Effect of Some Fertilization Treatments on Anatomical Characters and Productivity of Some Sugar Beet Cultivars Under Drip Irrigation System, Sinai

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Abstract: *Under drip irrigation system, two field experiments were conducted in 2003/2004 and 2004/2005 seasons at The Experimental Farm of The General Company of Land Reclamation, El-Kantara Shark, Sinai to study the effect of two fertilization treatments on anatomical structure and productivity of 5 sugar beet cvs.;namely, Pleno, Top, Kawemira, Gloria and Farida , while the two fertilization treatments were: 100 kg N + 46.5 kg P_2O_5 + 48 kg K_2O /fed (F1) and 20 m^3 compost + 67.5 kg N + 31 kg P_2O_5 + 24 kg K_2O /fed (F2) in the two seasons. Data were recorded at harvest time on root characteristics (root length, root diameter and fresh weight/plant) top fresh weight/plant, TSS%, sucrose% and purity% of roots juice, also, root, sugar and top yields (ton/fed.). Anatomical structure of leaves and secondary roots were undertaken in the second season only. Results show that some of the studied parameters of leaves and secondary roots structure varied according to cultivars and fertilization treatments. Regarding leaf structure, sugar beet cv.Top fertilized by F2 recorded the highest values for thickness of midrib, vascular bundle, phloem tissue, xylem tissue, sclerenchyma beneath phloem and collenchyma beneath upper epiderms at midrib, as well as, the highest values of number of xylem arms/vascular bundle and number of xylem vessels/ vascular bundle. sugar beet cv.Gloria fertilized by F2 gave the maximum values for thickness of palisade tissue + upper epidermis, palisade tissue + lower epidermis, spongy tissue and leaf wing. Concerning secondary root structure, the highest values for root diameter in T. S. and number of growth rings were observed in sugar beet cv.Kawemira fertilized by F2 and the maximum thickness of periderm and the highest number of phellem rows in sugar beet cv.Top fertilized by F1. Moreover, sugar beet cv.Farida fertilized by F1 gave the maximum thickness of six rows of parenchyma beneath periderm. Over the two seasons, F2 increased significantly top and root weights/plant, sucrose %, purity % and root, sugar and top yields/fed comparing with F1.The studied cultivars did not differ significantly from each other in root characteristics (length, diameter and weight), sucrose % and root, top and sugar yields/fed,while they differed in TSS % and purity %. Sugar beet cv.Top recorded the highest values for root diameter, root weight/plant, top weight/plant, roots yield/fed, top yield/fed and sugar yield/fed. in the second season only.*

Key word: *Sugar beet, Beta vulgaris L., NPK, Compost, Anatomy, Yield.*

INTRODUCTION

Most of projects of land reclamation (eastern and western Suez Canal) are being conducted in sandy soil and salt affected lands. Such lands are very promising for growing sugar beet.

Sprinkler and drip irrigation systems permit more precise control of the timing and amount of water applied than furrow irrigation. Mambelli *et al.*(1992) and Urbano *et al.*(1992) stated that yields of sugar beet improved under drip irrigation. Also, Sharmasarkar *et al.* (2001a and 2001b) found that sugar beet yield and sugar content were higher under drip irrigation comparing with furrow (flood) irrigation. Moreover, Abdel-Wahab *et al.* (2005) reported that sugar beet under drip irrigation was more vigorous and resulted higher root, sugar and top yields/fed than sprinkler irrigation.

Selecting the promising cultivars (which have better growth, juice and yield characters), is among the important factors to produce maximum productivity from sugar beet. Whereas, Hassanin (1999), Mokadem (1999), Ramadan (1999), Nassar (2001) and Al-Naas (2004) reported that sugar beet varieties differed in root yield and its juice properties (TSS %, sucrose % and purity %).

Prugar *et al.* (1980) showed that adding 20 tons FYM/ha increased root yield from 31.9 to 36.0 ton/ha. Abd El-Gaffar *et al.* (1981) found that root yield was significantly increased by applying organic manure with or without nitrogen and the combination of organic manure with nitrogen was more effective than applying any of them alone. Vales and Strand (1990) showed that root yield was higher by using FYM than nitrogen fertilization. Al-Labbody (1998) found that the combination of FYM with nitrogen increased significantly root diameter, root length and root yield, while juice purity and sucrose % were not affected significantly by this application. Ouda *et al.* (1999) found that 5 m^3 FYM + 120 kg N/fed produced the maximum root length and diameter and gave the highest root and sugar yields/fed., while, 20 m^3 FYM + 60 kg N/fed recorded the highest sucrose and purity percentages. Organic manure application to soil reduced soil pH and increased cations exchange capacity. Also, available N, P and K in soil increased after the application of manure and reduced gradually by time of harvest (Negm *et al.*, 2003). Moreover, Zaki (2004) reported that the combination of compost farmyard manure and ammonium nitrate (10 tons CFYM + 40 kg N/fed) showed the best results of plant growth, yield sugar concentration and purity. Abdel-Wahab *et al.*(2005) found that 20 m^3 compost + 67.5 kg N + 31 kg

P_2O_5 + 24 kg K_2O /fed increased significantly root weight/plant and root, sugar and top yields/fed.

Concerning the anatomical structure, El-Fadaly *et al.* (1990) observed that some of the anatomical characters of sugar beet plants varied among cultivars. EL-Maghraby *et al.* (1997) and Ibrahim and Attia (1998) found that potassium fertilizer had a positive effect on root structure and sugar yield Milform and Houghton (1999) showed that the number of growth rings of root ranged from 7-10 rings according to sugar beet cultivars. Ouda *et al.* (1999) observed that 5 m^3 compost + 120 kg N/fed produced the maximum root structure, length and diameter and gave the highest root and sugar yields/fed. Agami (2000) concluded that root length, root diameter and parameters of leaf structure increased gradually and significantly with increasing potassium fertilizer levels up to 120 kg K_2O/fed. Also, Azab (2003) found that the thickness of mesophyll region represented by upper epidermis + palisade tissue, lower epidermis + spongy tissue varied among cultivars and concluded that there were a firm and close relationship between the formation of root and accumulation of sugars. Furthermore, Zaki (2004) reported that the combination of 10 tons compost + 40 kg N/fed gave the best results of leaf and root structure of sugar beet varieties.

This work aimed to study the most suitable fertilization treatment which produces the highest productivity under the recent technique of irrigation (dripping) in the newly reclaimed areas. The anatomical characters of the most promising high yielding cultivars under such conditions will be concerned.

MATERIALS AND METHODS

Two field experiments were conducted on 15th of October during 2003/2004 and 2004/2005 seasons in The Experimental Farm of The General Company of Land Reclamation, Gelbana village, El-Kantra Shark (Project of El- Salam Canal), Sinai to study the effect of two fertilization treatments, namely 100 kg N + 46.5 kg P_2O_5 + 48 kg K_2O /fed (F1) and 20 m^3 compost + 67.5 kg N + 31 kg P_2O_5 + 24 kg K_2O /fed (F2) on the anatomical structure and the productivity of five sugar beet cultivars (Pleno, Top, Kawemira, Gloria and Farida) under drip irrigation system. Theses cultivars obtained from Sugar beet Company, Belkas, Dakahlia.

