encourages suger beet crop growers to decrease the gab between sugar production and consumption. One of these all attempts is likely to be increasing sugar beet yield per unit area. Increasing of sugar beet production can be achieved through optimizing the agricultural practices. The optimum fertilization with major elements i.e. nitrogen and growth regulators are important for sugar beet growth and yield.

Nitrogen is an essential nutrient for sugar beet, because of the fact that the efficiency of other nutrients is based on it. Nitrogen has a pronounced effect on sugar beet growth and physiological processes. El-Hawary (1999),

Nemeat Alla *et al.* (2002), Leilah *et al.* (2005) and Abd El-Kader (2008) reported that increasing nitrogen fertilizer rate increased yields of top, root and sugar of sugar beet per fed, on the other hand, sucrose % sodium% and potassium % in roots of sugar beet were decreased with increasing nitrogen fertilizer rates. Abd El-Razek et *al.* (2011) found that Increasing N fertilizer up to 90 kg N/fed significantly increased root and sugar yield, while decreased sucrose % of sugar beet . Decidedly, most of researches reported that increasing nitrogen fertilizer decrease sucrose % of sugar beet root because nitrogen increases vegetative growth more than sucrose accumulation in roots.

Therefore, spraying sugar beet plants with growth regulators may be occasion the balance between foliage growth and sucrose content in roots. Mepiquate chloride (pix) and indole acetic acid are growth regulators that has been widely used to reduce vegetative growth to allow plants to direct more metabolic energy towards the productive structure (Fletcher *et al*., 1994), also it inhibits the synthesis of the plant hormone giblerellic acid which plays a major role in enhancing vegetative growth (Wahdan, 1990 and Mohamoud *et al*., 1994). Zaheed *et al*. (1980) reported that sprayed sugar beet plants by 100 ppm naphthalenacetic acid (NAA) decreased root fresh weight by 5.70 % and increased sugar content in root by 32.20 % compared to the control (0 % application NAA). Daie (1986) found that IAA modified the activity of sucrose phosphate syntheses enzyme and resulted in altered carbon partitioning between sucrose and starch causing increased level of soluble sugars. Moustafa, Shafika *et al.* (2001) found that spraying sugar beet foliage with ABA + IAA decreased root sugar yield (ton / fed), but increased root content of total soluble solids and sucrose %. El-Gabiery (2002) found that spraying mepiquate chloride (pix) significantly decreased plant height, leaf area index and dry weight of leaves per plant.

Therefore, this investigation aims to study the effect of nitrogen fertilizer rates and some growth regulators i.e., Indole acetic acid and Mepiquate chloride (pix) on growth, yield and quality of sugar beet plant at El-Hamoul, Kafr El-Sheikh Governorate.

MATERIALS AND METHODS

Two field experiments were carried out at El – Hamoul, Kafr El – Sheikh Governorate in 2009 / 2010 and 2010 / 2011 seasons to study the effect of nitrogen fertilizer rates and some growth regulators treatments on yield of sugar beet, (Farida variety). The nitrogen and growth regulators treatments studied were as follows:

Nitrogen fertilizer rates:

Four nitrogen fertilizer rates used were 0, 70, 90 and 110 kg N / fed. Nitrogen fertilizer in the form of urea 46 % at the previously mentioned rates were applied at two equal half, the first was applied at 40 days from sowing and the second at 75 days from sowing.

Growth regulators treatments:

Spraying sugar beet plants by two indole acetic acid concentrations i.e. 100 and 200 ppm and sprayed plants by two Mepiquate Chloride (pix) concentrations i.e. 1000 and 2000 ppm as well as sprayed plants with tap water (control). Plants sprayed twice with growth regulators treatments at 50 and 90 days from sowing at the rate of 100 liters / fed.

The experiments were laid out in split plot design with three replications. The main plots were devoted to the nitrogen fertilizer rates and the sub plots were allocated to the growth regulators treatments (indole acetic acid (IAA) and Mepiquate Chloride (pix) concentration treatments as well as control). The area of each sub plot was 10.50 m^2 (5.00 ridges x 0.60 m width x 3 m long). Mechanical and chemical analysis of the soil at the experimental site during 2009 / 2010 and 2010 / 2011 seasons are shown in Table 1.

