Minia J. of Agric. Res. & Develop.
Vol. (36), No.3, pp. 407-427, 2016

FACULTY OF AGRICULTURE

EFFECT OF PLANTING METHODS AND GROWTH REGULATORS ON YIELD AND QUALITY OF SOME SUGAR BEET CULTIVARS

Ibrahim M. M.[(1)] ; N. A. E. Azaz[(2)] ; Y. A. M . Khalifa[(1)] and E. M. M. Khames[(2)].

[(1)]Dept. of Agron., Fac. of Agric., Al-Azhar Univ., Assiut branch, Egypt.
[(2)] Dept. of Chem., Fac. of Agric., Damietta Univ., Egypt.

Received: 29August (2016) Accepted: 7 September (2016)

ABSTRACT

Two field experiments were carried out in 2013/2014 and 2014/2015 growing seasons at a private farm at Gohina, Sohag Governorate to study the response of three mono-germ of sugar beet cultivars (Marathon, Puma and Paicea) to some growth regulators [indol acetic acid (IAA) at 50, 100 and 150 ppm] and [gibberlic acid (GA3) at 50, 100 and 150 ppm] as well as control and two planting methods (direct seed and transplanting by paper pots). The experiments were performed in a split-split plot design where sugar beet cultivars were assigned to the main plots, while growth regulators treatments and planting methods were distributed randomly in the sub and sub-sub plots, respectively.

The obtained results showed that puma cultivar was superior in root yield, sugar yield, total soluble solids % and sucrose % in both season and potassium % in the first season. Paicea cultivar was superior in purity% in the first season. Marathon cultivar was superior in purity % in the second seasons.

The results indicated that root yield and sugar yield were significantly increased by increasing growth regulators concentration from 50 to 100 or 150 ppm in both seasons. Foliar application GA3 at100 ppm gave the highest sucrose % in both seasons, T.S.S % and purity% in the second season only. However foliar application GA3 at 50 ppm gave the highest purity% in the first season, only. Foliar application IAA at 100 ppm gave the highest T.S.S% in the first season. Control treatment gave the highest potassium % in both seasons.

Results indicated that direct seed recorded the highest values from root yield and potassium in the first season. Transplanting by paper pots recorded the highest T.S.S %, sucrose % and purity% in both seasons and the highest potassium in the first season.

The interaction effects among the factors under study on roots yield, sugar yield/fed. T.S.S %, sucrose %, potassium %, and purity percentage were significant effect on these characters with the exception of growth regulators x planting methods and cultivars x growth regulators x planting methods in 2014/2015 season only.

Generally, it could be concluded that foliar application GA3 at 100 ppm on Puma cultivar with transplanting by paper pots maximized root and sugar yields per feddan.

INTRODUCTION

Nowadays, sugar beet *(Beta vulgaris L.)* is the second sugar crop in Egypt after sugar cane. In Egypt, sugar beet could be cultivated in the newly reclaimed soil . The Egyptian government carring out many efforts to decrease the gab between sugar production and consumption. One of these attempts is likely to be in creasing sugar beet yield per unit area. Increasing of sugar beet production can be achieved through optimizing the agricultural practices. Planting of sugar beet is advised to be from the 1st of October till the third week of November. To match the environmental conditions of its origin. On other hand, the economical operating of beet sugar factory dictates that its running period should be within 4-6 months. Sugar beet represents the strategic gate to reduce the gap between production and consumption of sugar in Egypt. Kamel *et al.* (1981) found that multigerm cvs. significantly produced heavier roots than monogerm ones, while the monogerm cvs had the highest sugar content. Jassem (1982) reported that mono-germ sugar beet varieties had lower sugar beet content .He found that mono-germ varieties are higher yielding than multi-germ varieties. Munzert *et al.* (1982) pointed that the variance due to varieties was significant for sugar content, sugar beet yield and quality. Abou-salama and El-Syaid (2000) found significant differences among varieties as Gazelle produced maximum root yield (ton/fed.). However, maximum sugar yield (ton/fed.) was produced by Oscar poly due to its high quality index values. Saif-Laila (2000) appeared that sugar beet root length and root diameter insignificantly affected by the examined varieties. Fresh weight of root and /or top/plant for sugar beet plants significantly responded to the differences between the studied varieties. The values of sucrose % and purity percentage were affected by studied varieties. El-Hosary *et al.* (2007) they found that monta binaco variety recorded the highest value of total soluble solids % and potassium concentration. While, Gloria variety produced the highest value of sucrose, purity percentage. Gomaa *et al.* (2007) studied the performance of three sugar beet varieties (Kawemira, Mont Bianco and Gloria). The results indicated that sugar beet variety Gloria surpassed the studied varieties with respect to its quality. Mean while: it recorded the highest sucrose and purity % and attained the lowest percent to sugar loss to molasses and impurities (K, Na and ∞ -amino-N).

One of these 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 most two important factors in this concern are planting methods and growth regulators. Spraying sugar beet plants with growth regulators may be occasion the balance between growth and sucrose content in roots. Indole acetic acid is a growth regulator 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 gibrellic acid which plays a major role in enhancing vegetative growth. Agarwala *et al*. (1978) Wahdan. (1990) and Mahamoud *et al*.(1994) reported that foliar application of GA3 and IAA increased sugar and root yields. 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 GA3 and IAA affected sucrose up- take by sugar beet root tissue. El-kassaby *et al.* (1988) found that application of GA3 at 1000 ppm significantly increased root dimension, sucrose percentage, root and sugar yield compared with control. Shehata ,Mona (1989) found that GA3 at 300 ppm gave the highest root diameter ,root length ,root fresh weight ,TSS% ,sucrose % ,purity % ,root and sugar yields. El –Taweel *et al.* (2004) indicated that all studies characters significantly affected in both seasons except juice purity in the first season only insignificantly affected. Foliar application of GA3 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 percentage 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 GA3 at 300 ppm compared with the check treatment over both seasons. Abd El-Kader. (2011) indicated that all studies traits were significant 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 both seasons, respectively.

