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RESPONSE OF THREE SUGAR BEET VARIETIES TO COMPOST, MINERAL NITROGEN FERTILIZER AND THEIR COMBINATION UNDER SANDY SOIL CONDITIONS II- YIELD AND QUALITY

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ABSTRACT

Two field experiments were carried out at the Agricultural Experiments Desert Station, Faculty of Agriculture, Cairo University in Wadi El-Natroon, El-Beheira Governorate, during 2008/2009 and 2009/2010 seasons, to study the response of three sugar beet varieties, *i.e*. KWS1436, Swello and Faraha growing in sandy soil to compost (CM) , Mineral-N fertilizer and their combinations, at five treatments : 4 tons fed^{-1} of (CM), 4 tons fed^{-1} of (CM) +80 kg N fed^{-1} (100% N), 4 tons fed^{-1} of (CM) +60 kg N fed^{-1} (75 % N), 4 tons fed^{-1} of (CM) + 40 kg N fed^{-1} (50 %N) and 80 kg N fed^{-1}(100 % N) on yield and quality of sugar beet under drip irrigation system. The obtained results revealed that sugar beet varieties differed significantly in all studied traits in both seasons except for, sugar yield, purity % and sugar losses to molasses (SLM) % in the 1st season only. KWS1436 variety surpassed the other two varieties in sucrose %, extractable sugar % as well as sugar yield, also, it gave the highest root yield (28.81 ton fed^{-1}) and purity in the 1st season. Swello variety recorded the highest root yield (29.96 ton fed^{-1}), in the 2nd season. In combination treatments, increasing N levels from 40 to 80 kg N fed^{-1} significantly increased top, root and sugar yields and sucrose %, in the two seasons. Combination of CM + 80 kg N fed^{-1}(100 % N), produced the highest extractable sugar % (15.53 %) in the 1st season and increased root yield by (11.42 and 3.16 %), sugar yield by (13.62 and 5.22 %) in the 1st and 2nd seasons, respectively and sucrose % by (2.08 %) in the 1st season, as compared with adding 80 kg N fed^{-1}(100% N) alone. Combination of CM + 60 kg N fed^{-1} increased sucrose % by (4.13 %) as compared with 80 kg N fed^{-1} alone in the 2nd season. Compost alone gave the highest purity and Alkalinity coefficient (AC) % and the lowest impurities (K, Na and Alpha-amino N %) and SLM% in the 2nd season. Various interaction orders among the two factors affected significantly all traits under study. According to this investigation, to gain high sugar yield of sugar beet, KWS1436 fertilized by 4 tons compost + N level of 80 kg N fed^{-1} (100% N) is recommended under saline sandy soil conditions of Wadi El-Natroon and similar areas..

Key words: *compost, nitrogen fertilizer, sandy soil, sugar beet (Beta vulgaris L.), varieties , yield and quality.*

1. INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is grown for sugar production and it is the second source of sugar after sugar cane. Sugar beet has some advantages: the ability to store high sucrose percentage, the byproducts which are used for alcohol production and livestock and the wide adaptability to grow in poor, saline and alkaline soils. Despite the recently introduced sugar beet in Egypt, it is of great importance in newly reclaimed sandy soils at the northern parts of Egypt without competition from other crops because of its tolerance to salinity and the ability to produce high yields of sugar under saline affected soil and water conditions. Under continuous cropping or in the newly reclaimed lands, the soils have short supply of some elements especially nitrogen. In most sugar beet growing regions, N is the most important fertilizer element for normal growth and high yield of root and sugar. Many investigations have been oriented to optimize the use of nitrogen through a better understanding of crop requirements under varying conditions of soil environmental pollution (Salama and Badawi, 1996; Ghura *et al*. 2000 and Attallah and El Etreiby 2002). El-Sarag (2009) stated that application of 120 kg N fed^{-1} gave the heighest root yield (33.15 and 35.22 ton / fed^{-1}) in both seasons and increased sugar yield by 21.2, 14.1, 0.37% compared with 60, 80 and 100 kg N fed^{-1}. Ferweez *et al*., (2011) stated that the highest values of root yield (36.38 ton/fed) were recorded by120 kg N fed^{-1}. Adding100 kg N fed^{-1} recorded the highest value of sugar yield (4.18 ton/fed) and caused a decrease in pol% by 5.74 and 16.89%, and Na, K, and alpha amino–N% compared with the control (80 kg N fed^{-1}). Also Aboshady *et al*., (2011) reported that the application of N- at the rate of 105 kg N/fad. gave the highest root, top and sugar yields as well as Na , K, alpha amino-N and sugar loss in molasses. While sugar extractable %, extractability %and alkalinity coefficient recorded the lowest values.

