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RESPONSE OF SOME SUGAR BEET CULTIVARS TO GROWTH REGULATOR TREATMENTS

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ABSTRACT

Two field experiments were conducted at Sabahia Agric. Res. Station in Alexandria during 2002/ 2003 and 2003 / 2004 seasons. The objectives of this investigation was aimed to study the effect of some cultivars of sugar beet (Farida, Lados, and Athospoly) to some growth regulator treatments [indol acetic acid (IAA) and gibberellic acid (GA_3)] at different concentration (control, 100 ppm IAA, 200 ppm GA_3, 300 ppm GA_3,(100 ppm IAA + 200 ppm GA_3) and (100 ppm IAA + 300 ppm GA_3) on root yield and its quality. A split plot design in four replications was used. The main finding could be summarized as follows:-

The results indicated that studied cultivars significantly differed in all studied characteristics under study exclusive root diameter and juice purity in both seasons as well as root weight in g / plant in the first season only were insignificantly affected. Farida cultivar surpassed Lados cultivar by 6.8 and 12.9 %, Athospoly cultivar by 5.5 and 9.3 % in root and sugar yield / fed, respectively over both seasons.

Regarding growth regulator treatments, the results indicated that all studied characters significantly affected in both seasons except juice purity in the first season only insignificantly affected. Foliar application of GA_3 at 300 ppm significantly produced the highest root diameter, root length, root weight in g / plant, total soluble solids (T.S.S. %), sucrose, juice purity percentages as well as root and sugar yields / fed in both seasons. Root yield increased by 37.5 % and sugar yield by 66.6 % with spraying GA_3 at 300 ppm compared with the check treatment over both seasons.

Generally, it could be concluded that foliar application of GA_3 at 300 ppm with sown Farida cultivar maximized root and sugar yields per feddan.

Keywords: Sugar beet, Cultivars, Growth regulators GA_3, IAA, Root and Sugar yields.

INTRODUCTION

Sugar beet (*Beta vulgaris , L.*) is considered one of the two important sugar crops in the world as well as in Egypt. It is well established that among sugar beet varieties, root and sugar yields as well as sucrose percentage related to inherent growth capabilities vary widely. Also, the wide variability response among genotypes to environmental factors. Some investigators have reported differences among sugar beet varieties in root yield and quality. Kamel *et al* (1981) found that multigerm cvs. significantly produced heavier roots than the monogerm ones, while the monogerm cvs. had the highest sugar content. Ramadan, (1999) reported that the Eva variety had the best quality traits in terms of sucrose, purity and recoverable sugar percentages as well as the lowest impurities in the root, while Raspoly variety gave the highest root weight, the highest number of roots at harvest and out yielded the other varieties in roots and sugar production.

It is well known that growth hormones play a vital role in the control of growth, not only within the plant as whole, but apparently also within individual organ of sugar beet. Many investigators utilized growth regulators to increasing sugar beet yield and quality. Khalil, and Reda (1975) reported that GA_3 increased sugar and root yields. Bhatnagar and Raj, (1978) concluded that the highest root yield and sucrose percentage was observed when the varieties were sprayed with1000 ppm. GA_3 at 81 and 91 days after planting. Also they concluded that the effects of GA_3 were genotype specific. Agarwala *et al* (1978), reported that foliar application of GA_3 and IAA increased sugar and root yields. Papakosta – Tasopoulou, and Sficas, (1978) found that spraying GA_3 increased total soluble solids and root yields of sugar beet. Saftner and Wyse (1980) observed that it has been proposed that sucrose is co – transported with potassium and counter - transported with proton across the tonoplast on the sink cells and this process is apparently stimulated by the hormones IAA and ABA. Also they stated that GA_3 and IAA affected on sucrose up – take by sugar beet root tissue. El – kassaby *et al* (1988) found that application of GA_3 at 1000 ppm significantly increased root dimension, sucrose percentage, root and sugar yields when compared with control.