Planting method play important role of sugar beet productivity, particularly, root and sugar yields. On other hand, the earlier sowing season, i.e. August till September ,the summer crops are still under harvest and consequently land preparation for sugar beet earlier season will be delayed in addition , the earlier sowing season for sugar beet will increase the enhance for pests and diseases to attack sugar beet plants. So and based on the available information in respect to the problem, this work was conducted to face and solve delaying land preparation as well as pest management of the earlier sowing season of sugar beet. Using paper pots in a small nursery in the field will keep sugar beet plants under aseptic conditions and save enough time for land preparation after harvesting the summer crops. (El-Geddawy et al. 1997) and Valnli (1985a) reported that transplanting sugar beet seedling grown in paper pots increased yield by 12.97 ton. roots and 2.00 tons sugar/h compared with sowing seed in the field. Vigoureux (1986) noticed that transplanting of sugar beet increased sucrose yield by 22% compared with drilled crop. Lunnan *et al*.(1991) mentioned that transplanting rather than sowing increased sugar content from 14.6 to 15.4%. Ghonema and Sarhan (1994) showed that direct sowing method surpassed the other experimental transplanting ones in all studies charcteristics.Prunning one third of top leaves of seedlings before transplanting was superior over prunning the complete seedling in all studied characters. El-Geddawy *et al.* (1997) found that the highest response in root dimension was attainted with direct sowing method. However, the highest figures of root dimensions were recorded by using paper pots when sugar beet were seedling in 2-leaf stage. He added that using paper pots as a method of transplanting sugar beet seedling attained an additional increments in sucrose content amounted to be 10,6 % over that of direct sowing. While, yields of roots attained the highest values under direct sowing methods fallowed by sowing by sowing by using the transplanting seedling of paper pots. On other hand, top yield was not affect by sowing treatments. Osman *et al.* (2007) they found the highest values of sucrose %, T.S.S % and purity % were obtained from transplanting seedling of 15 days age and/or sowing beet seeds by usual methods of planting lowered values of potassium % in roots. Yousef (2009) showed that both direct seeding and transplants 25 days age produced the highest root yield without significant deference between them. Also, direct seeding did not different significantly from transplants 15 or 25 days age concerning sugar yield.

MATERIALS AND METHODS

Two field experiments were carried out at a private farm, at Gohina, Sohag Governorate, Egypt during seasons, 2013/2014 and 2014/2015 to study the effect planting methods and growth regulators on growth, yield and quality of three sugar beet cultivars. The preceding summer crop was maize in both seasons.

Each experiment included 42 treatments which were combinations of three sugar beet cultivars, two planting method and seven growth regulator treatments.

A-Sugar beet cultivars:

Marathon, Puma and Piacea

B-Growth regulators treatments:

1. Control (without addition).
2. Indole acetic acid (IAA) concentrations i.e.50. 100 and 150 ppm.
3. Gibberellic acid (GA3) concentrations i.e.50 .100 and 150 ppm.

C- Planting methods:

Direct seed and Transplanting by paper pots.

The performed experiment was designed at randomized complete block with split-split plot arrangement of treatments with three replications.

Sugar beet cultivars were assigned to the main plots, growth regulators treatments were distributed randomly in the sub plot planting methods were located in the sub- sub plots. The experimental unit area was 10,5m^2 consisted of five ridges, 60 cm apart and 3,5 m length (1/400 fed.).Sugar beet seeds were planting at 15 cm between hills.

Seeds in the two planting methods were sown on October, 15th in both seasons. After 30 days from seeding from seeding when plants are came 10 cm in height, Seedling was transplanted by the above mention methods in the permanent soil. Seedling roots were dropped in a solution from cupper sulphate 10 ppm before the transplanting in the soil- after 30 days from seed sown in the direct seed planting method. Plants were thinned in one plant per hill. Spraying sugar beet plants by Indole Acetic Acid concentrations i.e. 50,100 and 150 ppm and sprayed plants by gebbrelic acetic acid concentrations i.e. 50,100 and 150 ppm as well as sprayed plants with tap water (control). Plants sprayed twice with growth regulators treatments at 45 and 55 days from sowing at the rat of 100 liters/fed.

The recommended doses of fertilizers nitrogen, phosphorus and potassium were applied at rate of (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 moth later. Fertilizer sources were ammonium nitrate (33.5%N), calcium super phosphate (15.5% p_2o_5) and potassium sulphate (48 % k_2o).

Table (1): Some physical and chemical of soil field experiments:-

Season	2013/2014	2014/2015
Physical analysis		
Sand (%)	26.71	27.31
Silt (%)	36.50	37.79
Clay (%)	36.79	34.90
Soil texture	Clay loam	Clay loam
Chemical analysis		
Organic matter (%)	0.93	*1.12*
Available N (PPM)	54	*51*
Available P (PPM)	75	*39*
Available K (PPM)	220	*380*
Ph (sp 68.7)	7.80	*8.03*
E.C (ds m^{-1})	1.14	*1.17*
Total Ca co (%)	2.80	*2.52*

Data was recorded during plant growth as well as at harvest as fallows:

Yield and yield component characters:

After 180 days the plants of the three inner ridges of each sub-sub plot were harvested to estimate yield components characters as fallows:

1. Root yield (ton/fed.):-
2. Sugar yield (ton/fed.). it was computed according to the fallowing formula:
3. Sugar yield (ton/fed.)

White Sugar yield (ton/fed.) = root yield (ton/ fed) x (Z B) white sugar percentage.

ZB= pol –{0.343(k+Na)+0.094 &N+ 0.29}

Chemical components and quality:

1. Total soluble solids percentage (T.S.S %) of roots, it was measured in juice of fresh root using hand refractometer according to (A.O.A.C. 1986).
2. Sucrose %, which was determined according to Le-Decote (1927).
3. Potassium percentage.

Potassium was determined in the digested solution using Flame Photometer according to the method described by Brown and Lilliland (1964).

4- Juice purity %, it was calculated according to Carruthers and Oldfield (1961) as fallows:

$$\text{Juice purity \%} = \frac{\text{Sucrose \%}}{\text{T.S.S \%}} \times 100$$

***Statistical analysis:**

The results were statistically analyzed according to Gomez and Gomez (1984), using the computer MSTAT-C statistical analysis package by Freed *et al.* (1989). The least significant differences (LSD) test at probability level of 0.05 was manually calculated to compare the differences among means.

RESULTS AND DISCUSSION

Yield and yield components:-

1- Root yield (ton/fed.):-

Data presented in Table (2) show that root yield was significantly affected by cultivars (A) in both seasons . Puma cultivar gave the highest values (31.16 and 30.79 ton/fed.) in 2013/2014 and 2014/2015 seasons, respectively. While, the lowest values recorded by piaceae cultivar in both seasons. The difference between cultivars of root yield could be due to the variation in the gene make up and their response to the environmental conditions . This result are agreed with those obtained by Kamel *et al.* (1981), Saif-Laila (2000) and Osman (2005)

This results obtained in Table (2) show that root yield/fed, significantly affected by growth regulators (B) in both seasons. Foliar spraying of (IAA) at 150 ppm gave the highest root yield (32.58 and 32.26 ton/fed.) in 2013/2014 and 2014/2015 seasons, respectively. The lowest root yield /fed. produced from the control treatments in both seasons. The increasing in root yield due to increasing indole acetic acid (IAA) concentration may be attributed to rising photosynthetic rate which led to increasing root yield per fed. This result with those obtained by Abd EL-Kader (2011).

Data show root yield was significantly affected by planting method (C) in both season. Direct seed had a higher root yield (30.54 and 30.23 ton/fed.) than transplanting by paper pots in 2013/2014 and 2014/2015 seasons, respectively . The greater root length, root diameter and heaviest fresh root weight. might contribute much for such finding by Ghonema and Sarhan (1994) and El-Geddawy *et al.* (1997).

Root yield was significantly affected by interaction between (A× B) in both seasons. The highest values (33, 59 and 33, 21 ton/fed.) were obtained from puma cultivar when received of (IAA) at 150 ppm in the first and second seasons, respectively.