Irrigation was carried out every two days through the first month, then every week till 15 days before harvest. Period of irrigation was 2 hours.

In each season, field experiment was carried out in four replicates using split plot design. The two fertilization treatments were allocated in the main plots, whereas the five cultivars were arranged randomly in the sub plots. The experimental unit sized 30 m^2 (10 rows 5 m in length and 60 cm in width).

Organic matter (Compost) was applied to the soil during preparing land. Table (1) includes the chemical and mechanical analyses of the experimental soil and chemical analysis of irrigation water (El-Salam Canal), while Table (2) includes the chemical analysis of compost. These analysis were carried out in Soil and Water Dept., Fac. of Agric. In Ismailia. Seeds were sown in hills 20 cm apart on October 15 in both seasons. Plants were thinned to one plant/hill at 45 days after sowing (DAS). Each experimental unite was treated with sulfur (50 kg/fed) in two equal doses (at 21 and 51 DAS).

Phosphorus was added as calcium superphosphate (15.5% P_2O_5), nitrogen as ammonium nitrate (33.5 % N) and potassium as potassium sulfate (48 % k_2O). Phosphorus and potassium fertilizers with the above mentioned rates were added in two equal doses (at 21 and 51 DAS), while nitrogenous fertilizer was applied in three doses (at 21, 51 and 81 DAS). NPK fertilizers were added using drilling method. Moreover, plants were sprayed with Soluveg three times namely at 60, 90 and 120 DAS at rate 1g/Liter. Soluveg consists of 14 % N, 7 % P, 28 % K, 3 % Mg, 12 % S, 0.02 % B, 0.005 % Cu, 0.06 % Fe, 0.04 % Mn 0.0025 % Mo and 0.05 % Zn). Spraying volume ranged from 150 to 300 liters/fed according to plant age.

In each season, at harvest time (200 DAS), five plants were taken randomly from each plot to determine yield components (root length, root diameter, root fresh weight and top fresh weight /plant), juice quality (TSS %, sucrose % and purity %). Root and top yields per feddan were estimated from three inner rows of each experimental unit. Sucrose % was determined as described by Le Docte (1927). Sugar yield was calculated by multibling sucrose percentage × root yield per feddan. Purity % was calculated according to the following equation: purity %= sucrose % × 100 / TSS %.

On the other hand, in the second season only, structure of secondary root at 5 cm from stem and external leaf at the apex at (150 DAS) were studied. Samples were Killed and fixed in F.A.A. solution, dehydrated in tertiary butyl alcohol series, infiltration and embedding in pure paraffin wax (M.P. 56-58^0 C) were carried out as described by Willey (1971), using a rotary microtome. Sections (10μ) were obtained, and stained with safranin and light green before being mounted in Canada balsam. Sections were examined microscopically and the different tissues were scored by eyepiece micrometer. Data of each season were subjected to proper statistical analysis of variance and combined analysis of variance for the two seasons was undertaken according to Snedecor and Chocran (1981). Means followed by the same alphabetical letters are not statistically different according to Duncan's multiple range test at 5 % level of significance (Duncan, 1955).

RESULTS AND DISCUSSIONS

I-Anatomical structure:-

a-The leaf structure:-

Data in Table (3) and Figures (1 and 2) show that most parameters were differed as a result of the studied treatments. The highest values of midrib thickness (6.56 mm), thickness of vascular bundle (1.50 mm), thickness of phloem tissue (0.31 mm), xylem tissue thickness (0.76 mm), number of xylem arms/vascular bundle (14), number of xylem vessels/vascular bundle (52), thickness of sclerenchyma beneath phloem (0.38 mm) and thickness of collenchyma beneath upper epidermis

Table (1): Chemical and physical analyses of the experimental soil set (Gelbana village, El-Kantra Shark) and irrigation water (El-Salam Canal).

proprieties	Soil	Irrigation water
pH (Soil extract 1: 5)	8.03	7.16
EC (dS m^{-1})	15.05	2.86
Cations (meq L^{-1})		
Ca^{++}	45.50	2.00
Mg^{++}	29.50	8.00
Na^{+}	63.94	16.55
K^{+}	2.56	0.49
Anions (meq L^{-1})		
Cl^{-}	135.0	18.15
HCO_3^{-}	4.5	6.80
CO_3^{-}	--	0.64
SO_4^{-}	20.5	1.45
Total N %	0.32	
P (mg Kg^{-1})	1.90	
K (mg Kg^{-1})	43.1	
Soil texture	Sandy	

Table (2): Chemical analysis of the applied organic manure (compost).

pH (Soil extract 1: 2.5)	7.19
EC (dSm $^{-1}$)	3.97
Organic matter (%)	48.08
C:N ratio	20.74
Nitrogen (%)	1.34
Phosphorus (%)	0.12
Potassium (%)	1.21
Fe (mg kg^{-1})	141.15
Mn (mg kg^{-1})	94.43
Cu (mg kg^{-1})	32.73
Zn (mg kg^{-1})	56.65

(1.06 mm) were recorded by sugar beet cv. Top as a result of applying (F2) treatment (Fig. 2b). In addition, the maximum values of palisade tissue + upper epidermis thickness (1.31mm), palisade tissue + lower epidermis thickness (0.94 mm), spongy tissue thickness (0.69 mm) and leaf wing thickness (2.94 mm) were noticed by sugar beet cv Gloria with applying (F2) treatment (Fig. 2d). Whereas, the lowest ones of midrib thickness (3.56 mm), palisade tissue + lower epidermis thickness (0.62 mm), spongy tissue thickness (0.25 mm), vascular bundle thickness (0.62 mm), phloem tissue thickness (0.06 mm), xylem tissue thickness (0.37 mm), thickness of sclerenchyma beneath phloem (0.12 mm), thickness of collenchyma beneath upper epidermis (0.25 mm) and leaf wing thickness (1.56 mm) were observed by sugar beet cv. Farida as a result of applying (F1) treatment (Fig. 1e). Furthermore, the lowest values of both number of xylem arms/vascular bundle (7) and number of xylem vessels/vascular bundle (20) were recorded by Sugar beet cv. Pleno with applying (F1) treatment (Fig. 1a).

b-The secondary root structure:-

Results in Table (4) and Figures (3, 4, 5 and 6) show that most parameters were differed as a results of the studied treatments. The maximum values of root diameter (12.66 cm) and number of growth rings (10) were observed by sugar beet cv. Kawemirawith applying (F2) treatment (Fig. 4 c). Moreover, the highest values of periderm thickness (0.47 mm) and number of phellem rows (5) were recorded by sugar beet cv. Top with applying (F1) treatment (Fig. 5b). Furthermore, the highest phellem cell thickness (0.12 mm) was observed by sugar beet cv. Gloria as a results of applying (F2) treatment (Fig. 6 d). Also, the maximum value of six rows of parenchyma beneath periderm thickness (0.78 mm) was noticed by sugar beet cv. Farida with applying (F1) treatment (Fig. 5 e). However, the lowest values of root diameter (10.16 cm) and number of growth rings (7) were shown by sugar beet cv. Gloria with applying (F1) treatment (Fig. 3 d), periderm thickness (0.12 mm), number phellem rows.