Recently, some investigators utilized the farmyard manure (FYM) to fertilize sugar beet to decrease the cost and minimize the pollution due to mineral fertilizers. Zalat and Nemeat Alla (2001) found that farmyard manure increased sucrose % and TSS % while mineral N gave the highest root, top and sugar yield. Attallah and El Etreiby (2002) indicated that relative to untreated soil, treatment compost + mineral-N increased root yield, sucrose % and TSS % by 87.40, 15.71 and 15.73 %, respectively. Also, Marinkovic *et al.* (2004) found that the application of organic fertilizer increased root yield from 1.41 to 2.13 ton/ha. compared with the untreated treatment. Similarly, Hassan (2004) reported that the application of organic fertilizer increased the root yield, sugar yield, sucrose content and purity%. Mohamed (2008) revealed that compost significantly increased sucrose % and sugar yield compared to using mineral-N fertilizers. Compost has been shown to have a positive effect on agricultural soils and crop production, because compost provides a whole array of nutrients for the soil (Seok-In and Hee-Myong, 2009). Moreover, its use reduces the dependence on mineral fertilizers and contributes to pollution free environment, which is of great need (Attallah *et al*, 1997; Attallah and El Etreiby 2002 and Seok-In and Hee-Myong 2009).

Concerning varieties, Ali (2000) tested three sugar beet varieties Pleno, Kawemira and Lola. He found that Lola surpassed the other varieties in root and sugar yields. Badawi *et al*. (2002) evaluated four sugar beet cultivars *i.e.*, Top, Lola, Pleno and Kawemira. They found that, Kawemira was superior in sucrose%, root, top and sugar yields. Azzazy *et al.* (2007) and El-Sheikh *et al*. (2009) showed that the evaluated sugar beet varieties varied significantly in root and sugar yields, while sucrose and purity % did not differ significantly. Sugar beet variety KWS-9422 gave the highest root and sugar yields. Ouda (2009) tested two sugar beet varieties (Athos poly and Lados) and found that, Lodos variety surpassed Athos Poly in top, root and sugar yields. On the other hand, Omar (2007) indicated that sugar beet varieties had no significant effect on root and sugar yields in two seasons.

The main objectives of the present research were to find out the best variety to be grown under the stress conditions (sandy soil and salinity irrigation water of 2496-2650 ppm) and the optimum nitrogen level with organic fertilizer to obtain the highest yield and quality of sugar beet.

2. MATERIALS AND METHODS

Two field experiments were carried out at the Agricultural Experiments Desert Station of the Faculty of Agriculture, Cairo University in Wadi El-Natroon, El-Beheira Governorate, during the two successive winter seasons of 2008/2009 and 2009/2010 to study the response of three sugar beet varieties (KWS1436, Swello and Faraha) to five treatments of compost (CM), and of Mineral-N fertilizer and their combination: 4 tons fed^{-1} of (CM), 4 tons fed^{-1} of (CM) and 80 kg N fed^{-1}(100% N), 4 tons fed^{-1} of (CM) and 60 kg N fed^{-1}(75 % N), 4 tons fed^{-1} of (CM) and 40 kg N fed^{-1} (50 %N) and 80 kg N fed^{-1}(100 % N, recommended rate) on yield and quality of sugar beet. Treatments were arranged in a split-plot in a randomized complete block design with three replications. The main plots were devoted to the sugar beet varieties, while the sub plots were occupied by fertilizer treatments. Plot area was 21 m^2 (6 ridges, 7 m long and 50 cm apart). Sugar beet was sown on 10 and 15 October in the two seasons, respectively. All plots were fertilized with 30 kg P_2O_5 /fed before planting in the form of single super-phosphate (15.5 % P_2O_5). 50 kg K_2O fed^{-1} in the form of potassium sulphate (48% K_2O) was added through six equal doses. The first dose was added after thinning and the rest doses were applied at 7-day intervals. Nitrogen fertilizer was applied at levels of 40, 60 and 80 kg N fed^{-1}, in the form of ammonium nitrate (33.5% N) in six equal doses; the first dose was added after thinning and the rest doses were applied at 7-day intervals. 2 ton/Fed. of compost (CM) was broadcasted on soil two weeks before sowing. All suitable agricultural practices were conducted in the proper time. The mechanical and chemical analyses of the soil, water and compost analysis were carried out by the Reclamation and Development Center for desert soils, Faculty of