Root yield was significantly affected by interaction between (A×C) in both seasons. The highest values (31.32 and 30. 98 ton/fed.) were obtained from puma cultivar with direct seed in 2013/2014 and 2014/2015 seasons, respectively.

Root yield was significantly affected by interaction between (B×C) in the first season, only. The highest values (32.71 ton/fed.) was obtained from spraying of (IAA) at 150 ppm with direct seed in the 2013/2014 season.

Root yield was significantly affected by interaction between (A×B ×C) in the first seasons, only. The highest value (33.71 ton/fed.) was obtained from puma cultivar when received (IAA) at 150 ppm with trans planting by paper pots method in the first season.

Table (2) Effect of growth regulators and planting methods on root yield (ton/fed.) of sugar beet cultivars in 2013/2014 and 2014/2015 seasons.

Cultivars (A)	Planting methods (C)	Growth regulators (B)							Mean
		Control	(IAA) 50 ppm	(IAA) 100 ppm	(IAA) 150 ppm	(GA3) 50 ppm	(GA3) 100 ppm	(GA3) 150 ppm	
2013/2014 season									
Marathon	Seed	27.29	29.83	31.47	32.86	29.61	31.78	32.90	30.82
	Trans	26.89	28.59	31.64	32.93	28.25	31.29	32.19	30.25
Mean		27.09	29.21	31.55	32.90	28.93	31.53	32.55	30.54
Puma	Seed	27.60	30.66	32.68	33.47	29.86	31.68	33.31	31.32
	Trans	27.47	29.85	32.11	33.71	29.66	31.41	32.74	30.99
Mean		27.54	30.26	32.40	33.59	29.76	31.54	33.03	31.16
Paicea	Seed	26.61	28.49	30.66	31.80	27.64	29.68	31.47	29.48
	Trans	25.11	26.99	29.74	30.73	25.89	28.70	29.98	28.16
Mean		25.86	27.74	30.20	31.26	26.77	29.19	30.73	28.82
Direct Seed		27.17	29.66	31.60	32.71	29.04	31.05	32.56	30.54
Trans Planting		26.49	28.48	31.16	32.46	27.93	30.47	31.64	29.80
Mean over all		26.83	29.07	31.38	32.58	28.49	30.76	32.10	
2014/2015 season									
Marathon	Seed	26.49	29.40	30.64	32.37	28.91	31.52	32.56	30.42
	Trans	26.49	28.37	31.34	32.57	27.77	30.59	31.57	29.81
Mean		26.49	28.89	30.99	32.47	28.34	31.05	32.06	30.04
Puma	Seed	27.29	30.41	32.22	33.34	29.51	31.50	32.62	30.98
	Trans	26.80	29.70	31.56	33.07	29.29	31.35	32.39	30.59
Mean		27.05	30.06	31.89	33.21	29.40	31.42	32.51	30.79
Paicea	Seed	26.27	28.31	31.65	31.63	27.46	29.47	31.32	29.44
	Trans	24.81	26.62	29.51	30.57	25.57	28.50	29.44	27.86
Mean		25.54	27.47	30.58	31.10	26.52	28.99	30.38	28.65
Direct Seed		26.68	29.37	31.50	32.45	28.63	30.83	32.17	30.23
Trans Planting		26.03	28.23	30.80	32.07	27.54	30.15	31.13	29.43
Mean over all		26.36	28.80	31.15	32.26	28.09	30.58	31.65	

L.S.D 0.05	2013/2014	2014/2015
Cultivars (A)	0.125	0.151
Growth regulators (B)	0.087	0.105
A×B	0.296	0.506
Planting methods (C)	**	**
A×C	0.138	0.294
B×C	0.210	N.S|
A×B×C	0.365	N.S

2- Sugar yield (ton/fed.):-

Data presented in Table (3) show that sugar yield was significantly affected by cultivars (A) in both seasons. Puma cultivar gave the highest values (4.417 and 3.893 ton/fed.) in 2013/2014 and 2014/2015 seasons, respectively. The lowest values recorded by paicea cultivar in 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 with EL-Taweel, Fayza *et al.* (2004).

Sugar yield/fed significantly affected by growth regulators (B) treatments in both seasons. Foliar spraying of (IAA) at 100 ppm gave the highest sugar yield (5.115 ton/fed.) in 2013/2014 season, only. While foliar spraying of (GA3) at 100 ppm gave the highest value (4.315 ton/fed.) in 2014/2015 season. The lowest value recorded by control in both season. these increase in sugar yield may be due to the effect of IAA and GA3 increasing growth of the plant. These results are in agreement with EL-Taweel, Fayza *et al.* (2004).

The results in Table (3) show that sugar yield ton/fed. was significantly affected by planting methods (C) in both seasons. Transplanting by paper pots had a higher top yield (4.481 and 4.103 ton/fed.) than direct seed in 2013/2014 and 2014/2015 seasons, respectively. This increment may be due to that sucrose of the transplanting seedling by using paper pots induced somewhat small size of roots and less water unit in turn high sugar content compared with the higher roots sown directly in the permanent field. These results in accordance with those reported by EL-Gedawy *et al.* (1997) who showed that transplanted sugar beet by using paper pots increased sugar yield ton/fed.

Data in Table (3) reveal that sugar yield was significantly affected by interaction between (A× B) in both seasons. The highest values (5.494 ton/fed.) was obtained from paicea cultivar when received of (GA3) at 100 ppm in 2013/2014 season and the highest value (4.519 ton/fed.) was obtained from puma cultivar when received foliar (IAA) at 100 ppm in 2014/2015 season.

Sugar yield was significantly affected by interaction between (A×C) in both seasons. The highest values (5.058and 4.380 ton/fed.) were obtained from puma cultivar with Transplanting by paper pots in the first and second seasons, respectively.

Sugar yield was significantly affected by interaction between (B×C) in both seasons. The highest values (5.287 ton/fed.) was obtained from spraying of (IAA) at 100 ppm with Transplanting by paper pots in 2013/2014 season and the highest values (4.516 ton/fed.) was obtained from spraying of (GA3) at 100 ppm with Transplanting by paper pots in 2014/2015 season .

Sugar yield was significantly affected by interaction between (A×B ×C) in both seasons. The highest values (5.604 ton/fed.) was obtained from paicea cultivar when received (GA3) at 100 ppm with transplanting methods by paper pots in 2013/2014 season and the highest values (4.816 ton/fed.) was obtained from puma cultivar when received (GA3) at 100 ppm with transplanting methods by paper pots 2014/2015 season.

Table (3) Effect of growth regulators and planting methods on sugar yield (ton/fed.) of sugar beet cultivars in 2013/2014 and 2014/2015 seasons.