Table (3): Effect of some fertilization treatmtens on leaf structure of five sugar beet cultivars under drip irrigation system.

Character → / Treatments ↓		Average thickness of midrib (mm)	Average thickness of palisade tissue + upper epidermis (mm)	Average thickness of palisade tissue + lower epidermis (mm)	Average thickness of spongy tissue (mm)	Average thickness of vascular bundle (mm)	Average thickness of phloem tissue (mm)	Average thickness of xylem tissue (mm)	Average number of xylem arms/vascular bundle	Average number of xylem vessels/vascular bundle	Average thickness of sclerenchyma beneath phloem (mm)	Average thickness of collenchyma beneath upper epidermis at midrib (mm)	Average thickness of leaf wing (mm)
F_1	Pleno	4.69	1.12	0.75	0.63	0.87	0.19	0.38	7	20	0.25	0.31	2.50
	Top	5.31	0.62	0.63	0.45	1.46	0.19	0.75	11	48	0.31	0.43	1.69
	Kawemira	4.25	0.94	0.75	0.62	1.00	0.12	0.56	8	26	0.14	0.26	2.31
	Gloria	5.62	0.75	0.63	0.38	1.19	0.25	0.56	9	40	0.24	0.56	1.75
	Farida	3.56	0.69	0.62	0.25	0.62	0.06	0.37	8	21	0.12	0.25	1.56
F_2	Pleno	4.87	0.94	0.75	0.50	0.94	0.22	0.56	8	22	0.13	0.37	2.19
	Top	6.56	0.94	0.69	0.31	1.50	0.31	0.76	14	52	0.38	1.06	1.94
	Kawemira	5.31	0.75	0.63	0.50	1.44	0.25	0.75	9	40	0.37	0.37	1.87
	Gloria	5.94	1.31	0.94	0.69	1.31	0.25	0.69	13	35	0.31	0.50	2.94
	Farida	5.44	0.94	0.63	0.49	1.31	0.25	0.62	12	33	0.25	0.62	2.06

F_1= 100N kg + 46.5P_2O_5 kg + 48K_2O kg/fed. F_2= 20m^3 compost + 67.5N kg + 31P_2O_5 kg + 24K kg/fed.
+ = Present - = Absent

Table (4): Effect of some fertilization treatments on secondary roots structure of five sugar beet cultivars under drip irrigation system.

Characters → / Treatments ↓		Average root diameter in T.S. (cm)	Average number of growth rings	Average thickness of periderm (mm)	Average number of phellem rows	Average thickness of maximum phellem cell (mm)	Average thickness of six rows of parenchyma beneath phelloderm (mm)
F_1	Pleno	10.83	8	0.31	3	0.06	0.47
	Top	12.33	8	0.47	5	0.10	0.69
	Kawemira	11.16	9	0.28	4	0.06	0.34
	Gloria	10.16	7	0.22	3	0.09	0.41
	Farida	11.16	9	0.31	3	0.08	0.78
F_2	Pleno	11.16	8	0.19	3	0.09	0.62
	Top	12.33	9	0.28	4	0.08	0.47
	Kawemira	12.66	10	0.28	4	0.06	0.47
	Gloria	10.66	8	0.44	4	0.12	0.59
	Farida	11.16	8	0.12	2	0.03	0.50

F_1= 100N kg + 46.5P_2O_5 kg + 48K_2O kg/fed. F_2= 20m^3 compost + 67.5N kg + 31P_2O_5 kg + 24K kg/fed.

(2) and phellem cell thickness (0.03 mm) were recorded by sugar beet cv. Farida as a result of applying (F2) treatment (Fig. 6 e)and thickness of six rows of parenchyma beneath periderm (0.34 mm) was found in sugar beet cv. Kawemira. With applying (F1) treatment (Fig. 5c). These results are in harmony with those obtained by Milform and Houghton (1999) who showed that the number of growth rings of root ranged from 7-10 rings among sugar beet varieties. In addition, Ouda *et al.* (1999) observed that 5 m^3 compost + 120 kg N/fed gave the maximum values of root, length diameter and produced the highest root and sugar yields/fed. Also, Azab (2003) found that the thickness of mesophyll region of sugar beet cultivars represented by upper epidermis + palisade tissue, lower epidermis + spongy tissue varied among cultivars.

II. Yield and its components:

A. Effect of fertilization treatments:

The differences between (F1) 100 kg N + 46.5 kg P_2O_5 + 48 kg K_2O/fed and (F2) 20 m^3 compost + 67.5 kg N + 31kg P_2O_5 + 24 kg K_2O/fed did not attain the statistical significance concerning the effect on root length and root diameter/plant in the two seasons and over them (Table 5). Applying F2 significantly increased top and root fresh weights/plant in the first season and over the two seasons compared with applying (F1). Also, data illustrated in Table (6) indicate that (F2) significantly increased both sucrose and purity