Agriculture, Cairo University (Tables 1, 2 and 3). The two field experiments were conducted under drip irrigation system.

2.1. Studied characters

Sugar beet was harvested by hand after 210 days from sowing. Weight per plot was obtained and used to calculate root yield per-feddan. Plants of each plot for various treatments were uprooted and topped to estimate the following characters:

- Yield components:

2.1.1.Average root fresh weight (kg/plant)

2.1.2. Top yield (ton fed^{-1})

2.1.3. Root yield (ton fed^{-1})

2.1.4. Sugar yield (ton fed^{-1}) was calculated according to the following equation:

Sugar yield (ton fed^{-1}) = Root yield (ton fed^{-1}) X Sugar %

2.2. Juice quality

2.1.1. Sucrose % was determined as described by Le Docte (1927).

2.2.2. Juice impurity (Potassium %, Sodium % and alpha-amino-N %), Na, K determined using Flame photometer as described by Page (1982) and alpha-amino-N determined using Hydrindnation method according to Carruthers *et al.* (1962).

2.2.3. Juice purity % and sugar lost to molasses % were calculated by the equation of Devillers (1988) as follows:

- Juice purity % = 99.36-[14.27(V1+V2+V3)/V4].

- Sugar loss to molasses % (SLM) = 0.14 (V1+V2) + 0.25 (V3) + 0.50.

2.2.4. Extractable sugar % and alkalinity coefficient % (AC) were calculated as proposed by Dexter *et al*. (1967):

- Extractable sugar % =V4 – SLM - 0.6.

- Alkalinity coefficient (AC) = V1+V2 / V3.

Where: V1= Sodium%, V2 = potassium %, V3 = Alpha-amino-N % and V4 = Sucrose %.

Data obtained from each season of the study were statistically analyzed according to procedures outlined by Gomez and Gomez (1984) using M-STAT-C computer program (Freed *et al.*, 1989). The differences among treatment means were compared by Least Significant Differences test (L.S.D) at 0.05 level of propability.

3. RESULTS AND DISCUSSION

3.1. Effect of varieties

Data in Table (4) cleared that the evaluated sugar beet varieties differed significantly in root fresh weight, top, root and sugar yields and sucrose % in both seasons except sugar yield in the 2nd season. KWS1436 sugar beet variety surpassed the other two varieties, Swello and Faraha in sucrose % and sugar yield in the two seasons. It recorded 18.27 % and 5.26 ton fed^{-1}, in the 1st season corresponding to 18.07 % and 5.30 ton fed^{-1} in the 2nd one, respectively.

It also produced the highest root yield (28.81 ton fed^{-1}), in the 1st season, Swello variety recorded the highest insignificant root yield (29.96 ton fed^{-1}) in the 2nd season.

The variation between varieties is probably due to genetic differences. El-Hinnawy *et al.* (2003) showed that the genotypes significantly differed in root and sugar yields. Also, Ouda (2009) evaluated two sugar beet varieties (Athos poly and Lodos) and reported that, Lodos variety surpassed Athos Poly in top, root and sugar yields.

Results in Table (5) showed that, all quality parameters *i.e.* juice impurities (K, Na and alpha-amino N %), juice purity %, sugar loss to molasses (SLM %), extractable sugar % and AC % were significantly affected by the studied sugar beet varieties in both seasons except for, purity % and SLM % in the 2nd season.