Cultivars (A)	Planting methods (C)	Growth regulators (B) Control	(IAA) 50 ppm	(IAA) 100 ppm	(IAA) 150 ppm	(GA3) 50 ppm	(GA3) 100 ppm	(GA3) 150 ppm	Mean
2013/2014 season									
Marathon	Seed	2.798	4.620	5.553	4.585	4.629	5.383	4.736	4.563
	Trans	2.353	4.247	5.447	3.908	4.423	5.604	2.555	4.077
Mean		2.576	4.334	5.500	4.247	4.526	5.494	3.646	4.332
Puma	Seed	2.783	4.651	4.564	4.548	4.478	5.122	4.498	4.378
	Trans	3.843	5.250	5.431	5.666	5.147	5.404	4.885	5.058
Mean		3.313	4.501	4.998	5.107	4.812	5.263	4.961	4.718
Paicea	Seed	2.736	4.561	4.710	4.793	3.973	4.702	4.539	4.288
	Trans	3.344	4.352	4.982	4.071	4.227	4.348	4.832	4.308
Mean		3.040	4.457	4.864	4.432	4.100	4.525	4.686	4.298
Direct Seed		2.772	4.610	4.942	4.642	4.360	5.069	4.591	4.410
Trans Planting		3.180	4.616	5.287	4.584	4.599	5.119	4.091	4.481
Mean over all		2.976	4.613	5.115	4.613	4.480	5.094	4.341	
2014/2015 season									
Marathon	Seed	1.858	3.017	4.278	3.156	4.075	4.302	2.829	3.359
	Trans	3.200	4.076	4.476	4.209	4.000	4.496	4.259	4.102
Mean		2.530	3.547	4.377	3.683	4.038	4.399	3.544	3.731
Puma	Seed	1.970	3.103	4.405	2.978	3.775	4.455	2.405	3.298
	Trans	3.400	4.280	4.632	4.527	4.467	4.816	4.535	4.380
Mean		2.658	3.692	4.519	3.753	4.121	4.636	3.470	3.839
Paicea	Seed	1.855	2.169	3.234	3.555	2.191	3.582	4.418	3.000
	Trans	2.574	3.495	4.228	4.570	3.356	4.236	4.334	3.828
Mean		2.215	2.832	3.731	4.063	2.774	3.909	4.376	3.414
Direct Seed		1.894	2.763	3.972	3.040	3.347	4.113	3.217	3.219
Trans Planting		3.058	3.950	4.445	4.435	3.944	4.516	4.376	4.103
Mean over all		2.737	3.357	4.209	3.738	3.646	4.315	3.797	

L.S.D 0.05	2013/2014	2014/2015
Cultivars (A)	0.029	0.042
Growth regulators (B)	0.020	0.029
A×B	0.150	0.125
Planting methods (C)	**	**
A×C	0.071	0.073
B×C	0.108	0.111
A×B×C	0.187	0.192

Chemical components and quality:-

1-Total soluble solid (T.S.S %):-

Data presented in Table (4) show that total soluble solids was significantly affected by cultivars (A) in both seasons. Puma cultivar gave the highest values (22. 21and 23.26%) in the first and second seasons, respectively. The difference between cultivars of total soluble solid percentage due to the variation in the gene make-up and their response to the environmental conditions.

These results are agreed with those obtained by Osman (2005) .

The same table reveal that growth regulators (B) had a significant on this trait in both seasons. The highest value (22.81%) was obtained from spraying of (IAA) at 100 ppm in 2013/2014 season and the highest values (23.64%) was obtained from spraying of (GA3) at 100 ppm in 2014/2015 season. The lowest (T.S.S) percentage produced from control treatment. The increase in total soluble solids may be due to rapid growth and in turn vigorous plants. These results were agreed with that obtained by El-kassaby *et al.* (1988).

Total soluble solids were significantly affected by planting methods (C) in both seasons. The highest values (22.14 and 23. 22%) were obtained from transplanting by paper pots in the first and second seasons, respectively.

Data reveal that total soluble solids was significantly affected by interaction between (A×B) in both seasons. The highest value (25. 02%) was obtained from puma cultivar when received foliar spraying of (IAA) at 100 ppm in 2013/2014 season and The highest value (24.06%) was obtained from puma cultivar when received foliar spraying of (GA3) at 100 ppm in 2014/2015 season.

Data reveal that total soluble solids was significantly affected by interaction between (A×B) in both seasons. The highest value (25. 02%) was obtained from puma cultivar when received foliar spraying of (IAA) at 100 ppm in 2013/2014 season and The highest value (24.06%) was obtained from puma cultivar when received foliar spraying of (GA3) at 100 ppm in 2014/2015 season.

Total soluble solids was significantly affected by interaction between (A×C) in both seasons. The highest values (23. 24 and 23.32%) were obtained from puma cultivar with transplanting by paper pots in the first and second seasons, respectively.

Total soluble solid was significantly affected by interaction between (B×C) in both seasons. The highest value (23.73%) was obtained from application spraying of (GA3) at 100 ppm with transplanting by paper pots in 2013/2014 season and the highest value (24.46%) was obtained from application spraying of (GA3) at 100 ppm with direct seed in 2014/2015 season.

The results indicated that total soluble solid was significantly affected by interaction between (A×B ×C) in both seasons. The highest values (27.27%) was obtained from puma cultivar when received spraying of (IAA) at 100 ppm with trans planting by paper pots in 2013/2014 season. The highest value (24.93%) was obtained from puma cultivar when received spraying of (GA3) at150 ppm with direct seed in 2014/2015 season.

Table (4) Effect of growth regulators and planting methods on total soluble solids (T.S.S %) of sugar beet cultivars in 2013/2014 and 2014/2015 seasons.

Cultivars (A)	Planting methods (C)	Control	(IAA) 50 ppm	(IAA) 100 ppm	(IAA) 150 ppm	(GA3) 50 ppm	(GA3) 100 Ppm	(GA3) 150 Ppm	Mean
2013/2014 season									
Marathon	Seed	21.92	21.27	22.77	21.12	21.24	21.53	20.21	21.44
	Trans	21.35	22.20	21.66	21.57	20.94	23.04	19.06	21.40
Mean		21.63	21.73	22.22	21.35	21.09	22.28	19.64	21.42
Puma	Seed	21.36	20.58	22.76	21.19	21.17	21.77	19.39	21.17
	Trans	21.28	23.04	27.27	21.46	22.10	24.45	23.05	23.24
Mean		21.32	21.81	25.02	21.33	21.63	23.11	21.22	22.21
Paicea	Seed	23.73	20.80	22.35	21.26	19.94	21.39	19.88	21.34
	Trans	19.51	21.50	20.05	24.00	20.83	23.71	22.89	21.78
Mean		21.62	21.15	21.20	22.63	20.39	22.55	21.39	21.56
	Direct Seed	22.34	20.88	22.63	21.19	20.78	21.56	19.83	21.32
	Trans Planting	20.71	22.25	22.99	22.34	21.29	23.73	21.67	22.14
	Mean over all	21.52	21.56	22.81	21.77	21.04	22.65	20.75	
2014/2015 season									
Marathon	Seed	22.30	22.79	24.29	21.69	23.49	24.46	21.21	22.89
	Trans	24.38	22.83	23.73	23.18	22.35	22.68	22.42	23.08
Mean		23.34	22.81	24.01	22.44	22.92	23.57	21.82	22.99
Puma	Seed	20.86	21.38	24.53	21.61	24.49	24.60	24.93	23.20
	Trans	24.42	22.94	23.52	22.81	23.10	23.53	22.91	23.32
Mean		22.64	22.16	24.02	22.21	23.80	24.06	23.92	23.26
Paicea	Seed	20.90	21.52	21.37	23.12	22.93	24.33	24.60	22.68
	Trans	21.55	24.92	23.17	23.95	24.26	22.25	22.72	23.26
Mean		21.23	23.22	22.27	23.53	23.60	23.29	23.66	22.97
	Direct Seed	21.35	21.90	23.40	22.14	23.64	24.46	23.58	22.92
	Trans Planting	23.45	23.56	23.47	23.31	23.24	22.82	22.68	23.22
	Mean over all	22.40	22.73	23.43	22.73	23.44	23.64	23.13	