Indol acetic acid (IAA)has been implicated in energy dependent phloem – loading process. (Ho and Baker 1982; Daie and Wyse, 1983). Daie (1987) stated that the hormonal control of sucrose – metabolizing enzymes in leaves, suggesting that GA_3 and IAA may be crucial roles in the partitioning of carbon in this tissue.

On the other hand, Abo El – Ghait (1993) investigated the effect of foliar application of IAA at 0, 1000 and 1500 ppm on some sugar beet varieties in two location in Egypt. He found that using 1500 ppm of IAA significantly increased sucrose percentage at Kafr El – Sheikh. Ashmaye, Samia (1998) observed that IAA increased markedly sugar yield. Moustafa, Shafika *et al* (2001) stated that treatment with indol acetic acid + abscisic acid (IAA + ABA) enhanced the root content of total soluble solids and sucrose, also the yield of root and sugar ton fed $^{-1}$ especially at 10^{-6} Molar. Moustafa, Zeinab *et al* (2001) found that IAA at 10^{-6} or 10^{-12} Molar increased root quality (total soluble solids, sucrose and purity in juice) root and sugar yields.

The objectives of this study was aimed to study performance of some sugar beet cultivars to growth regulator treatments on root yield and its quality.

MATERIALS AND METHODS

Two field experiment was carried out during two successive seasons of 2002 / 2003 and 2003 / 2004 at Sabahia Agric. Res. Station in Alexandria Governorate, Egypt. The aim of this investigation was study the effect of growth regulator treatments on performance of some sugar beet cultivars productivity. The experiment factors of this study were arranged in split – plot design with four replications. The main plots included three cultivars (Farida, Lados, and Athospoly). While six growth regulator treatments of indol acetic acid (IAA) and gibberellic acid (GA_3) were arranged in sub – plots at concentrations control, 100 ppm IAA, 200 ppm GA_3, 300 ppm GA_3, (100 ppm IAA + 200 ppm GA_3) and (100 ppm IAA + 300 ppm GA_3). All growth regulators were foliar

sprayed on plants at two equal doses the first one was applied after 60 days from sowing and the second dose was sprayed 30 days later. Plot area was (3.5 x 3) = 10.5 m^2 included four ridges 50 cm apart and 3.5 m length. Sugar beet seeds were sowing 20 cm between hills. The recommended doses of fertilizers Nitrogen, phosphorus and potassium were applied (90,15 and 48 kg / fed, respectively). The phosphorus and potassium fertilizers were added during soil preparation and before sowing. Nitrogen was added in two equal doses the first dose was applied after thinning (30 days from sowing) and the second was applied one month later. Fertilizer sources were ammonium nitrate (33 % N), superphosphate (15 % P_2O_5) and potassium sulphate (48 % K_2O). The preceding crop was sweet sorghum during the both seasons. The other agricultural practices were carried out as it is prevailing in the region. Physical, mechanical and chemical properties of the experimental soil are presented in Table 1. Soil properties were determined according to Page (1982) and Jackson (1967).

At harvest (210 days from sowing) two guarded rows for every plot were taken to determine the yield and yield attributes and then random sample of ten plants was taken from each plot to determine the following measurements: -

1– Root length, root diameter, root weight in g / plant.

2 – Total soluble solids percentage (T.S.S %) was determined by using a hand refractometer according to (A.O.A.C. 1986).

3 – Sucrose percentage was determined according to Carruthers and Oldfield (1961).

4 –Theoretical juice purity percentage was computed using the following equation according to Carruthers and Oldfield (1961).

Theoretical juice purity percentage = sucrose % X 100 ÷ T.S.S. %

5 – Root yield (ton / fed).