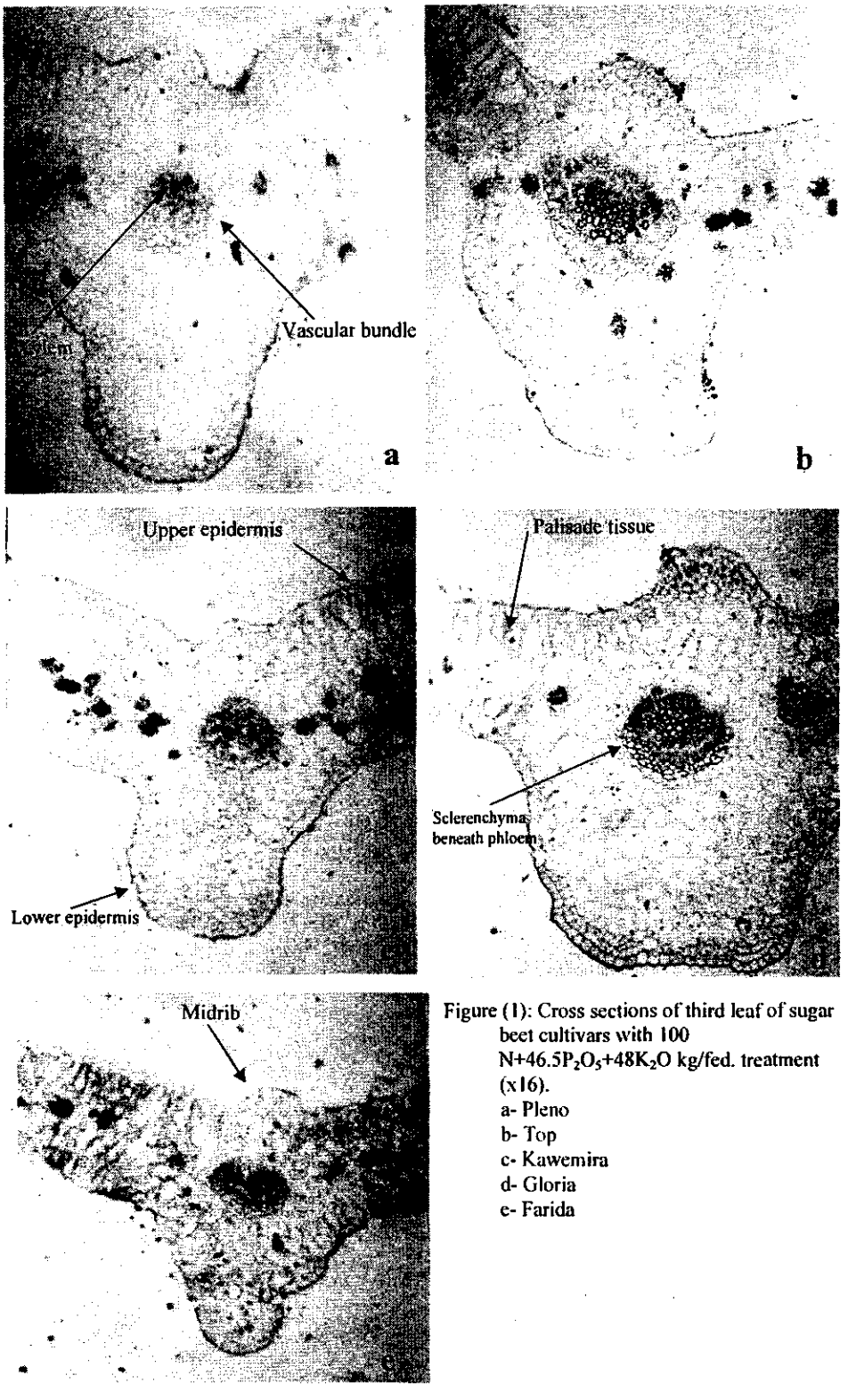

Figure (1): Cross sections of third leaf of sugar beet cultivars with 100 $N+46.5P_2O_5+48K_2O$ kg/fed. treatment (x16).
a- Pleno
b- Top
c- Kawemira
d- Gloria
e- Farida

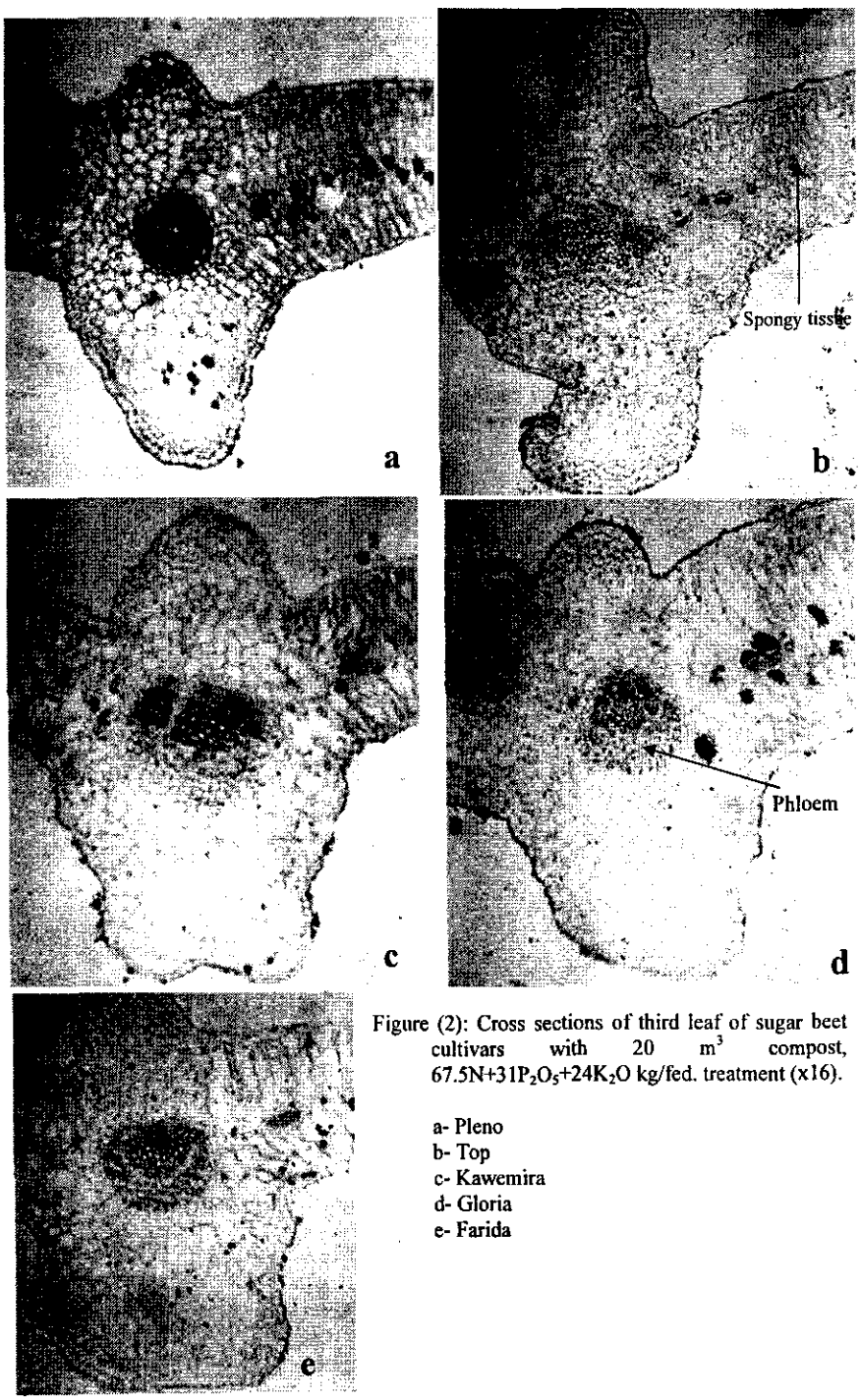

Figure (2): Cross sections of third leaf of sugar beet cultivars with 20 m^3 compost, 67.5N+31P_2O_5+24K_2O kg/fed. treatment (x16).