L.S.D 0.05	2013/2014	2014/2015
Cultivars (A)	0.109	0.124
Growth regulators (B).	0.076	0.087
A×B	0.414	0.208
Planting methods (C)	**	**
A×C	0.214	0.131
B×C	0.327	0.199
A×B×C	0.566	0.346

2- Sucrose percentage :-

Data presented in Table (5) show that sucrose percentage was significantly affected by cultivars (A) in both seasons. The highest values (18.35 and 16.88%) were obtained from puma cultivar in the first and second seasons, respectively. The difference between cultivars due to gene make-up effect. These results are agreed with those obtained by Osman (2005).

The data presented in Table (5) show that growth regulators (B) had significant affected on this trait in both seasons. The highest values (19.34 and 18.27 %) were recoded by foliar spraying of (GA3) at100 ppm in the first and second seasons, respectively. This may by due to the influence of (GA3) on the cell division (division of the cambia and sub sequent division of the cambial products) and rapid cell expansion which increased the cells size which reflected on sucrose formation . These finding are in agreement with Milford (1973). Also GA3 and IAA affected on sucrose up-take by sugar. These results obtained by Shehata, Mona (1989) and EL-Taweel , Fayza *et al.* (2004).

Table (5) Effect of growth regulators and planting methods on sucrose percentage % of sugar beet cultivars in 2013/2014 and 2014/2015 seasons.

Cultivars (A)	Planting methods (C)	Control	(IAA) 50 ppm	(IAA) 100 ppm	(IAA) 150 Ppm	(GA3) 50 ppm	(GA3) 100 ppm	(GA3) 150 Ppm	Mean
2013/2014 season									
Marathon	Seed	14.99	18.15	20.01	17.17	18.17	19.10	17.06	17.81
	Trans	13.65	18.62	19.17	15.98	18.10	20.31	16.05	17.41
Mean		14.32	18.39	19.59	16.57	18.14	19.71	16.55	17.61
Puma	Seed	14.68	17.67	17.83	16.97	17.87	18.76	16.18	17.14
	Trans	17.34	20.13	21.48	19.55	19.32	20.52	18.62	19.57
Mean		16.01	18.90	19.66	18.26	18.60	19.64	17.40	18.35
Paicea	Seed	15.62	18.25	18.53	17.45	16.93	18.41	16.93	17.45
	Trans	16.12	17.61	18.41	20.88	18.44	18.95	19.21	18.52
Mean		15.87	17.93	18.47	19.17	17.69	18.68	18.07	17.98
Direct Seed		15.10	18.02	18.79	17.20	17.66	18.76	16.72	17.46
Trans Planting		15.70	18.79	19.69	18.80	18.62	19.93	17.96	18.50
Mean over all		15.40	18.41	19.24	18.00	18.14	19.34	17.34	
2014/2015 season									
Marathon	Seed	12.24	15.29	18.42	14.31	18.20	18.27	13.36	15.73
	Trans	17.16	18.11	18.39	17.31	17.94	18.26	17.39	17.79
Mean		14.70	16.70	18.40	15.81	18.07	18.26	15.38	16.76
Puma	Seed	12.27	14.77	18.31	13.88	17.71	18.65	13.52	15.59
	Trans	17.60	18.18	18.56	17.67	18.18	19.07	17.91	18.17
Mean		14.94	16.48	18.44	15.78	17.95	18.86	15.72	16.88
Paicea	Seed	12.16	12.92	14.78	16.12	12.86	17.20	18.63	14.95
	Trans	14.95	18.09	18.22	18.92	17.84	18.19	18.29	17.79
Mean		13.55	15.50	16.50	17.52	15.35	17.70	18.46	16.37
Direct Seed		12.22	14.33	17.17	14.77	16.26	18.04	15.17	15.42
Trans Planting		16.57	18.13	18.39	17.97	17.99	18.51	17.86	17.92
Mean over all		14.40	16.23	17.78	16.37	17.12	18.27	16.52	

L.S.D 0.05	2013/2014	2014/2015
Cultivars (A)	0.087	0.117
Growth regulators (B)	0.061	0.081
A×B	0.409	0.227
Planting methods (C)	**	**
A×C	0.215	0.154
B×C	0.328	0.235
A×B×C	0.568	0.408

Sucrose percentage was significantly affected by planting method (C) in both seasons. Transplanting by paper pots had a higher sugar content compared with direct seed in both seasons. The highest values (18.50 and 17.92%) were obtained with transplanting by paper pots in the first and second seasons, respectively. This increment may be due to that sucrose of the transplanting seedling by using paper pots induced some what small size of roots and less water unit in turn high sugar content compared with the higher roots sown directly in the permanent field. These results in accordance with these reported by EL- Geddawy *et al.* (1997) who showed that transplanted sugar beet by using paper pots increased sucrose percentage over beet .

Data reveal that sucrose percentage was significantly affected by interaction between (A×B) in both seasons. The highest value (19.71%) was obtained from marathon cultivar when received (GA3) at 100 ppm in 2013/2014 season and the highest value (18.86%) was obtained from puma cultivar when received (GA3) at 100 ppm in 2014/2015 season.

Sucrose percentage was significantly affected by interaction between (A×C) in both seasons. The highest values (19.57 and18.17 %) were obtained from puma cultivar when transplanting method in the first and second seasons, respectively

Sucrose percentage was significantly affected by interaction between (B×C) in both seasons. The highest values (19.93 and 18. 51%) were obtained from spraying of (GA3) at 100 ppm with Transplanting by paper pots in the first and second seasons, respectively.

Sucrose percentage was significantly affected by interaction between (A×B ×C) in both seasons. The highest value (21.48%) was obtained from puma cultivar when received spraying of (IAA) at 100 ppm with transplanting by paper pots in 2013/2014 season and the highest value (18.92 %) was obtained from paicea cultivar when received spraying of (IAA) at 150 ppm with transplanting by paper pots in 2014/2015 season.

3- Potassium content (Meq/100g):-

Results in Table (6) show that Potassium content was significantly affected by cultivars (A) in both seasons. The highest Potassium content was obtained from puma cultivar in 2013/2014 season and Paicea cultivar recorded the highest Potassium content in 2014 / 2015 season. The difference between cultivar may by due to gene make-up. This results agreement those obtained by Abou Salama and El Sayid (2000) and El Hosary (2007) reported variety differences in impurity components.