6 – Theoretical sugar yield (ton / fed) was calculated by multiplying root yield ton / fed by sucrose %

Table (1): Some physical, mechanical and chemical properties of the surface soil layer (30 cm) of the experimental soil

Soil Character		2002/ 2003	2003 / 2004
Mechanical analysis	Clay	42.3	43.1
	Silt	43.1	42.8
	Sand	14.6	14.1
Texture class		Clay loam	Clay loam
Organic matter %		1.38	1.25
$pH_{1:2.5}$		7.78	8.02
$CaCO_3$ %		5.8	6.9
E.C dSm^{-1}		4.75	4.62
Total N %		0.10	0.13
Soluble cations (meq. L^{-1})	Cl^-	27.12	25.00
	K^+	1.25	0.96
	Ca^{++}	17.25	16.31
	Mg^{++}	11.3	10.20
	Na^+	4.60	13.90

Data were statistically analyzed using technique of analysis of variance for the split plot design according to Snedecor and Cochran (1967) to compare between means, LSD at 5% level of probability was used.

RESULTS AND DISCUSSION

1 – Root diameter

Means of root diameter as affected by cultivars and growth regulators during 2002/ 2003 and 2003 / 2004 seasons are presented in Table 2. The results show that there is no significant differences between root diameter of sugar beet roots due to cultivars in both seasons. Foliar application of growth regulators, gibberellic acid (GA_3) and indol acetic acid (IAA) significantly affected root diameter in both seasons. The biggest roots resulted from foliar application by gibberellic acid (GA_3) at concentration of 300 ppm, which were 13.2 and 12.3 cm in both seasons, respectively. The increases in root diameter due to the influence of gibberellic acid (GA_3) on the cell division (division of the cambia and subsequent division of the cambial products) and rapid cell expansion which increased the cell size this lead to increase the root diameter. These results are in agreement with those obtained by El – kassaby *et al* (1988) who found that application of GA_3 at 1000 ppm significantly increased root dimension. Also similar results are obtained by Darra and Saxena (1973), Gaber *et al* (1981), Shehata, Mona (1989), Abo EL- Ghait (1993), Ramadan (1999) and Moustafa, Zeinab *et al* (2001).

2 – Root length

The results in Tables 2 appear the response of sugar beet cultivars to foliar application with growth regulators on root length in the two seasons. The results obtained showed that Athospoly cultivar recorded the tallest root length, which were 31.2 and 30.9 cm in the first and second seasons, respectively. Lados cultivar recorded the lowest root length, which were 27.2 and 27.2 cm in the first and second seasons, respectively. Concerning the effect of foliar application with growth regulators on root length. The results pointed out that GA_3 at concentration of 300 ppm gave the highest root length values in both seasons. While the control treatment recorded the shortest roots in the two seasons. These finding are in accordance with those obtained by Gaber *et al* (1981), Shehata, Mona (1989), Abo EL- Ghait (1993), Ramadan (1999) and Moustafa, Zeinab *et al* (2001).

3 – Root weight

The results in Table 2 reveals the influence of cultivar and growth regulators on root weight in gram per plant in the two seasons. The results show that cultivars significantly differed in root weight in the second season only, while in the first season insignificantly affected. In the second season Farida cultivar gave the highest root weight (859.20 g), while Athospoly cultivar gave the highest root weight (887.12 g) in the first season. Spraying sugar beet plants with GA_3 alone at 300 ppm produced the heaviest roots (1049.33 and 1032.70 g) followed by spraying with mixture of 300 ppm of GA_3 and 100 ppm of IAA which recorded (990.07 and 940.75 g.) in the two

seasons, respectively. Decreasing concentration of GA $_3$ from 300 ppm to 100 ppm lead to lowest root weight. Similar results were found by Gaber (1979), Gaber *et al* (1981), Ashmaye, Samia, (1998), Moustafa, Shafika, *et al* (2001) and Moustafa, Zeinab, *et al* (2001).

Table 2: Means of root diameter, root length and root weight as affected by growth regulators and cultivars of sugar beet during the two seasons.