On 15 and 20 October, seeds were hand sown in hill 20 cm apart in 2009 / 2010 and 2010 / 2011 seasons, respectively. All other agronomic practices were followed as usually done for the sugar beet crop.

Table 1: Chemical and Mechanical analysis of the experimental sites in 2009/2010 and 2010/2011 seasons.

characters	seasons	
	2009	2010
A- Chemical characters:		
pH	7.19	7.48
E.C(mmohs/ cm)	1.41	1.58
Total N%	0.41	0.43
Available P (ppm)	18.03	17.96
Available Zn (ppm)	5.35	5.27
Available K (ppm)	1.41	1.22
Total soluble salts	9.92	10.33
B- Mechanical characters:		
Soil texture	Clay	Clay
Sand %	12.96	12.79
Silt %	21.91	20.96
Clay %	66.31	64.86

At harvest time after 190 days from sowing plants of the three middle ridges were harvested to determine the following data:

1- Root / top ratio, it was measured as the following formula

$$\text{Root / top ratio} = \frac{\text{Root fresh weight (g)}}{\text{Leaves fresh weight (g)}}$$

2- Root sucrose percentage, it was measured by sacharimeter apparatus according to Le Docte (1927).

3- Root potassium percentage.

4- Root sodium percentage.

K and Na were measured by flamephotometer according to Brown and Lilliand (1964).

The plants were harvested from the three middle ridges of each plot to determine the following characters.

5- Top yield / fed (ton).

6- Root yield / fed (ton).
7- Sugar yield / fed (ton) was estimated by multiplying root yield by sucrose %

The data were statistically analyzed according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Average root / top ratio, sucrose percentage, potassium and sodium percentages, top yield per fed, root yield per fed and sugar yield per fed as affected by nitrogen fertilizer rates and growth regulators treatments vez Mepiquate Chloride (pix) and Indole acetic acid (IAA) in 2009/ 2010 and 2010/ 2011 seasons are shown in Tables 2 – 8.

Table 2: Average root / top ratio of sugar beet as affected by nitrogen fertilizer rates and growth regulators treatments and their interaction in 2009/2010 and 2010/2011 seasons .

Nitrogen fertilizer rates (kg N/fed)	2009/2010 season					Mean	2010/2011 season					Mean
	Growth Regulators treatments						Growth Regulators treatments					
	Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix		Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix	
Zero (control)	4.91	5.50	5.22	5.89	6.59	5.62	4.89	5.39	4.98	5.78	6.43	5.49
70	5.00	5.39	4.93	7.12	9.02	6.29	4.83	5.51	5.05	7.05	8.60	6.21
90	5.84	4.50	4.51	6.73	8.09	5.94	5.82	4.46	4.61	6.70	8.00	5.92
110	5.19	5.28	4.77	6.49	8.12	5.97	5.18	5.21	5.09	6.62	8.41	6.10
Mean	5.90	5.16	4.85	7.50	9.19	6.53	5.82	5.14	4.93	7.42	8.99	6.46

LSD at 5% for:

Nitrogen rates (N)	**0.24**	**0.28**
Growth regulators (G)	**0.27**	**0.31**
nteraction (N) ×(G)	**0.54**	**0.62**

Results recorded in Tables 2 to 8 shows clearly that the effect of nitrogen fertilizer rates was significant on root/ top ratio, sucrose %, potassium %, sodium %, top yield/ fed, root yield / fed and sugar yield/ fed in both seasons. Increasing nitrogen fertilizer rates gradually increased potassium %, top yield/ fed, root yield/ fed and sugar yield/ fed, but decreased root/ top ratio, sucrose % and sodium % in both seasons. Raising nitrogen rate up to 110 kg N/ fed increased potassium % from 2.2 to 3.05 and 2.26 to 3.03 %, top yield / fed by 102.14 % and 103.53 %, root yield / fed by 112.55 and 118.19 % as well as sugar yield / fed by 136.69 and 142.60 % as compared to unfertilized plants with nitrogen (control) in 2009/2010 and 2010/2011 seasons, respectively. On the other hand, sugar beet plants fertilized by nitrogen at the rate of 110 kg N/ fed gave the lowest values of sodium % 1.63 and 1.59 %. While, plants received 70 kg N/fed gave the highest root / top ratio 6.29 and 6.21. Also, untreated sugar beet plants gave