The application of growth regulators (B) to sugar beet plants exerted a significant influence on potassium contents in both seasons. The highest value (6.567 and 7.234 meq/100 g) were obtained from control treatment in the first and second seasons, respectively. Potassium plays a major role in the translocation of sucrose's in leaves to roots in sugar beet. But, when juice quality is concerned, excess k has a negative effect on the quality index. These results are in agreement with El-kammash (2011b). In general the effect of IAA and GA3 on the Potassium content of plants have peen reviewed by many workers and different conclusions have been made.

Potassium content was significantly affected by planting method (C) in both seasons. The highest values (4.987 meq/100 g) were obtained from transplanting by paper pots in 2013/2014 season. The increase in potassium percentage from transplanting due to decreasing the transplanting process due to increasing the branched roots which consumptive more elements during their growth consequently increasing the value of the absorbed elements such as potassium. These findings are in harmony with those of Osman *et al.* (2007). The highest value (7.340 meq/100 g) was obtained from direct seed in 2014/2015 season.

Data reveal Potassium content was significantly affected by interaction between (A× B) in both seasons. The highest values (7. 650 meq/100g) was obtained from paicea cultivar with control treatment in 2013/2014 season and the highest values (7.773 meq/100 g) were obtained from paicea cultivar when received spraying of (GA3) at 50 ppm in 2014/2015 season.

Potassium content was significantly affected by interaction between (A×C) in both seasons. The highest values (5.535 meq/100 g) was obtained from puma cultivar when transplanting by paper pots in 2013/2014 season and the highest value (7.427 meq/100 g) was obtained from piacea cultivar with direct seed in 2014/2015season.

Potassium content was significantly affected by interaction between (B×C) in both seasons. The highest value (7.498 meq/100 g) was obtained from control treatment by direct seed in 2013/2014season and the highest value (7.823 meq/100 g) was obtained from spraying of (GA3) at 50 ppm by direct seed in 2014/2015 season.

Potassium content was significantly affected by interaction between (A×B ×C) in both seasons. The highest value (10.177 meq/100 g) was obtained from paicea cultivar when received control treatment with direct seed in 2013/2014 season and the highest value (8.633 meq/100 g) was obtained from puma cultivar when received spraying of (GA3) at 50 ppm with direct seed in 2014/2015 season.

Table (6) Effect of growth regulators and planting methods on potassium content (meq/100g) of sugar beet cultivars in 2013/2014 and 2014/2015 seasons.

Cultivars (A)	Planting methods (C)	Growth regulators (B) Control	(IAA) 50 ppm	(IAA) 100 ppm	(IAA) 150 ppm	(GA3) 50 ppm	(GA3) 100 ppm	(GA3) 150 ppm	Mean
2013/2014 season									
Marathon	Seed	6.553	4.993	3.883	4.400	3.813	3.743	4.377	4.537
	Trans	6.420	5.720	3.710	4.217	4.480	4.387	4.083	4.717
Mean		6.487	5.357	3.797	4.308	4.147	4.065	4.230	4.627
Puma	Seed	5.763	4.457	3.923	6.557	4.383	3.520	4.220	4.689
	Trans	5.367	4.413	8.713	3.030	4.377	6.027	6.820	5.535
Mean		5.565	4.435	6.318	4.793	4.380	4.773	5.520	5.112
Paicea	Seed	10.177	4.137	5.357	5.447	4.017	4.457	4.640	5.462
	Trans	5.123	5.327	2.553	4.980	3.297	7.080	4.610	4.710
Mean		7.650	4.732	3.955	5.213	3.657	5.768	4.625	5.086
Direct Seed		7.498	4.529	4.388	5.468	4.071	3.907	4.412	4.896
Trans Planting		5.637	5.153	4.992	4.076	4.051	5.831	5.171	4.987
Mean over all		6.567	4.841	4.690	4.772	4.061	4.869	4.792	
2014/2015 season									
Marathon	Seed	6.807	7.823	6.893	7.367	6.730	7.177	7.407	7.172
	Trans	7.883	6.227	6.847	7.000	5.927	5.887	6.207	6.568
Mean		7.345	7.025	6.870	7.183	6.328	6.532	6.807	6.870
Puma	Seed	7.340	6.943	7.230	7.817	8.633	7.127	6.853	7.420
	Trans	7.913	6.160	6.507	6.383	6.050	6.110	6.370	6.499
Mean		7.627	6.552	6.868	7.100	7.342	6.618	6.612	6.960
Paicea	Seed	7.300	7.503	6.963	7.140	8.107	7.917	7.060	7.427
	Trans	6.160	8.013	6.323	6.473	7.440	5.477	6.103	6.570
Mean		6.730	7.758	6.643	6.807	7.773	6.697	6.582	6.999
Direct Seed		7.149	7.423	7.029	7.441	7.823	7.407	7.107	7.340
Trans Planting		7.319	6.800	6.559	6.619	6.472	5.825	6.227	6.546
Mean over all		7.234	7.112	6.794	7.030	7.148	6.616	6.667	

L.S.D 0.05	2013/2014	2014/2015
Cultivars (A)	0.094	0.067
Growth regulators (B)	0.065	0.047
A×B	0.071	0.076
Planting methods (C)	**	**
A×C	0.070	0.045
B×C	0.107	0.068
A×B×C	0.185	0.118

4- Juice purity percentage %:-

The data presented in Table (7) show that purity percentage was significantly affected by cultivars (A) in both seasons. The highest value (83.60 %) was obtained from paicea cultivar in 2013/2014 season and the highest value (72.80%) was obtained from marathon cultivar in 2014/2015 season. The difference between cultivars of purity percentage could be due to the variation in the gene make-up and their response to the environmental conditions. These results were agreed with that obtained by Saif-Laila (2000) who stated that purity percentage was no significantly affected by cultivars.

Table (7) Effect of growth regulators and planting methods on purity percentage % of sugar beet cultivars in 2013/2014 and 2014/2015 seasons.