a- Pleno
b- Top
c- Kawemira
d- Gloria
e- Farida

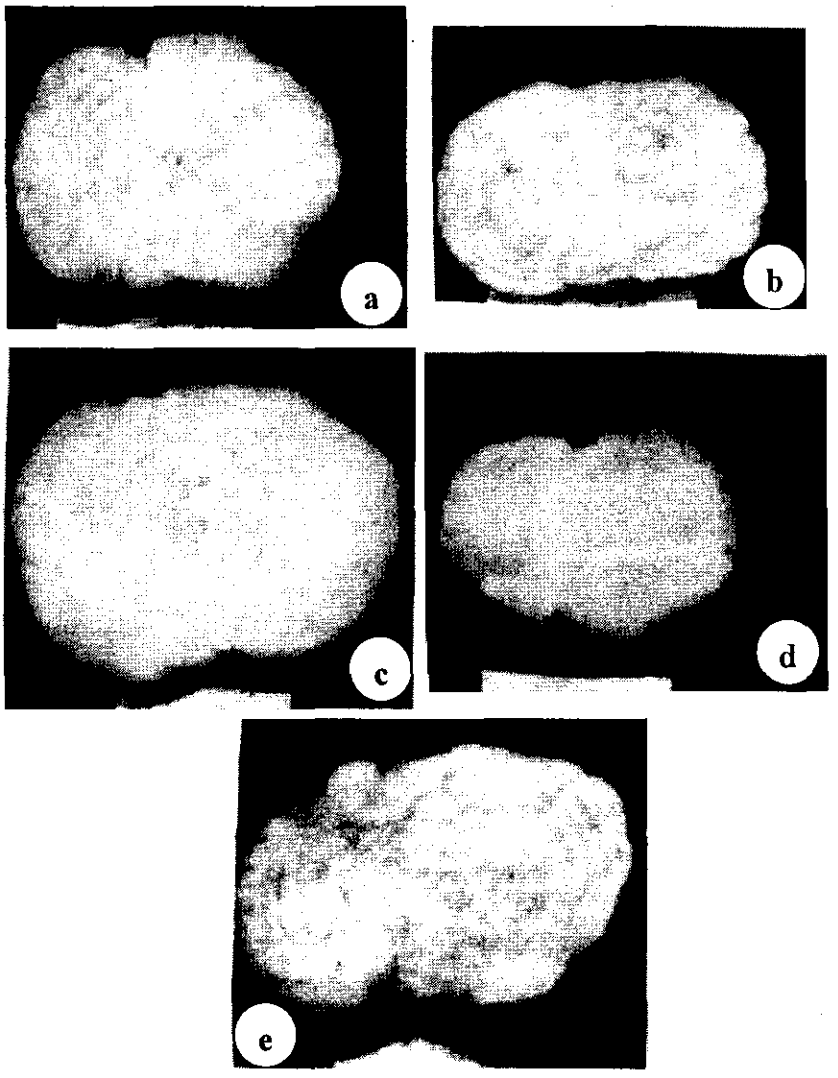

Figure (3): Cross sections of secondary root structure of sugar beet cultivars with 100 $N+46.5P_2O_5+48K_2O$ kg/fed. treatment.

a- Pleno b- Top c- Kawemira d- Gloria e- Farida

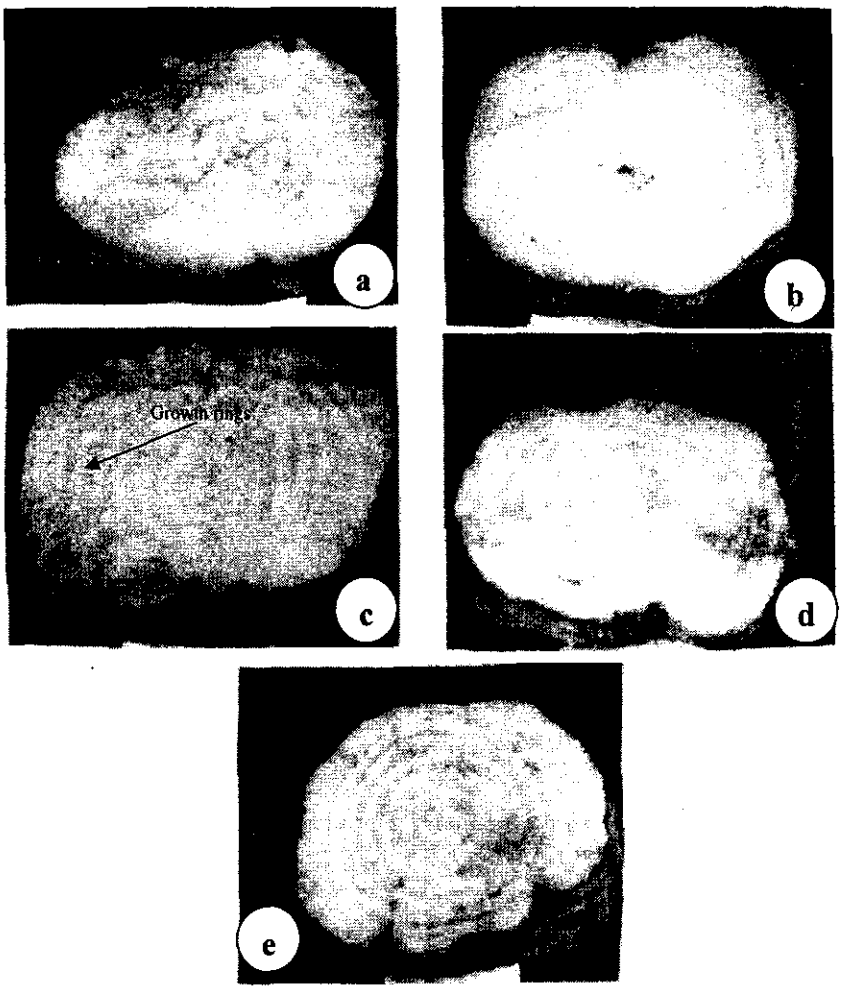

Figure (4): Cross sections of secondary root structure of sugar beet cultivars with 20 m^3 compost, 67.5N+31P_2O_5+24K_2O kg/fed. treatment.