KWS1436 variety recorded the highest extractable sugar (15.70 and 15.41 %), and the lowest values of Na % (1.76 and 1.74 %,) in the 1st and 2nd seasons, respectively and recorded the highest purity (91.89 %) and lowest K (6.33 %) and SLM% (1.98 %) in the 1st season. While, Faraha variety was superior to the other two varieties in juice purity (91.46%) in the 2nd season. In the same line, Abou El Seoud *et al*. (2009) recorded significant differences in quality parameters, except for purity and extractable sugar % among sugar beet varieties.

3.2. Effects of fertilizer treatments

The obtained data in Table (6) revealed that combination of CM + 80 kg N fed^{-1}(100% N), was more effective and produced the highest top yield (13.42 and 15.24 ton fed^{-1}), and increased root yield by (11.42 and 3.16 %), sugar yield by (13.62 and 5.22 %) in the 1st and 2nd seasons, respectively and increased sucrose % by (2.08 %) in the 1st season, as compared with adding 80 kg N fed^{-1}(100% N) alone (Table 6). However, using (CM) +60 kg N fed^{-1}(75 % N) exhibited significant increase in sucrose % over fertilizing by 80 kg N fed^{-1}(100% N) alone by 4.13 % in the 2nd season. It is important to notice that the differences between (CM) +60 kg N fed^{-1} and (CM) +40 kg N fed^{-1}(50 % N) were insignificant for root and sugar yields and sucrose % in the 1st season.

These results may be due to that compost with high organic matter and low concentration of inorganic and organic pollutants allowed improvements of physical , chemical and

Table (1): Physical and chemical properties of soil in 2008/2009and 2009/2010 seasons.

Soil properties	Seasons	
	2008/2009	2009/2010
Physical properties		
Sand %	93.00	92.25
Silt %	4.56	5.19
Clay %	2.44	2.56
Texture	Sandy	Sandy
Chemical properties		
Soil (pH)	7.81	7.75
Ec (ds/m)	7.80	7.50
Organic Matter (%)	0.29	0.32
Total CaCo3 (%)	2.59	2.65
Total N (%)	0.60	0.65
Soluble anions concentration (meq/L) (meq/100g soil)		
Cl^-	77.75	77.0
HCO_3^-	0.51	0.55
SO_4^-	0.52	0.49
Soluble cations concentration (meq/L) (meq/100g soil)		
Na^+	52.0	50.0
K^+	1.00	1.20
Ca^+	17.00	7.50
Mg^+	17.00	18.00

Table (2): Chemical analysis of water samples in 2009 and 2010 years.

Year	pH	EC		Ions concentration meq/L						
	Unit	ds/m	ppm	HCO_3^-	Cl^-	$SO_4^=$	Ca^{++}	Mg^{++}	Na^+	Ka^+
2008	7.49	3.9	2496	3.7	31.5	7.60	4.5	5.10	34.9	0.50
2009	7.43	4.15	2656	3.2	30.0	7.10	5.0	4.0	30.0	0.42

Table (3): The mean value of chemical composition and DTPA-extractable micronutrients of the used compost.

Ec Dsm^{-1}	pH	O.C %	T.N. %	P %	K %	C/N Ratio	Ash %	OM %	Fe	Zn	Mn	Cu
									(Mg kg^{-1})			
1.90	7.2	19.1	1.40	0.30	0.98	13.64	80.2	32.65	45.9	14.3	36.0	22.4

Table (4): Mean performance of three sugar beet cultivars for top, root and sugar yields and sucrose % in 2008/2009 and 2009/2010 seasons.

Variety	Top yield (ton fed^{-1})	Root yield (ton fed^{-1})	Sugar yield (ton fed^{-1})	Sucrose %
2008/2009				
KWS1436	12.03	28.81	5.26	18.27
Swello	12.51	26.88	4.72	17.58
Faraha	11.32	26.47	4.74	17.84
LSD $_{0.05}$	0.70	2.20	0.39	0.18
2009/2010				
KWS1436	11.13	29.30	5.30	18.07
Swello	12.69	29.96	5.29	17.69
Faraha	13.44	28.31	5.22	17.96
$LSD_{0.05}$	2.19	0.79	N.S.	0.27

N.S = not significant

Table (5): Mean performance of three sugar beet cultivars for root juice quality percentages at harvest in 2008/2009 and 2009/2010 seasons.