Cultivars (A)	Planting methods (C)	Growth regulators (B) Control	(IAA) 50 ppm	(IAA) 100 ppm	(IAA) 150 ppm	(GA3) 50 ppm	(GA3) 100 ppm	(GA3) 50 Ppm	Mean
2013/2014 season									
Marathon	Seed	68.41	85.35	87.87	81.30	85.53	88.71	84.37	83.08
	Trans	63.96	83.88	88.49	74.08	86.48	88.19	84.20	81.33
Mean		66.19	84.62	88.18	77.69	86.01	88.45	84.29	82.20
Puma	Seed	68.71	85.85	78.34	80.11	84.43	86.19	83.43	81.01
	Trans	81.47	87.39	78.77	91.09	87.44	83.94	80.80	84.41
Mean		75.09	86.62	78.56	85.60	85.93	85.07	82.12	82.71
Paicea	Seed	65.84	87.74	82.93	82.09	84.88	86.06	85.13	82.10
	Trans	82.63	81.92	91.82	87.00	88.54	79.95	83.90	85.11
Mean		74.23	84.83	87.38	84.54	86.71	83.01	84.51	83.60
Direct Seed		67.65	86.31	83.05	81.17	84.95	86.99	84.31	82.06
Trans Planting		76.02	84.40	86.36	84.06	87.49	84.03	82.97	83.62
Mean over all		71.84	85.36	84.70	82.61	86.22	85.51	83.64	
2014/2015 season									
Marathon	Seed	54.88	67.14	75.83	66.00	77.45	74.69	62.99	68.43
	Trans	70.40	79.34	77.51	74.68	80.29	80.51	77.56	77.18
Mean		62.64	73.24	76.67	70.34	78.87	77.60	70.27	72.80
Puma	Seed	58.81	69.10	74.67	64.23	72.32	75.86	54.26	67.04
	Trans	72.09	79.27	78.94	77.48	78.72	81.07	78.18	77.96
Mean		65.45	74.18	76.81	70.85	75.52	78.46	66.22	72.50
Paicea	Seed	58.16	60.05	69.16	69.72	56.13	70.69	75.74	65.66
	Trans	69.40	72.59	78.65	79.03	73.58	81.76	80.50	76.50
Mean		63.78	66.32	73.91	74.38	64.85	76.23	78.12	71.08
Direct Seed		57.28	65.43	73.22	66.65	68.63	73.75	64.33	67.04
Trans Planting		70.63	77.07	78.37	77.06	77.53	81.11	78.75	77.22
Mean over all		63.96	71.25	75.79	71.86	73.08	77.43	71.54	

L.S.D 0.05	2013/2014	2014/2015
Cultivars (A)	0.123	0.295
Growth regulators (B)	0.085	0.205
A×B	0.439	0.643
Planting methods(C)	**	**
A×C	0.243	0.347
B×C	0.372	0.530
A×B×C	0.644	0.918

Table (7) reveals that purity percentage was significantly affected by growth regulators (B) in both seasons. The highest value (86.22%) was obtained from spraying of (GA3) at 50 ppm in 2013/2014 season and the highest value (77.43%) was obtained from spraying of (GA3) at 100 ppm in 2014/2015 season. The increase in purity percentage may be due to rapid growth and in turn vigorous plants. These results were agreed with that obtained by Shehata, Mona (1989) and EL-Taweel , Fayza *et al.* (2004).

Results presented in Table (7) purity percentage was significantly affected by planting method (C) in both seasons. Transplanting by paper pots had a higher purity percentage than direct seed in both seasons. The highest values (83.62 and 77.22%) were obtained from transplanting by paper pots in the first and second seasons, respectively. This superiority in purity percentage due to the highest sucrose % as results for small root for this treatment. These results were agreed with that obtained by Osman *et al.* (2007).

Data reveal that purity percentage was significantly affected by interaction between (A×B) in both seasons. The highest value (88.45%) was obtained from marathon cultivar with spraying of (GA3) at 100 ppm in 2013/2014 season and the highest value (78.87%) was obtained from marathon cultivar with spraying of (GA3) at 50 ppm in 2014/2015 season.

The results in table (7) showed that purity percentage was significantly affected by (A×C) in both seasons. The highest value (85.11%) was obtained from paicea cultivar with Transplanting methods by paper pots in 2013/2014 season and the highest value (77.96%) was obtained from puma cultivar with Transplanting methods by paper pots in 2014/2015 season.

Purity percentage was significantly affected by interaction between (B×C) in both seasons. The highest value (87.49%) was obtained from spraying of (GA3) at 50 ppm with Transplanting methods by paper pots in 2013/2014 season and the highest value (81.11%) was obtained from spraying of (GA3) at 100 ppm with Transplanting methods by paper pots in 2014/2015season.

Purity percentage was significantly affected by interaction between (A×B ×C) in both seasons. The highest value (91.82%) was obtained from paicea cultivar when received spraying of (IAA) at 100 ppm with transplanting methods by paper pots in 2013/2014 season and the highest value (81.76 %) was obtained from paicea cultivar when received spraying of (GA3) at 100 ppm with transplanting methods by paper pots in 2014/2015 season.

REFERENCES

Abd El-Kader, (2011). Effect of nitrogen fertilizer rates and some growth regulators treatments on sugar beet. J. plant production, Mansoura Univ., 2 (2): 1693-1702.

Abou-salama, A.M. and S.I. El-Syiad (2000).Studies on some sugar beet cultivars under middle Egypt conditions.1-Response to planting and harvesting dates. Assiut J.of Agric.Sci., 31(1):137-159.

Agarwala, S.C.; P.N. Sharma. and C.P.Sharma. (1978): Effect of auxin and gibberellic acid on some aspects of growth and metabolism of boron deficient sugar beet. Indian Journal of plant physiology, 21 (3) 292-295.

A.O.A.C.(1986). Official Methods of Analysis Association of Official Agricultural Chemists. Washington ,DC, USA.

Brown, I. D. and Lilliland, O.(1964). Rabid determination of potassium and sodium in plant material and soil extracts by flame photometer.Proc.Amer. Soc.Hort. Sci.,48:341-346.

Carruthers, A. and J. E. T. Oldfield (1961): Methods for assessment of beet quality .Int. Sugar J.63,72h: 103-105.

El-Geddawy, I.H.; S.S. Zalat and Laila M. Saif (1997). Transplanting sugar beet seedling with relation to yield and quality of sugar beet. J. Agric. Sci., Mansoura Univ., 22(2): 361-368.

El-Hosary, A.A.; A.M.M. Saad; I.H. El-Gddawy and B.S, Ibrahim (2007). Effect of boron and molybdenum on chemical constituents and quality of some sugar beet varieties. Egypt. J. Agric. Res., 84:1335-1353.

El-Kassaby A. T. ; M. S. Sultan ; M. A. Badawi and A.A. Lailah (1988). Response of some sugar beet cultivars to Gibberellic acid treatments. J. Agric. Sci. Mansoura Univ. 13(1): 9-14.

El-Taweel, Fayza M. Abo El-F.: B. M. Abou El-Magd and K.H. A. Aboushady (2004) .Response of some sugar beet cultivars to growth regulators treatments .J. Agric. Sci. Mansoura Univ., 29 (10): 5503-5513.

Fletcher, D. C. ; J. C. Silertooth ; E. R. Norton ; B.L. Unruch and A. Lowis. (1994). Evaluation of feedback vs.schedual approach to epiquate chloride application. Proc Beltwide Cotton Conf., 1259-1260.(C.F. Computer search).

Freed, R.S.P. ; S.P. Eisemith ; S.Goetez;D.Reicosky; V.W.Smal and P.Wolberag.(1989). Users guide to MSTAT-C.A software program for the design ,moorage egement and analyses of agronomic research experiments Michigan State Univ, U.S.A.

Ghonema, M.H. and A.A.Sarhan (1994). Response of direct seeding and transplanted sugar beet to NPK fertilization rates. J. Agric. Sci. Mansoura Univ. 19 (9): 2785-2797.