a- Pleno b- Top c- Kawemira d- Gloria e- Farida

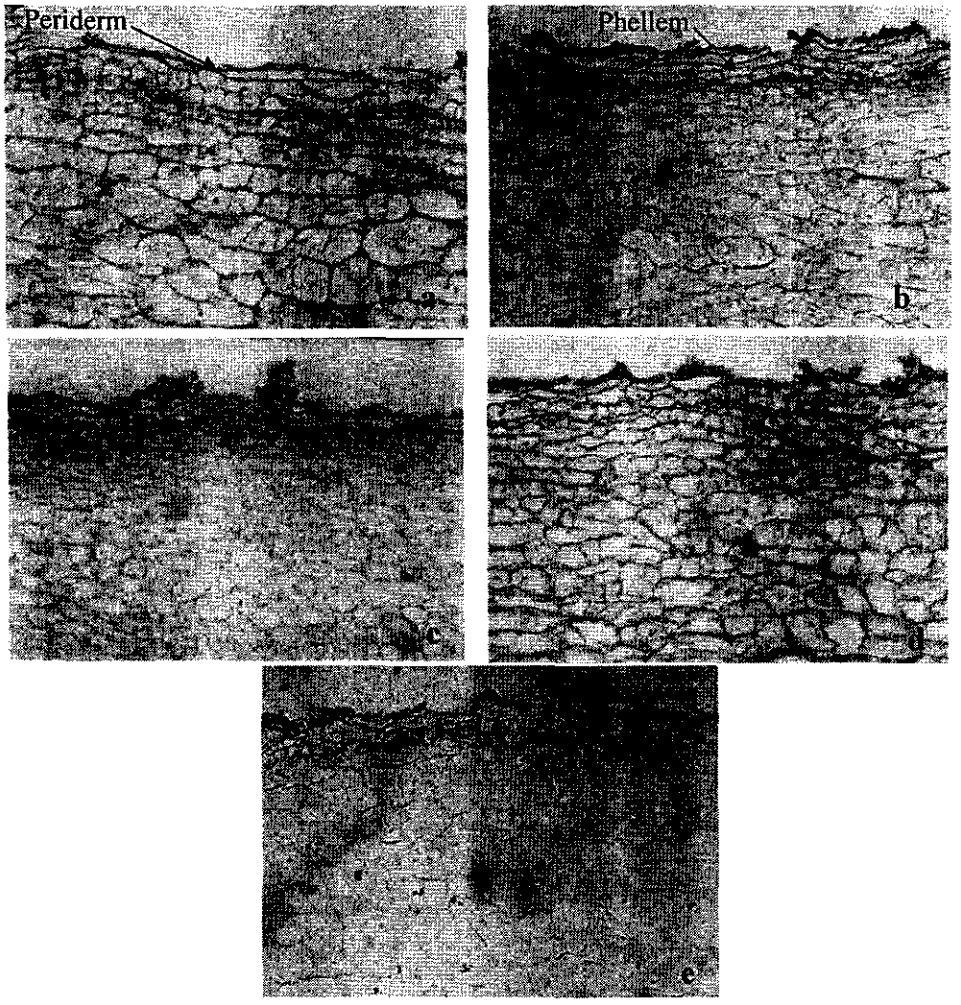

Figure (5): Cross sections of secondary root structure of sugar beet cultivars with 100 $N+46.5P_2O_5+48K_2O$ kg/fed. treatment (x32).

a- Pleno b- Top c- Kawemira d- Gloria e- Farida

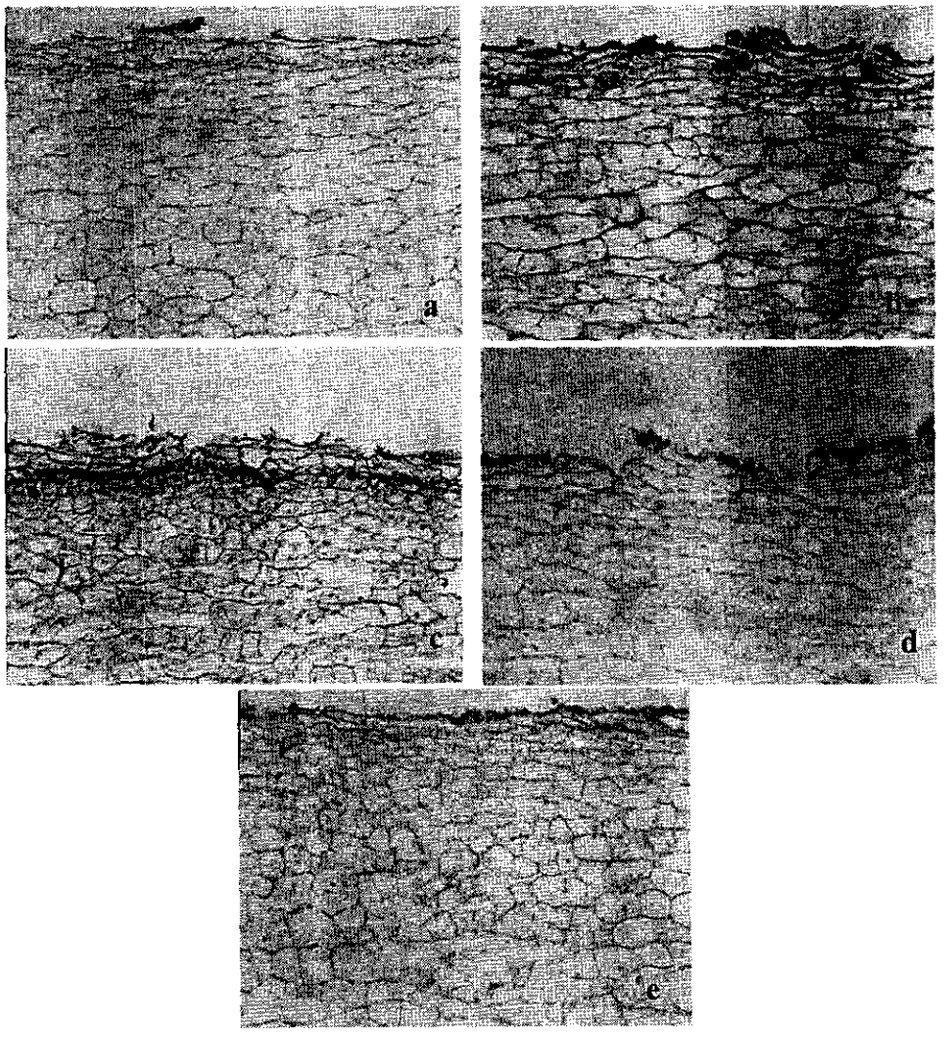

Figure (6): Cross sections of secondary root structure of sugar beet cultivars with 20 m^3 compost, 67.5N+31P_2O_5+24K_2O kg/fed. treatment (x32).

a- Pleno b- Top c- Kawemira d- Gloria e- Farida

percentages in the second season and over the two seasons compared with (F1), while TSS % was not affected by fertilization treatments.

Top, root and sugar yields/fed recorded significant increases with applying F2 and that was true in both seasons and over them, except that the increases in top and root yields/fed did not attain the level of significancy in the second season (Table 7).F2 included application of 20 m^3 compost which might improve the physical and chemical properties of the soil of experimental site beside its role as a source for macro and micronutrients (Table 1 and 2). In this respect, Negm *et al* (2003) mentioned that manure application to soil had favorable effects on its pH, cation exchange capacity and available N, P and K contents. Therefore, F2 had favorable effect on growth of sugar beet plants as expressed by fresh weight of top and root as well as on sucrose and purity percentages. This might account much for the superiority of resulted top, root and sugar yields/fed with applying this treatment of fertilization. The increase in top and root fresh weight (kgl/plant), top, root and sugar yield (ton/fed.) due to the increase in thickness of midrib, vascular bundle, phloem tissue and xylem tissue, also, number of xylem arms and xylem vessels of leaf (Table 3); as well as, number of growth rings and storage parenchyma thickness of root (Table 4). These results are in good accordance with those of Prugar *et al* (1980), Abd El-Gaffar *et al* (1981), Vales and Strand (1990), Al-Labbody (1998), Ouda *et al* (1999), Zaki (2004) and Abdel-Wahab *et al*.(2005).