Variety	Juice impurities %			Juice purity %	Sugar loss to molasses (SLM %)	Extr. sugar %	Alkalinity coeff. (AC %)
	K %	Na %	Alpha-amino-N %				
2008/2009							
KWS1436	6.33	1.76	1.36	91.89	1.98	15.70	6.09
Swello	6.64	1.77	1.30	91.46	2.00	14.98	6.61
Faraha	6.50	1.79	1.35	91.62	2.00	15.24	6.29
$LSD_{0.05}$	0.06	0.02	0.06	0.12	0.01	0.18	0.34
2009/2010							
KWS1436	6.97	1.74	1.40	91.38	2.07	15.41	6.51
Swello	6.57	1.81	1.48	91.35	2.04	15.05	5.87
Faraha	6.66	1.86	1.44	91.46	2.06	15.30	6.01
$LSD_{0.05}$	0.30	0.06	0.01	N.S.	N.S.	0.27	0.27

N.S. = not significant

Table (6): Effect of fertilizer treatments on top, root and sugar yields (ton fed^{-1}) and sucrose % in 2008/2009 and 2009/2010 seasons.

Fertilizer treatments	Top yield (ton fed^{-1})	Root yield (ton fed^{-1})	Sugar yield (ton fed^{-1})	Sucrose %
2008/2009				
Compost (CM)	9.76	25.01	4.48	17.93
CM+80 kg N	13.42	30.74	5.59	18.18
CM+60 kg N	12.42	26.62	4.77	17.93
CM+40 kg N	11.18	26.95	4.76	17.63
80 kg N	13.00	27.59	4.92	17.81
$LSD_{0.05}$	0.51	1.23	0.23	0.34
2009/2010				
Compost (CM)	9.37	25.51	4.48	17.56
CM+80 kg N	15.24	31.31	5.64	18.02
CM+60 kg N	13.07	30.00	5.52	18.40
CM+40 kg N	11.67	28.78	5.34	17.89
80 kg N	12.76	30.35	5.36	17.67
$LSD_{0.05}$	0.75	0.85	0.15	0.12

biochemical characteristics of the soil and encouraged plant uptake of N and other elements and activated accumulation of carbohydrates, which in turn enhanced sugar beet root fresh weight, yield productivity and quality.

In general, in combination treatments increasing N levels from 40 kg N fed^{-1} (50 %N) to 80 kg N fed^{-1} (100% N) significantly increased root fresh weight, top, root and sugar yields and sucrose in both seasons, which can be explained by the role of nitrogen in enhancing growth, chlorophyll formation and photosynthesis process. Similar results were reported by many investigators in other sugar beet production areas

Table (7):Effect of fertilizer treatments on impurity %, purity %, sugar loss to molasses, extractable sugar % and alkalinity coeff. % in 2008/2009 and 2009/2010 seasons.

Fertilizers	Juice impurity %			Juice purity %	Sugar loss to molasses (SLM)%	Extr. sugar %	Alkalinity coeff. (AC %)
	K %	Na %	Alpha-amino-N %				
2008/2009							
Compost (CM)	6.62	1.67	1.37	91.54	2.01	15.32	6.11
CM+80 kg N	6.66	1.92	1.36	91.49	2.05	15.53	6.41
CM+60 kg N	6.12	1.80	1.07	92.20	1.88	15.45	7.41
CM+40 kg N	6.27	1.62	1.32	92.11	1.90	15.13	5.98
80 kg N	6.79	1.85	1.56	90.97	2.14	15.08	5.73
$LSD_{0.05}$	0.07	0.03	0.03	0.19	0.01	0.21	0.23
2009/2010							
Compost (CM)	5.93	1.66	1.06	92.32	1.83	15.13	7.17
CM+80 kg N	7.43	1.83	1.61	90.70	2.20	15.21	5.82
CM+60 kg N	6.74	1.89	1.36	91.60	2.05	15.76	6.58
CM+40 kg N	6.85	1.85	1.55	91.18	2.11	15.19	5.78
80 kg N	6.72	1.78	1.62	91.18	2.09	14.97	5.28
$LSD_{0.05}$	0.24	0.05	0.06	0.24	0.04	0.13	0.34

Table (8): Effect of interaction between sugar beet varieties and fertilization treatments on top yield, root yield and sugar yield in 2008/2009 and 2009/2010 seasons.