the lowest values of sucrose percentage 14.49 and 14.39 %, on the contrary, the highest sucrose % 18.40 and 18.75 were recorded with the application of 70 kg N / fed as compared with all other treatments in 2009/ 2010 and 2010/ 2011 seasons, respectively.

The increase of potassium %, yields of top, root and sugar yields per fed due to increasing nitrogen fertilizer rate may be attributed to the favorable effects of nitrogen on increasing leaf area per plant which led to increasing photosynthetic activates.

Table 3: Average sucrose percentage of sugar beet as affected by nitrogen fertilizer rates and growth regulators treatments and their interaction in 2009/2010 and 2010/2011 seasons

Nitrogen fertilizer rates (kg N/fed)	2009/2010 season					Mean	2010/2011 season					Mean
	Growth Regulators treatments						Growth Regulators treatments					
	Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix		Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix	
Zero (control)	13.87	14.30	14.78	14.66	14.85	14.49	13.95	14.36	13.87	14.81	14.95	14.39
70	17.05	18.07	17.57	18.30	21.03	18.40	17.13	18.25	17.71	18.55	22.13	18.75
90	15.65	17.46	18.68	17.80	17.97	17.51	15.80	17.48	17.07	17.33	18.51	17.24
110	15.12	15.78	15.30	16.56	17.09	15.97	15.16	15.85	15.38	16.68	17.18	16.05
Mean	15.42	16.40	16.58	16.83	17.73	16.60	15.51	16.48	16.01	16.84	18.19	16.61

LSD at 5% for:

Nitrogen rates (N)	**0.61**	**0.25**
Growth regulators (G)	**0.68**	**0.27**
Interaction (N) ×(G)	**1.37**	**0.55**

Table 4: Average potassium percentage of sugar beet as affected by nitrogen fertilizer rates and growth regulators treatments and their interaction in 2009/2010 and 2010/2011 seasons

Nitrogen fertilizer rates (kg N/fed)	2009/2010 season					Mean	2010/2011 season					Mean
	Growth Regulators treatments						Growth Regulators treatments					
	Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix		Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix	
Zero (control)	1.62	2.40	2.62	2.06	2.32	2.20	1.68	2.43	2.68	2.16	2.38	2.26
70	2.03	2.80	2.97	2.24	2.50	2.51	2.20	2.91	3.08	2.50	2.61	2.66
90	2.23	3.07	3.19	2.62	2.86	2.79	2.40	3.13	3.21	2.73	2.91	2.87
110	2.40	3.22	3.34	2.95	3.11	3.05	2.46	3.23	3.37	2.96	3.15	3.03
Mean	2.07	2.87	3.03	2.46	2.70	2.63	2.19	2.92	3.09	2.58	2.76	2.71

LSD at 5% for:

Nitrogen rates (N)	**0.04**	**0.04**
Growth regulators (G)	**0.04**	**0.04**
Interaction (N) ×(G)	**0.08**	**0.08**

Table 5: Average sodium percentage of sugar beet as affected by nitrogen fertilizer rates and growth regulators treatments and their interaction in 2009/2010 and 2010/2011 seasons

Nitrogen fertilizer rates (kg N/fed)	2009/2010 season					Mean	2010/2011 season					Mean
	Growth Regulators treatments						Growth Regulators treatments					
	Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix		Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix	
Zero (control)	2.33	1.98	1.90	2.18	2.05	2.09	2.29	1.94	1.90	2.14	2.00	2.05
70	1.90	1.76	1.68	1.83	1.82	1.80	1.94	1.72	1.64	1.81	1.78	1.78
90	1.92	1.68	1.62	1.80	1.73	1.75	1.84	1.65	1.55	1.76	1.72	1.70
110	1.80	1.58	1.44	1.70	1.60	1.63	1.79	1.56	1.34	1.68	1.58	1.59
Mean	1.99	1.75	1.66	1.88	1.80	1.81	1.96	1.71	1.60	1.84	1.77	1.78