Treatments		Root diameter cm		Root length cm		Root weight g / plant	
		2002 / 2003	2003 / 2004	2002 / 2003	2003 / 2004	2002 / 2003	2003 / 2004
A –Cultivars	Farida	11.5	11.2	28.0	28.1	883.16	859.20
	Lados	11.6	10.7	27.2	27.2	825.25	837.04
	Athospoly	11.5	10.2	31.2	30.9	887.12	772.79
F- test		N.S	N.S	**	*	N.S	*
L.S.D. 5%		-	-	0.8	1.7	-	54.70
B – Growth regulators	Control	10.2	9.7	24.9	24.3	753.58	711.85
	IAA 100 ppm	11.5	11.2	28.0	27.9	930.80	848.80
	GA_3 200 ppm	11.6	10.5	29.2	29.3	858.54	809.8
	GA_3 300 ppm	13.2	12.3	37.0	37.8	1049.33	1032.70
	IAA 100 ppm + GA_3 200 ppm	11.5	10.9	28.6	28.6	894.67	829.30
	IAA 100 ppm + GA_3 300 ppm	12.4	11.7	32.5	32.8	990.07	940.75
F-test		**	**	**	**	**	**
L.S.D 5%		0.5	0.4	1.9	1.7	65.60	55.10

4 – Total Soluble Solids percentage (T.S.S. %)

The results furnished in Table 3 clear the performance of some sugar beet cultivars to growth regulator treatments and their effect on total soluble solids percentage in both seasons. The results showed that the highest total soluble solids percentage (21.21 and 19.95 %) was recorded from Farida cultivar which also recorded the highest sucrose percentage, however, Lados cultivar gave the lowest values of total soluble solids (19.75 and 19.83 %) in both seasons, respectively. In respect to GA $_3$ and IAA influence on T.S.S. % the results in Table 3 pointed out that spraying sugar beet by GA $_3$ alone gave the highest T.S.S. percentages. The lowest T.S.S. percentages produced from control treatment. These observations were fairly true with those elucidated by Shehata, Mona, (1989), Abo EL- Ghait (1993), Ramadan (1999) and Moustafa, Zeinab, *et al* (2001).

5 – Sucrose percentage

The results obtained in Table 3 pointed out the performance of studied some sugar beet cultivars to growth regulator treatments on sucrose percentage of sugar beet in the two seasons. The available results showed that Farida cultivar recorded the highest sucrose percentage in both seasons (16.25 and 16.54 %). Foliar application on sugar beet by GA_3 alone gave the highest sucrose concentration (18.46 and 17.98 %) followed by spraying with mixture from 300 ppm of GA_3 and 100 ppm of IAA which recorded (17.62 and 17.14 %). Decreasing GA $_3$ concentration caused to decrease sucrose percentage. this finding was as similar as that of T.S.S. (Table 3). This may be due to the influence of gibberellic acid (GA $_3$) on the cell division

(division of the cambia and subsequent division of the cambial products) and rapid cell expansion which increased the cells size. These finding are in agreement with Milford (1973) who examined sucrose concentration in more detail by determining its relationship with cell size. He found that as cell size increased to 10 –15 X 10^{-8} cm^3 the sucrose content per cell increased nearly proportionally with cell volume and Saftner and Wyse (1980) who stated that it has been proposed that sucrose is co – transported with potassium and counter - transported with proton across the tonoplast on the sink cells and this process is apparently stimulated by the hormones IAA and ABA. Also they observed that GA_3 and IAA affected on sucrose up – take by sugar beet root tissue. Similar conclusion was obtained by Gaber *et al* (1981), Shehata, Mona, (1989), Abo EL- Ghait (1993), Ramadan (1999) and Moustafa, Zeinab, *et al* (2001).

6 – Juice purity percentage

The results in Table 3 reveal the influence of some sugar beet cultivars and growth regulator treatments as GA_3 and IAA on juice purity percentage of sugar beet roots. The results appear that there is no significant differences between cultivars on juice purity percentages in both seasons. Foliar spraying of sugar beet plants with growth regulators significantly affected on juice purity percentages in both seasons. Foliar spraying sugar beet plants with GA_3 at concentration of 300 ppm gave the highest purity percentages (85.30 and 85.62 %) in the two seasons followed by spraying a combination of 300 ppm of GA_3 with 100 ppm of IAA which recorded (82.03 and 82.01%). However, the control treatment recorded the lowest percentages of juice purity (81.59 and 81.46 %) in both seasons. These results are in line those obtained by Shehata, Mona, (1989), Abo EL – Ghait (1993), Ramadan (1999) Moustafa, Shafika, *et al* (2001) and Moustafa, Zeinab, *et al* (2001).