Variety	Fertilizer treatments	Top yield (ton fed^{-1})		Root yield (ton fed^{-1})		Sugar yield (ton fed^{-1})	
		2009	2010	2009	2010	2009	2010
KWS-1436	Compost (CM)	8.40	8.51	25.20	25.48	4.71	4.55
	CM+80 kg N	14.00	13.53	30.61	31.55	5.68	6.00
	CM+60 kg N	13.13	11.20	29.10	29.73	5.06	5.23
	CM+40 kg N	11.20	11.20	29.06	29.40	5.41	5.29
	80 kgN	13.44	11.20	30.05	30.35	5.44	5.44
Swello	Compost (CM)	9.80	11.20	25.20	25.85	4.37	4.78
	CM+80 kg N	14.59	14.00	30.80	31.22	5.21	5.17
	CM+60 kg N	12.93	12.60	25.20	30.87	4.68	5.88
	CM+40 kg N	11.23	12.60	26.60	30.80	4.52	5.34
	80 kgN	14.00	13.07	26.60	31.05	4.81	5.28
Faraha	Compost (CM)	11.07	8.40	24.64	25.20	4.37	4.11
	CM+80 kg N	11.67	18.20	30.80	31.17	5.88	5.75
	CM+60 kg N	11.20	15.40	25.57	29.40	4.57	5.46
	CM+40 kg N	11.12	11.20	25.20	26.13	4.36	5.40
	80 kg N	11.57	14.00	26.13	29.64	4.49	5.36
$LSD_{0.05}$		0.89	1.28	2.13	1.46	0.39	0.27

(El-Hinnawy *et al*., 1998; Attallah and El Etreiby 2002; Attallah 2004; Leilah *et al*. (2005) and El-Geddawy *et al*. (2006). They reported that combination of CM with mineral-N had marked positive effect on root and sugar yields and sucrose %.

Table (9): Effect of interaction between sugar beet varieties and fertilization treatments on sucrose %, potassium %, sodium % and alpha-amino-N % in 2008/2009 and 2009/2010 seasons.

Variety	Fertilizer treatments	Sucrose %		Potassium (K) %		Sodium (Na) %		Alpha-amino-N %	
		2009	2010	2009	2010	2009	2010	2009	2010
KWS-1436	Compost CM)	18.68	17.85	6.10	6.52	1.69	1.71	1.26	1.10
	CM+80 kg N	18.53	19.03	6.07	7.03	2.02	1.89	1.55	1.50
	CM+60 kg N	17.38	17.60	6.20	7.26	1.76	1.75	1.02	1.05
	CM+40 kg N	18.60	17.98	6.13	7.09	1.58	1.65	1.49	1.57
	80 kg N	18.15	17.91	7.16	6.97	1.82	1.70	1.49	1.76
Swello	Compost CM)	17.35	18.50	6.90	5.84	1.56	1.61	1.60	0.99
	CM+80 kg N	16.90	16.57	7.68	7.84	1.87	1.91	1.40	1.49
	CM+60 kg N	18.57	19.02	6.11	5.79	1.80	1.96	1.06	1.51
	CM+40 kg N	17.00	17.33	6.65	6.68	1.75	1.68	1.02	1.84
	80 kg N	18.08	17.02	5.87	6.71	1.83	1.92	1.43	1.57
Faraha	Compost CM)	17.75	16.32	6.85	5.43	1.77	1.65	1.26	1.10
	CM+80 kg N	19.10	18.45	6.24	7.41	1.88	1.70	1.14	1.84
	CM+60 kg N	17.85	18.58	6.04	7.17	1.85	1.96	1.13	1.51
	CM+40 kg N	17.30	18.37	6.04	6.79	1.54	2.23	1.46	1.25
	80 kg N	17.20	18.07	7.34	6.49	1.90	1.73	1.76	1.52
$LSD_{0.05}$		0.32	0.21	0.12	0.42	0.05	0.09	0.05	0.11

Table (10): Effect of interaction between sugar beet varieties and fertilization treatments on purity %, sugar losses to molasses %, extractable sugar % and alkalinity coefficient % in 2008/2009 and 2009/2010 seasons.