LSD at 5% for:

Nitrogen rates (N)	**0.05**	**0.04**
Growth regulators (G)	**0.05**	**0.04**
Interaction (N) ×(G)	**NS**	**0.08**

Table 6: Average top yield /fed (ton) of sugar beet as affected by nitrogen fertilizer rates and growth regulators treatments and their interaction in 2009/2010 and 2010/2011 seasons

Nitrogen fertilizer rates (kg N/fed)	2009/2010 season					Mean	2010/2011 season					Mean
	Growth Regulators treatments						Growth Regulators treatments					
	Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix		Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix	
Zero (control)	2.86	2.85	3.04	2.55	2.34	2.80	2.91	2.96	3.25	2.63	2.43	2.83
70	3.93	4.83	5.48	3.28	2.83	4.07	4.15	4.90	5.61	3.39	3.03	4.21
90	4.32	6.33	6.74	3.90	3.39	4.94	4.43	6.56	6.76	4.05	3.53	5.05
110	5.40	6.65	7.73	4.52	3.97	5.66	5.50	6.90	7.83	4.56	4.03	5.76
Mean	4.12	5.17	5.75	3.56	3.13	4.36	4.24	5.33	5.86	3.65	3.25	4.46

LSD at 5% for:

Nitrogen rates (N)	**0.10**	**0.12**
Growth regulators (G)	**0.11**	**0.13**
Interaction (N) ×(G)	**0.27**	**0.28**

This is reflected in greater net assimilation rate stored which led to increasing top, root and sugar yields per fed. On the other hand, the decreases in root/ top rate due to increasing nitrogen rate might be attributed to the stimulating effect of nitrogen on foliage growth than root, hence root/ top ratio decreased. Also, decreasing sucrose % in roots as increasing nitrogen rate may be due to increasing root volume and weight with raising nitrogen rate led to decrease sucrose concentration in big roots. These results are in harmony with those of El-Hawary (1999), Nemeat Alla *et al.* (2002), Leilah *et al*. (2005) and Abd El-Kader (2008).

Table 7: Average root yield /fed (ton) of sugar beet as affected by nitrogen fertilizer rates and growth regulators treatments and their interaction in 2009/2010 and 2010/2011 seasons

Nitrogen fertilizer rates (kg N/fed)	2009/2010 season					Mean	2010/2011 season					Mean
	Growth Regulators treatments						Growth Regulators treatments					
	Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix		Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix	
Zero (control)	14.05	15.68	15.87	15.02	15.43	15.21	14.23	15.98	16.21	15.21	15.62	15.45
70	19.68	26.10	27.38	23.40	25.52	24.41	20.08	27.06	28.31	23.95	25.95	25.07
90	25.30	28.80	30.46	26.33	27.40	27.66	25.85	29.33	31.58	27.16	28.26	28.44
110	28.05	35.08	36.90	29.37	32.29	32.33	28.54	36.00	39.84	30.23	33.95	33.71
Mean	21.77	26.41	27.65	23.53	25.16	24.90	22.17	27.09	28.98	24.14	25.94	25.67

LSD at 5% for:

Nitrogen rates (N)	**0.44**	**0.45**
Growth regulators (G)	**0.49**	**0.51**
Interaction (N) ×(G)	**0.99**	**1.03**

Table 8: Average sucrose yield /fed (ton) of sugar beet as affected by nitrogen fertilizer rates and growth regulators treatments and their interaction in 2009/2010 and 2010/2011 seasons