Table 3: Means of total soluble solids, sucrose and juice purity as affected by growth regulators and cultivars of sugar beet during the two seasons.

Treatments		T.S.S. %		Sucrose %		Juice Purity %	
		2002 / 2003	2003 / 2004	2002 / 2003	2003 / 2004	2002 / 2003	2003 / 2004
A - Cultivars	Farida	21.21	19.95	17.25	16.54	81.33	82.91
	Lados	19.75	19.92	16.19	16.30	81.97	81.82
	Athospoly	19.75	19.83	16.29	16.32	82.48	82.30
F- test		*	*	*	*	N.S	N.S
L.S.D. 5%		0.64	0.44	0.48	0.32	-	-
B – Growth regulators	Control	18.92	18.77	15.43	15.29	81.55	81.46
	IAA 100 ppm	20.50	19.90	16.77	16.29	81.80	81.86
	GA_3 200 ppm	20.37	19.77	16.70	16.18	81.98	81.84
	GA_3 300 ppm	21.64	21.00	18.46	17.98	85.30	85.62
	IAA 100 ppm + GA_3 200 ppm	20.43	19.87	16.73	16.23	81.89	81.68
	IAA 100 ppm + GA_3 300 ppm	21.48	20.90	17.62	17.14	82.03	82.01
F-test		**	**	**	**	N.S	*
L.S.D 5%		0.78	0.57	0.67	0.45	-	1.36

7 – Root yield (ton / fed)

The results in Table 4 clearly indicated that studied sugar beet cultivars significantly differed in root yield / fed in both seasons. The results clearly showed that Farida cultivar exceeded Lados cultivar by 6.8% and surpassed Athospoly cultivar by 5.5 % in root yield / fed over both seasons. The differences in root yield / fed due to cultivar may be attributed to differences in yield components as well as genetically factors. Similar results were reported by Kamel *et al* (1981) and Ramadan (1999).

Regarding to the influence of growth regulator treatments on root yield / fed, the results showed that root yield / fed significantly affected by growth regulator treatments in both seasons. Foliar spraying of GA_3 at 300 ppm alone gave highest root yield / fed (29.40 and 30.14 ton / fed) compared with other treatments in both seasons. Spraying GA_3 exceeded root yield / fed by 37.5 % compared with the control treatment over both seasons. Followed with mixed IAA at 100 ppm + GA_3 at 300 ppm in both seasons. However, the lowest root yield / fed produced from the control treatment. These results in good agreement with that found by Shehata, Mona (1989), Abo EL- Ghait (1993), Ramadan (1999) and Moustafa, Zeinab *et al* (2001).

Table 4:- Means of root and sugar yields per feddan as affected by sugar beet cultivars and growth regulator treatments during the two seasons.

Treatments		Root yield ton / fed		Sugar yield ton / fed	
		2002 / 2003	2003 / 2004	2002 / 2003	2003/ 2004
A - Cultivars	Farida	25.00	25.02	4.31	4.14
	Lados	23.74	23.10	3.84	3.64
	Athospoly	22.58	24.85	3.68	4.05
F- test		**	*	*	*
L.S.D. 5%		0.428	0.73	0.192	0.169
B – Growth regulators	Control	21.54	20.86	3.32	3.19
	IAA 100 ppm	23.36	24.97	3.92	4.06
	GA_3 200 ppm	22.90	24.77	3.82	4.01
	GA_3 300 ppm	29.40	30.14	5.43	5.42
	IAA 100 ppm + GA_3 200 ppm	23.13	24.87	3.87	4.04
	IAA 100 ppm + GA_3 300 ppm	26.38	27.56	4.65	4.72
F-test		**	**	**	**
L.S.D 5%		0.68	0.81	0.338	0.201

Root yield in ton / fed significantly affected by the interaction between cultivars and growth regulators, the results in Table 5 clearly indicated that root yield / fed significantly affected in both seasons. The highest means of root yield / fed were produced from sown Farida cultivar with spraying by GA_3 at concentration of 300 ppm which were, 27.58 and 27.49 ton / fed in both seasons, respectively. However, the lowest root yield / fed were produced from Athospoly cultivar without spraying growth regulator in the first season and sown Lados cultivar without spraying growth regulator in the second season.