Variety	Fertilizer treatments	Juice purity %		Sugar losses to molasses (SLM)%		Extr. sugar %		Alkalinity coeff. (AC %)	
		2009	2010	2009	2010	2009	2010	2009	2010
KWS-1436	Compost (CM)	92.11	91.90	1.91	1.93	16.18	15.32	6.21	7.51
	CM+80 kg N	91.94	91.55	2.02	2.12	15.92	16.30	5.22	5.96
	CM+60 kg N	91.99	91.20	1.87	2.02	14.91	14.98	7.83	8.56
	CM+40 kg N	92.30	91.18	1.95	2.12	16.05	15.27	5.17	5.59
	80 kg N	91.12	91.05	2.13	2.15	15.42	15.16	6.02	4.93
Swello	Compost (CM)	91.08	92.86	2.09	1.79	14.66	16.11	5.28	7.58
	CM+80 kg N	90.12	89.67	2.19	2.24	14.11	13.73	6.84	6.56
	CM+60 kg N	92.46	92.42	1.87	1.96	16.09	16.47	7.45	5.15
	CM+40 kg N	92.11	90.97	1.82	2.13	14.58	14.60	7.57	4.54
	80 kg N	91.54	90.82	2.05	2.10	15.44	14.32	5.92	5.50
Faraha	Compost (CM)	91.42	92.20	2.02	1.77	15.13	13.95	6.85	6.43
	CM+80 kg N	92.40	90.89	1.93	2.24	16.57	15.61	7.17	4.95
	CM+60 kg N	92.14	91.19	1.89	2.16	15.36	15.83	6.96	6.04
	CM+40 kg N	91.91	91.38	1.93	2.08	14.77	15.69	5.21	7.22
	80 kg N	90.24	91.66	2.23	2.03	14.37	15.44	5.25	5.41
$LSD_{0.05}$		0.33	0.42	0.02	0.08	0.34	0.23	0.39	0.59

Data shown in Table (7) indicated that the use compost, Mineral- N and their combination had a significant effect on juice impurities (K, Na and alpha-amino N %), juice purity %, sugar loss to molasses (SLM %), extractable sugar % and AC %. In combined treatments, increasing N levels from 40 kg N fed^{-1} (50 %N) to 80 kg N fed^{-1}(100% N) significantly increased, K, alpha-amino N % and SLM% in the two seasons and Na % in the 1*st* season and decreased purity % . This effect may be due to the role of high N level that stimulates vegetative growth and hence more essential elements absorbed, in addition to the role of organic matter (compost) in increasing soil microbes and release the available nutrients which increased its rate in beet root at harvest and increased non –sugar component and sugar loss to molasses % (Abou El Seoud *et al.*, 2009). These results are in harmony with those obtained by Moustafa *et al.* (2005) and Abou El-Fotoh and Abou El-Magd (2006).

In the 1st season (Table 7), the combination of CM+ 60 kg N fed^{-1} (75% N), was more effective and recorded the highest values of purity and AC % (92.20 and 7.41 %, respectively) as well as the lowest K% (6.12 %), alpha-amino N % (1.07 %) and SLM % (1.88 %). However, in the 2nd season compost alone gave the highest purity and AC % (92.32 and 7.17 %, respectively) and the lowest impurities percentages of K, Na and alpha-amino N % (5.93, 1.66 and 1.06 %, respectively) and SLM % (1.83 %).

The increase of purity % and reduction of SLM may be attributed to decrease of non- sugar component, which necessarily had been taken into account of almost calculated aimed to assessing the contribution of the non – sugar to potential loss of sugar as mentioned before. From data in Table (7) it can be noticed that, extractable sugar % recorded the highest values (15.53 % and 15.76 %,) by using CM +80 kg N fed^{-1} (100% N) in the 1st season and by using CM +60 kg N fed^{-1} (75 % N) in the 2nd season. Such effect was compensated by corresponding apparent increase in sucrose % as reported before in Table (6).