Gomaa, M.A.; H.A. Basha; M.A. Farag and Hanan, Y.M. Yousif (2007). Juice properties of some sugar beet varieties as affected by organic and biochemical fertilizers. Zagazig J. Agric. Res., 34(6): 1075-1088.

Gomez, K.A and A.A. Gomez (1984).Statistical procedures for Agricultural Research 2nd ed. John

Wiley and Sons Inc. New York. USA.

Jassem, M. (1982).Characters and value of sugar beet varieties cultivated in Poland. Zucherindustrie. 106(12):104. (C.F.Plant Breeding .Abst. 53(2):1502).

Kamel, M.S.; M. M. F. Abdalla, E.A. Mahmoud. And I.K. Obead. (1981). Growth, yield and quality of sugar beet cultivars as affected by row and hill spacing. Bull. Fac. Agric. Cairo, Univ., 32:499-516.

Le-Docte, A. (1927). commercial determination of sugar beet root using the Sackr-Le-Docte process Int. Sugar J., 29: 488-492.

Lunnan, T ; A. Skutlaberg, and H. C. Svads(1991). Time of planting fertilization, plant spacing and transplants of sugar beet. Norwegian Journal of Agric. Sci. 5 (3): 283-288.

Munzert, M. ; A.Mangstl. and I, Gunther (1982). Zucker industrei 107(8):771-774[C.F. Field Abst., 36(10):8647].

Osman, M. S. ; I.H.El-Geddawy ; M.G.A. Taha and A.A. M. Eman (2007).Transplanting using paper pots technique and micro nut ration with relation to juice quality and chemical constituents sugar beet at different planting dates. Egypt. J. Agric .Res., 85(1):211-229.

Saftner, R. A. and R.E.Wyes (1980). Alkali cations/sucrose co-transport in the root sink of sugar beet.Plant Physio.66:884-889.Analysis.J.Biol.Chem.45:365 - 369.

Saif-laila, M.A. (2000). Stepwise regression and path coefficient analysis for some sugar beet characters under level of boron and nitrogen fertilization .proc 9th Conf Agronomy, Minufia Univ., 569-581.

Shehata, Mona, M. (1989). Physiological studies on the tolerance of some sugar beet varieties to salinity. Ph. D. thesis fac. Of Agric., Cairo univ.

Valnli, N. (1985a). The paper pot transplanting method growing sugar beet Turkey and possibilities of using of the method in that region. Seker.18-116, 1-12. (C.F.CAB Abs. 138, (1987-1989).

Vigoureux, A. (1986). Influence of some technological factors on growth and yield of Transplanted sugar beet. 49th winter congress, International Institute for sugar beet Res 165-179. (C.F. CAB Abstract No. 126, 1987-1989.

Wahdan, G.A., (1990). Physiological effect of nitrogen fertilization as foliar application and some growth regulators on plant.Ph.D. Thesis, Fac. Of Agric., Monufia Univ., Egypt

Yousef. M.S.H.(2009).Effect of transplanting dates on productivity of some sugar beet varieties in the newly reclaimed lands under Sinai conditions. J. Agric Sci , Mansoura Univ., 34 (9): 9557-9564.

تأثير طرق الزراعة ومنظمات النمو على المحصول والجودة لبعض أصناف بنجر السكر

مصطفى محمد إبراهيم(1)، نبيل عبد الخالق عزاز(2)، ياسر عبد الصبور خليفة(1)، إيهاب محمد خميس(2)

(1) **قسم المحاصيل – كلية الزراعة – جامعة الأزهر– فرع أسيوط.**
(2) **قسم الكيمياء – كلية الزراعة – جامعة دمياط .**

أقيمت تجربتان حقليتان بمزرعة خاصة –بمركز جهينة بمحافظة سوهاج.مصر . خلال موسمي الزراعة 2013–2014 و2014–2015 لدراسة استجابة ثلاثة أصناف من بنجر السكر ماراثون ، بوما و بايسيه (وحيدة الأجنة) لتركيزات مختلفة من منظمات النمو وهى اندول حمض الخليك بتركيز (100,50و150 جزء فى المليون) وحمض الجبريلليك بتركيز (100,50و150 جزء فى المليون) بالإضافة إلى معاملة الكنترول (بدون معاملة) وطريقتان من طرق الزراعة (الزراعة بالبذرة والزراعة بالشتل) وكان التصميم المستخدم القطع المنشقة مرتين حيث وزعت الأصناف على القطع الرئيسية ومنظمات النمو على القطع المنشقة الأولى وطرق الزراعة على القطع المنشقة الثانية. وكانت أهم النتائج المتحصل عليها هي :–

تفوق الصنف بوما فى محصول الجذور والسكر/فدان ونسبة المواد الصلبة الذائبة والسكروز فى كلا الموسمين والبوتاسيوم فى الموسم الأول بينما تفوق الصنف بايسيه فى نسبة البوتاسيوم والنقاوة فى الموسم الأول فقط و تفوق الصنف ماراثون فى نسبة النقاوة فى الموسم الثانى .

تشير البيانات إلى زيادة محصول الجذور والسكر بزيادة تركيزات منظمات النمو من50 إلى 100 أو 150 جزء فى المليون فى كلا الموسمين و سجلت معاملة الرش بحمض الجبريلليك بتركيز 100 جزء فى المليون أعلى القيم فى نسبة المواد الصلبة الذائبة الكلية والنقاوة فى الموسم الثانى وفى نسبة السكروز فى كلا الموسمين بينما حققت معاملة الرش بحمض الجبريلليك بتركيز 150 جزء فى المليون أعلى نسبة نقاوة فى الموسم الأول فقط بينما أعطت معاملة الرش باندول حمض الخليك بتركيز 100 جزء فى المليون أعلى نسبة للمواد الصلبة الذائبة الكلية فى الموسم الأول فقط بينما أعطت معاملة الكنترول أعلى نسبة من البوتاسيوم فى كلا الموسمين.

أدت طريقة الزراعة بالبذرة إلى الحصول على أعلى قيمة لمحصول الجذور في كلا الموسمين و من البوتاسيوم فى الموسم الثانى فقط بينما أدت طريقة الزراعة بالشتل إلى الحصول على أعلى نسبة من المواد الصلبة الذائبة الكلية و السكروز ونسبة النقاوة فى كلا الموسمين ومن البوتاسيوم فى الموسم الأول فقط.

لقد كان للتفاعل بين للعوامل تحت الدراسة تأثير معنوي على صفات محصول الجذور، محصول السكر/فدان، نسبة المواد الصلبة الذائبة الكلية، نسبة السكروز، نسبة البوتاسيوم، نسبة النقاوة باستثناء التفاعل بين منظمات النمو× طرق الزراعة والتفاعل بين الأصناف × منظمات النمو× طرق الزراعة في الموسم الثاني فقط.

وتوصى هذه الدراسة بزراعة الصنف بوما والرش بحمض الجبريلليك بتركيز 100 جزء فى المليون باستخدام طريقة الزراعة بالشتل باستخدام الصواني الورقية للحصول على أعلى إنتاجية وجودة من محصول السكر تحت ظروف محافظة سوهاج .