8 – Sugar yield (ton / fed)

Means of sugar yield in ton / fed significantly affected due to cultivars and growth regulator treatments in both seasons as shown in Table 4. the results indicated that cultivars significantly differed in sugar yield / fed in both seasons. The results clearly indicated that sown Farida cultivar surpassed Lados cultivar by 12.9 % and Athospoly cultivar by 9.3 % in sugar yield in ton / fed over both seasons. The differences in sugar yield of different cultivars may be attributed the differences in both root yield and sucrose percentages. These results are in agreed with those obtained by many investigators such as Ramadan (1999). Concerning the effect of growth regulator treatments on sugar yield / fed, the results clearly indicated that foliar spraying of GA_3 at 300 ppm produced the highest sugar yield / fed, which were 5.43 and 5.42 ton / fed in the first season and the second season respectively. Followed by mixture of GA_3 at 300 ppm + IAA at 100 ppm, which were 4.65 and 4.72 ton / fed in the first season and the second season, respectively. Foliar spraying of GA_3 at 300 ppm exceeded sugar yield by 66.6 % compared with the control treatment over both seasons. These results are conformed by Darra and Saxena (1973), Gaber *et al* (1981), Abo EL- Ghait (1993), Ramadan (1999), Moustafa, Shafika, *et al* (2001) and Moustafa, Zeinab, *et al* (2001).

Table 5:- Means of root yield / fed as affect by the interaction between cultivars and growth regulators treatments during the two seasons.

Treatments		2002 / 2003			2003 / 2004		
		Farida	Lados	Athospoly	Farida	Lados	Athospoly
Growth regulators	Control	23.27	22.64	22.06	22.94	21.98	22.85
	IAA 100 ppm	24.18	23.55	22.97	25.00	24.03	24.91
	GA_3 200 ppm	23.95	23.32	22.74	24.89	23.93	24.81
	GA_3 300 ppm	27.49	26.57	26.00	27.58	26.62	27.20
	IAA 100 ppm + GA_3 200 ppm	24.06	23.45	22.86	24.95	23.98	24.86
	IAA 100 ppm + GA_3 300 ppm	25.69	25.06	24.48	26.29	25.33	26.21
F-test		••			••		
L.S.D 5%		0.96			1.52		

Table 6 :- Means of sugar yield / fed as affect by the interaction between cultivars and growth regulators treatments during the two seasons.

Treatments		2002 / 2003			2003 / 2004		
		Farida	Lados	Athospoly	Farida	Lados	Athospoly
Growth regulators	Control	3.81	3.58	3.50	3.67	3.42	3.62
	IAA 100 ppm	4.12	3.88	3.80	4.10	3.86	4.06
	GA_3 200 ppm	4.06	3.83	3.75	4.08	3.83	4.03
	GA_3 300 ppm	4.87	4.64	4.55	4.78	4.54	4.74
	IAA 100 ppm + GA_3 200 ppm	4.09	3.86	3.78	4.09	3.85	4.05
	IAA 100 p-pm + GA_3 300 ppm	4.48	4.25	4.17	4.43	4.19	4.39
F-test		••			••		
L.S.D 5%		0.48			0.38		

Sugar yield in ton / fed significantly affected by the interaction between cultivars and growth regulators the results in Table 6 clearly showed that sugar yield / fed significantly affected in both seasons. The highest means of sugar yield / fed were produced from sown Farida cultivar with spraying by GA_3 at concentration of 300 ppm which were, 4.87 and 4.78 ton / fed in both seasons, respectively. However, the lowest sugar yield / fed were produced from sown Lados or Athospoly cultivars and without growth regulators application in both seasons.