B. Varietal differences:

It is evident from Table (5) that over fertilization treatments, differences among the studied five sugar beet cultivars in root length, root diameter, top and root fresh weights/plant were not significant in the two seasons and over the two seasons, except in the second season, differences among the studied cultivars in root diameter and fresh weights of shoot and root were significant. In the second season, the highest values for root diameter (12.5 cm), top weight/plant (0.715 kg) and root weight/plant (1.408 kg) were recorded by sugar beet cv. Top but it did not differ significantly by sugar beet cv. Kawemira in root diameter and root weight/plant and by sugar beet cvs. Kawemira and Gloria in top weight/plant.

Concerning juice quality traits, the differences among the studied cultivars in TSS% were significant in the first season and over the two seasons, in sucrose% were not significant in both seasons and over them and in purity% were significant in the second season and over the two seasons (Table 6). The highest TSS % was recorded for sugar beet cv Gloria (22.33 % and 23.75% in the first season and over the two seasons, respectively), while the highest purity % were recorded for sugar beet cv. Kawemira (77.29% and 79.42 % in the second season and over the two seasons, respectively). The present results are similar with those of Mokadem (1999), Ramadan (1999) and Nassar (2001).

Over the two seasons, the differences among the tested sugar beet cultivars concerning top, root and sugar yields/fed were insignificant, although these differences were significant for top and sugar yields/fed in the second season and were for root yield/fed in both growing seasons (Table 7). sugar beet cv. Top recorded the highest top yield (16.17 tons/fed) in the second season, but it differed significantly only from sugar beet cv. Farida Also, in the second season, sugar beet cv. Top recorded the highest root and sugar yields/fed (31.79 tons root and 5.52 tons sugar/fed), while this cultivar recorded the lowest root yield (20.67 tons/fed) in the first season. That flucation in root yield for sugar beet cv. Top may be due to the differences in environmental conditions. It is worthy to mention that sugar beet cv.Top recorded in the second season high values for root diameter, top fresh weight and root weight/plant which might interpret their superiority in top, root and sugar yields in the second season. These results over the two seasons are in contrary with those of Hassanein (1999) and AL-Naas (2004) who demonstrated differences among sugar beet cultivars in top, root and sugar yields.

C. Effect of interactions:

Over the two seasons, the interaction of cultivars × fertilization treatments did not affect all studied traits significantly except that, top fresh weight/plant, root fresh weight/plant and top yield/fed were affected significantly.

Table (8) demonstrates the averages of top fresh weight/plant, root fresh weight/plant and top yield/fed as affected by the interaction between the two experimental factors over the two seasons.

It is evident that F2 treatment significantly increased top fresh weight/plant for sugar beet cvs. Top and Pleno compared with F1, while the differences between the two fertilization treatments did not attain the statistical level concerned this trait for the other three cultivars. sugar beet cv. Kawemira Fertilized by F1 treatment gave the highest top fresh weight/plant (0.512 kg) and significantly differed from Sugar beet cv. Pleno only. Meanwhile, sugar beet cv. Top fertilized by F2 produced the highest value for this trait (0.606 kg) and significantly differed from sugar beet cv. Farida only.

Comparing with F1, F2 increased significantly root weight/plant by 27 % as average for all studied cultivars. sugar beet cv. Top fertilized by F1 gave the highest value concerned this trait (0.983 kg) and significantly differed from sugar beet cv. Kawemira only, while sugar beet cv. Kawemira fertilized by F2 recorded the highest root weight/plant (1.287 kg) without significant difference from Sugar beet cv. Pleno. Sugar beet cv. Kawemira recorded the maximum values of root diameter and number of growth rings, that increase its storage capacity consequently increase the root weight (Table 4).

Concerning top yield/fed, applying F2 significantly surpassed F1 for Pleno and Top cvs., while the differences between F1 and F2 did not attain the level of significant for the other three cultivars.

Table (5): Effect of two fertilization treatments on root length, root diameter, top fresh weight and root fresh weight/plant of five sugar beet cultivars in 2003/04 , 2004/05 seasons and combined data.

Treatments	Root length (cm)			Root diameter (cm)			Top fresh weight/plant (kg)			Root fresh weight/plant(kg)		
	2003 /04	2004 /05	Combin	2003 /04	2004 /05	Combin	2003/04	2004/05	Combin	2003/0 4	2004/0 5	Combin
Fertilization treatments:												
F1*	13.23	17.33	15.28	8.66	11.36	10.01	0.351	0.558	0.455	0.675	1.166	0.920
F2 **	14.60	17.03	15.81	10.56	11.60	11.08	0.430	0.611	0.521	0.973	1.371	1.172
F-test	ns	Ns	Ns	ns	ns	Ns	*	ns		*	ns	*
Cultivars:												
Pleno	14.75a	16.25a	15.50A	9.58 a	11.00 b	10.29A	0.433a	0.500 b	0.461A	0.895 a	1.241 b	1.068A
Top	14.16a	18.33a	16.25A	9.58 a	12.50a	11.04A	0.355a	0.715 a	0.536A	0.720 a	1.408 a	1.064A
Kawemira	12.66 a	16.58a	14.62A	9.91 a	11.75ab	10.83A	0.387a	0.625ab	0.506A	0.779 a	1.320ab	1.050A
Gloria	13.50a	16.08a	14.79A	9.41 a	11.00b	10.20A	0.366a	0.587ab	0.477A	0.866 a	1.195 b	1.031A
Farida	14.50 a	18.66a	16.58A	9.58 a	11.16b	10.37A	0.420a	0.495 b	0.458A	0.858 a	1.179 b	1.018A
Interaction	ns	Ns	Ns	ns	ns	Ns	ns	ns	*	ns	*	*

F1: 100 kg N + 46.5 kg P_2O_5 + 48 kg K_2O /fed
F2: 20 m^3 compost + 67.5 kg N + 31 kg P_2O_5 + 24 kg K_2O /fed

Table (6): Effect of two fertilization treatments on TSS %, sucrose % and purity % of five sugar beet cultivars in 2003/04, 2004/05 seasons and combined data.

Treatments	TSS %			Sucrose %			Purity %		
	2003/04	2004/05	Combin	2003/04	2004/05	Combin	2003/04	2004/05	Combin
F1*	21.20	23.60	22.40	16.91	16.31	16.61	77.23	69.23	73.23
F2 **	21.26	23.40	22.33	16.69	18.17	17.43	79.85	78.95	79.40
F-test	ns	ns	ns	ns	*	*	ns	ns	*
Pleno	21.66a	23.66a	22.66AB	16.31a	16.69 a	16.50A	75.15 a	70.56b	72.86B
Top	21.66a	23.00a	22.33AB	16.52a	17.32 a	16.92A	78.00 a	75.17ab	76.59AB
Kawemira	21.00ab	23.08a	22.04AB	17.31a	17.47 a	17.39A	81.55 a	77.29a	79.42A
Gloria	22.33a	23.75a	23.04A	16.40a	17.53 a	16.97A	77.35 a	74.24ab	75.79AB
Farida	19.50b	24.00a	21.75B	17.47a	17.17 a	17.32A	80.66 a	73.19ab	76.93AB
Interaction	ns	ns	ns	ns	ns	ns	ns	ns	Ns

F1: 100 kg N + 46.5 kg P_2O_5 + 48 kg K_2O /fed
F2: 20 m^3 compost + 67.5 kg N + 31 kg P_2O_5 + 24 kg K_2O /fed

Table (7): Effect of two fertilization treatments on top, root and sugar yields/fed of five sugar beet cultivars in 2003/04 , 2004/05 seasons and combined data.