Nitrogen fertilizer rates (kg N/fed)	2009/2010 season					Mean	2010/2011 season					Mean
	Growth Regulators treatments						Growth Regulators treatments					
	Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix		Zero (control)	100 ppm IAA	200 ppm IAA	1000 ppm Pix	2000 ppm Pix	
Zero (control)	1.95	2.24	2.19	2.20	2.29	2.18	1.99	2.30	2.25	2.26	2.34	2.23
70	3.36	4.72	4.81	4.29	5.37	4.15	3.45	4.49	5.02	4.45	5.75	4.72
90	3.96	5.14	5.21	4.54	5.03	4.77	4.08	5.13	5.40	4.71	5.24	4.91
110	4.24	5.54	5.65	4.87	5.52	5.16	4.33	5.71	6.13	5.05	5.84	5.41
Mean	3.38	4.41	4.46	3.97	4.55	4.16	3.46	4.52	4.70	4.12	4.79	4.14

LSD at 5% for:

Nitrogen rates (N)	**0.11**	**0.12**
Growth regulators (G)	**0.12**	**0.13**
Interaction (N) ×(G)	**0.24**	**0.27**

Results presented in Tables 2 to 8 indicate that the effect of growth regulators treatments was significant on all studied traits in both seasons. Sugar beet plants sprayed by Mepiquate Chloride (Pix) at the concentration of 2000 ppm gave the highest values of root/ top ratio 9.19 and 8.99, sucrose % (17.73 and 18.19) and sugar yield/ fed (4.55 and 4.79) tons as compared with all other treatments in 2009/ 2010 and 2010/ 2011 seasons, respectively. The differences in sugar yield per fed between plants treated by Mepiquate chloride at the concentration of 200 ppm and those sprayed by IAA at the concentration of 200 ppm was insignificant in the both seasons. In this connection, spraying sugar beet plants by indole acetic acid at the

concentration of 200 ppm gave the highest values of potassium % (3.03 and 3.09 %), top yield / fed (5.75 and 5.86) and root yield/ fed (27.65 and 28.28 tons), on the contrary, it had the lowest values of root/ top ratio 4.85 and 4.93, sodium % 1.66 and 1.60 as compared with the all other studied treatments in 2009/ 2010 and 2010/ 2011 seasons, respectively. The increase in root yield due to increasing Indole acetic acid (IAA) concentration may be attributed to IAA stimulated vegetative growth and increased nitrogen fertilizer which caused increased leaf area index and raising photosynthetic rate which led to increasing root yield per fed. While, increasing sugar yield per fed owing to the highest concentration of Mepiquate chloride (pix) might be due to the decrease vegetative growth rate and increased sucrose translocated and stored in roots, therefore sugar yield per fed increased. These results are in harmony with those of Daie (1986), Fletcher *et al*. (1994) and Moustafa, Shafika *et al.* (2001)

Results recorded in Tables 2-8 show that all studied traits were significantly affected by the interaction effect between nitrogen fertilizer rates and growth regulators treatments in both seasons, except sodium percentage in 2009/ 2010 season only. The obtained results indicated that the highest root/ top ratio (11.54 and 10.95) were recorded with treated plants by 2000 ppm Mepiquate chloride and did not received any nitrogen fertilizer (control) as compared to all other this interaction treatments, but the lowest values (4.50 and 4.46) were recorded with plants treated by 90 kg N/ fed and 100 ppm IAA in 2009/ 2010 and 2010/ 2011 seasons, respectively. Sugar beet plants fertilized by 70 kg N / fed and sprayed by 2000 ppm Mepiquate chloride gave higher sucrose % (21.03 and 22.13), but the untreated plants had the lowest sucrose % (13.87 and 13.95) compared to all other treatments in 2009/ 2010 and 2010/ 2011 seasons, respectively. Fertilizing sugar beet plants by 110 kg N/ fed and sprayed by IAA at the concentration of 200 ppm gave the highest potassium % (3.34 and 3.37), top yield/ fed (7.73 and 7.83) tons, root yield/ fed (36.90 and 39.84) tons and sugar yield / fed (5.65 and 6.13) tons, this results are in same line with obtained with Daie (1986). On the other hand, untreated plants with nitrogen fertilizer and growth regulators gave the lowest values of potassium % 1.62 and 1.68, root yield/ fed 14.05 and 14.23 ton and sugar yield/ fed 1.95 and 1.99 tons compared to all other treatments in 2009/ 2010 and 2010/ 2011 seasons, respectively.