Generally, it could be concluded that growing sugar beet cultivar viz. Farida and foliar spraying with 300 ppm GA_3 produced maximum root and sugar yields per feddan.

CONCLUSION

It could be conclude that foliar spraying with growth regulators such as GA_3 (300 ppm) gave a relative increase in root and sugar yields per feddan.

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استجابة بعض أصناف بنجر السكر لمعاملات منظمات النمو

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أقيمت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بالصبحية محافظة الإسكندرية خلال موسمي الزراعة ٢٠٠٢ / ٢٠٠٣ و ٢٠٠٣ / ٢٠٠٤ . بهدف دراسة سلوك بعض أصناف بنجر السكر (Farida, Lados, and Athospoly) لبعض التركيزات المختلفة من منظمات النمو وهى معاملة الكنترول (بدون منظمات نمو) – معاملة بتركيز ١٠٠ جزء في المليون IAA – معاملة بتركيز ٢٠٠ جزء في المليون GA_3 – معاملة بتركيز ٣٠٠ جزء في المليون GA_3 – معاملة تحتوى على خليط من (١٠٠ جزء في المليون IAA + ٢٠٠ جزء في المليون GA_3) – معاملة تحتوى علي خليط من (١٠٠ جزء في المليون IAA + ٣٠٠ جزء في المليون GA_3) تم استخدام تصميم القطع المنشقة مرة واحدة في أربع مكررات لتنفيذ التجارب وكانت أهم النتائج المتحصل عليها ما يلي :-

١ – لقد اختلفت الأصناف تحت الدراسة اختلافا معنويا في جميع الصفات المدروسة ما عدا قطر الجذر ونقاوة العصير خلال موسمي الزراعة ووزن الجذر بالجرام / نبات في الموسم الأول فقط. أشارت النتائج إلي تفوق الصنف Farida في محصول الجذور للفدان بنسبة ٦,٨ ٪ مقارنة بالصنف Lados وبنسبة ٥,٥ ٪ مقارنة بالصنف Athospoly . كما تفوق الصنف Farida في محصول السكر للفدان بنسبة ١٢,٩ ٪ مقارنة بالصنف Lados وبنسبة ٩,٣ ٪ مقارنة بالصنف Athospoly وذلك كمتوسط للموسمين.

٢ – أوضحت النتائج أن معاملات منظمات النمو أثرت معنويا على جميع الصفات تحت الدراسة ماعدا نسبة نقاوة العصير في الموسم الأول فقط.أشارت النتائج إلي أن معاملة الرش بحامض الجبريليك بتركيز ٣٠٠ جزء في المليون قد سجلت أعلى القيم لقطر الجذر و طول الجذر ووزن الجذر بالجرام / نبات ومحصول الجذور و السكر بالطن / فدان خلال موسى الزراعة. أدي الرش بحامض الجبريليك بتركيز ٣٠٠ جزء في المليون إلي زيادة في محصول الجذور بالطن / فدان بنسبة ٣٧,٥ ٪ ومحصول السكر بالطن / فدان بنسبة ٦٦,٦ ٪ وذلك مقارنة بمعاملة الكنترول وذلك كمتوسط للموسمين.

٣ – لقد أدي التفاعل بين الأصناف و معاملات منظمات النمو إلي تأثير معنوي لمحصول الجذور و السكر في كل من موسمي الزراعة. وأوضحت النتائج أن أعلى محصول للجذور و السكر قد نتج عن الزراعة بالصنف Farida والرش بحامض الجبريليك بتركيز ٣٠٠ جزء في المليون و ذلك خلال موسمي الزراعة.

توصى هذه الدراسة للحصول على أعلى إنتاجية وجودة من محصول بنجر السكر بزراعة الصنف Farida والرش بحامض الجبريليك بتركيز ٣٠٠جزء في المليون.