Treatments	Top yield (ton/fed)			Root yield (ton/fed)			Sugar yield (ton/fed)		
	2003/04	2004/05	Combin	2003/04	2004/05	Combin	2003/04	2004/05	Combin
F1*	10.16	12.64	11.40	19.47	26.85	23.16	3.29	4.36	3.82
F2 **	12.46	14.68	13.57	28.16	31.06	29.61	4.69	5.71	5.20
F-test	*	ns	*	*	ns	*	*	*	*
Cultivars									
Pleno	12.26a	13.14ab	12.70A	25.97 a	28.66 ab	27.31A	4.23a	4.77b	4.50A
Top	10.24a	16.17a	13.20A	20.67 b	31.79 a	26.23A	3.45a	5.52a	4.49A
Kawemira	11.21a	14.14ab	12.67A	22.54 ab	29.79 ab	26.17A	3.89a	5.23ab	4.56A
Gloria	10.51a	13.35ab	11.93A	24.75 ab	27.19 b	25.97A	4.08a	4.77b	4.42A
Farida	12.32a	11.49b	11.91A	25.16 ab	27.33 b	26.25A	4.29a	4.87b	4.58A
Interaction	ns	*	*	ns	*	ns	ns	ns	ns

F1: 100 kg N + 46.5 kg P_2O_5 + 48 kg K_2O /fed
F2: 20 m^3 compost + 67.5 kg N + 31 kg P_2O_5 + 24 kg K_2O /fed

Table (8): Effect of fertilization treatments × sugar beet cultivars interaction on top and root fresh weights/plant and top yield /fed (combined data).

Cultivars	Top fresh weight (kg/plant)		Root fresh weight (kg/plant)		Top yield (ton/fed)	
	F1	F2	F1	F2	F1	F2
Pleno	0.375	0.548	0.954	1.183	9.53	15.88
Top	0.465	0.606	0.983	1.146	11.49	14.92
Kawemira	0.512	0.500	0.812	1.287	12.65	12.70
Gloria	0.446	0.508	0.941	1.121	11.19	12.68
Farida	0.475	0.441	0.912	1.125	12.15	11.67
LSD 5 %	0.106		0.138		2.65	

F1: 100 kg N + 46.5 kg P_2O_5 + 48 kg K_2O /fed
F2: 20 m^3 compost + 67.5 kg N + 31 kg P_2O_5 + 24 kg K_2O /fed

CONCLUSION

It can be concluded that sugar beet cv. Top followed by sugar beet cv. Kawemira fertilized by compost + NPK with the for mentioned rates gave the highest top, root and sugar yields/fed. under drip irrigation system in the new reclaimed soil in Sinai. In addition, application of compost + NPK fertilization in this soil could be recommended for raising sugar beet quality.

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تأثير بعض المعاملات السمادية على الصفات التشريحية و إنتاجية بعض أصناف بنجر السكر تحت نظام الري بالتنقيط بسيناء

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أجريت في المزرعة التجريبية التابعة للشركة العامة لاستصلاح الاراضى بالقنطرة شرق بسيناء وتحت الرى بالتنقيط تجربتان حقليتان فى موسمي ٢٠٠٣/٢٠٠٤ ، ٢٠٠٤/٢٠٠٥ وذلك بهدف دراسة تأثير معاملتين سماديتين هما ١٠٠كجم ازوت + ٤٦,٥ كجم فو٢ا٥ + ٤٨ كجم بو٢ا /فدان (المعاملة السمادية الاولى) ، ٢٠م٣ سماد عضوى (كمبوست) + ٦٧,٥ كجم أزوت + ٣١جم فو٢ا٥ + ٢٤كجم بو٢ا/ فدان (المعاملة السمادية الثانية) على التركيب التشريحى وانتاجية خمسة اصناف من بنجر السكر هى بلينو و توب وكاوميرا و جلوريا و فريدا. تم تسجيل القراءات فى الموسمين عند الحصاد على صفات الجذر (الطول والقطر والوزن الغض) ، والوزن الغض للعرش/نبات ، ونسبة كل من المواد الصلبة الكلية الذائبة والسكروز والنقاوة بعصير الجذور، وكذلك محصول الجذور والسكر والعرش (طن/ فدان). كما تم دراسة التركيب التشريحى للاوراق والجذور فى الموسم الثانى فقط. توضح النتائج ان بعض القياسات المدروسة لتركيب الاوراق والجذور الثانوية اختلفت طبقا للاصناف والمعاملات السمادية. بالنسبة لتركيب الاوراق فان معظم القياسات المدروسة للتركيب التشريحى للاوراق (سمك العرق الوسطى والحزمة الوعائية ونسيج اللحاء ونسيج الخشب والاسكلرنكيما اسفل اللحاء والكولانكيما اسفل البشرة العليا بمنطقة العرق الوسطى وايضا عدد اذرع الخشب لكل حزمة وعائية وعدد اوعية الخشب لكل حزمة وعائية) تزايدت مع الصنف توب عند تسميده بالمعاملة السمادية الثانية ، بينما سجل الصنف جلوريا اعلى القيم لسمك النسيج العمادى + البشرة العليا وسمك النسيج العمادى + البشرة السفلى وسمك جناح الورقة عند تسميده بالمعامله السمادية الثنية. ايضا اوضحت معظم القياسات التشريحية للجذور الثانوية وجود اختلاف بين الاصناف والمعاملات السمادية المستخدمه ، حيث اعطى الصنف كوميرا مع المعاملة السمادية الثانية اعلى القيم لقطر الجذر فى القطاع العرضى وعدد حلقات النمو . ولوحظت اعلى القيم لكل من البريدرم وعدد صفوف الفلين وسمك ستة صفوف من الانسجة البارنكيمية اسفل البريدرم مع المعاملة السمادية الاولى للصنفين توب وفريدا على التوالى.

اوضحت نتائج التحليل التجميعي للموسمين أن استخدام المعاملة السمادية الثانية تحت ظروف التجربة أعطت أعلى وزن لعرش و جذر النبات الفردي و كذلك أعلى محصول من الجذور والسكر والعرش للفدان مقارنة بالمعاملة السمادية الاولى . لم تفترق الأصناف تحت الدراسة معنويا عن بعضها فى صفات الجذر و نسبة السكروز وكذلك محصول الفدان من العرش والجذور والسكر . إلا انه في الموسم الثاني فقط سجل الصنف توب أعلى القيم لقطر الجذر/نبات ، ووزن الجذر/نبا ت ، ووزن العرش/نبات وكذلك محصول الفدان من الجذور والعرش والسكر .