Generally, it could be recommended that fertilized sugar beet plants with 110 kg N/ fed and sprayed by IAA at the concentration of 200 ppm increased root and sugar yields/ fed at El-Hammoul, Kafer El-Sheikh Governorate conditions.

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تأثير معدلات السماد الأزوتى وبعض معاملات منظمات النمو على بنجر السكر

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أجريت تجربتان حقليتان في مركز الحامول محافظة كفر الشيخ في موسمي ٢٠٠٩/٢٠١٠ و ٢٠١٠/٢٠١١ لدراسة تأثير أربعة معدلات من السماد الأزوتى وهى كنترول(بدون إضافة) ٧٠؛ ٩٠ و ١١٠ كجم ن / فدان وخمسة معاملات لمنظمات النمو وهى كنترول(الرش بماء الصنبور) ؛ الرش بمنظمي النمو أندول حمض الخليك بتركيز ١٠٠؛٢٠٠ جزء في المليون و كلوريد ميبوكيت (بكس) بتركيز ١٠٠٠و٢٠٠٠ جزء في المليون على نمو ومحصول بنجر السكر . وقد صممت التجربة في تصميم القطع المنشقة مرة واحد في ثلاث مكررات.

وتتلخص أهم النتائج فيما يلي:

أوضحت النتائج أن تأثير معدلات السماد الأزوتى كان معنويا على نسبة الجذر / العرش والنسبة المئوية للسكروز والنسبة المئوية للبوتاسيوم والنسبة المئوية للصوديوم في الجذور ومحصول العرش/ فدان ومحصول الجذور / فدان ومحصول السكر / فدان في كلا موسمي الدراسة. أعطى التسميد بمعدل ١١٠ كجم ن / فدان زيادة تقدر بحوالي ١٠٧.٣٣% و ١٥٤.١٤ % لمحصول العرش / فدان ، ١١٢.٥٥% و ١١٨.١٨% لمحصول الجذور / فدان ؛ ١٣٦.٧٠% و ١٤٢.٦٠% لمحصول السكر / فدان مقارنة بالكنترول(بدون إضافة سماد أزوتى) في موسمي ٢٠٠٩/٢٠١٠ و ٢٠١٠/٢٠١١ على التوالي.

تأثرت كل الصفات المدروسة معنويا بمعاملات منظمات النمو في كلا موسمي الدراسة. حيث أعطى رش النباتات بمنظم النمو أندول حمض الخليك بتركيز ٢٠٠جزء في المليون أعلى محصول عرش / فدان ٥.٧٥و ٥.٨٦ طن ومحصول جذور / فدان ٢٦.٦٥ و ٢٨.٩٨ طن / فدان ومحصول سكر / فدان ٤.٤٦ و ٤.٧٠ طن / فدان مقارنة بباقي المعاملات الاخرى في موسمي ٢٠٠٩/٢٠١٠و ٢٠١٠/٢٠١١ على التوالي.

كان تأثير التفاعل بين معدلات السماد الأزوتى ومعاملات منظمات النمو معنويا على كل الصفات المدروسة في كلا الموسمين ماعدا النسبة المئوية للصوديوم في الجذور في موسم ٢٠٠٩/٢٠١٠. أعطى تسميد نباتات بنجر السكر بالسماد الأزوتى بمعدل ١١٠كجم ن / فدان ورشها بمنظم النمو أندول حمض الخليك بتركيز ٢٠٠جزء في المليون أعلى محصول عرش للفدان ٧.٧٣و٧.٨٣ طن ومحصول الجذور للفدان ٣٦.٩٠ و٣٩.٨٤ طن ومحصول السكر للفدان ٥.٦٥ و٦.١٣ طن مقارنة بباقي المعاملات الأخرى.

و توصى الدراسة بتسميد بنجر السكر بمعدل ١١٠ كجم ن / فدان مع رشها بمنظم النمو أندول حمض الخليك بتركيز ٢٠٠ جزء في المليون حيث أدي إلى زيادة محصول الجذور والسكر للفدان تحت ظروف ارض مركز الحامول بمحافظة كفر الشيخ .

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