3.3. Interaction effects

Interaction among varieties and fertilizer treatment affected significantly all traits under study (Tables 8, 9 and 10). In the 1st season, root and sugar yields and sucrose % of Faraha variety fertilized by CM + 80 kg N fed^{-1} recorded the highest values (30.80 ton fed^{-1}, 5.88 ton fed^{-1} and 19.10 %, respectively) (Tables 8 and 9). While, fertilizing variety Swello by CM + 60 kg N fed^{-1} gave the highest value of purity % (92.46 %) (Table 10).

In the 2nd season, the highest values of root and sugar yields (31.55 and 6.00 ton fed^{-1}) and sucrose % (19.03 %) were obtained by KWS1436 variety fertilized by CM + 80 kg N fed^{-1} (Tables 8 and 9). Fertilizing Faraha variety by compost alone recorded the lowest root and sugar yields (24.64, 25.20 and 4.36, 4.11 ton fed^{-1}, respectively) in the 1st and 2nd seasons, respectively (Table 8).

From these results, it could be concluded that fertilizing sugar beet varieties KWS1436 and Faraha by 4 ton compost + 80 kg N fed^{-1}(100% N), could be recommended to gain high sugar yield under saline sandy soil condition of Wadi El-Natroon and similar areas.

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إستجابة ثلاثة أصناف من بنجر السكر للتسميد بالكمبوست والأزوت المعدني والتوافيق بينهما تحت ظروف الأراضي الرملية
2- المحصول و جودته

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ملخص

أجريت تجربتان حقليتان بمحطة التجارب الزراعية الصحراوية لكلية الزراعة جامعة القاهرة بوادي النطرون، بمحافظة البحيرة ، خلال موسمي 2009/2008 ، 2010/2009 لدراسة استجابة 3 أصناف من بنجر السكر KWS1436, (Swello, Faraha) للتسميد بالكمبوست و النيتروجين في خمس معاملات : 4 طن كمبوست/ف، 4 طن كمبوست +80 كجم ن/ف (100 % ن)، 4 طن كمبوست + 60 كجم ن/ف (75 %ن)، 4 طن كمبوست + 40 كجم ن/ف (50 % ن) و 80 كجم ن/فدان (100% ن)وتأثير ذلك على محصول وجودة بنجر السكر تحت نظام الري بالتنقيط. ويمكن تلخيص أهم النتائج فيما يلي: أظهرت النتائج وجود إختلافات معنوية بين الأصناف في جميع الصفات المدروسة خلال موسمي الزراعة ما عدا صفة محصول السكر و نسبة النقاوة و نسبة السكر المفقود في المولاس في الموسم الاول فقط. تفوق الصنف KWS1436 على الصنفين الأخرين في النسبة المئوية للسكروز و النسبة المئوية للسكر المستخلص ومحصول السكر و أعطى اعلي محصول من الجذور (28.81 طن/ف) و نسبة النقاوة في الموسم الاول. سجل الصنف Swello أعلي القيم لصفة محصول الجذور (29.96 طن/ف)، علي التوالي في الموسم الثاني.

أدي التسميد بالكمبوست مع زيادة معدل النيتروجين من 40 إلي 80 كجم/ف إلي زيادة معنوية في محصول العرش و الجذور و السكر للفدان، و نسبة السكروز خلال موسمي الزراعة. أعطت المعاملة 80 كجم ن/فدان (100 % ن) مع الكمبوست اعلي قيمة للنسبة المأوية للسكر المستخلص (15.53%) خلال الموسم الأول و احدثت زيادة فى محصول الجذور بمقدار (11.42 و 3.16%) و محصول السكر (13.62و 5.22%) خلال الموسم الأول و الثاني علي الترتيب و نسبة السكروز (2.08%) خلال الموسم الأول مقارنة با لتسميد 80 كجم ن/فدان (100% ن) منفردا. كما أظهرت النتائج أيضا أن إضافة الكمبوست مع 60 كجم ن/ف احدث زيادة فى نسبة السكروز بمقدار(4.13 %) مقارنة بالتسميد بواسطة80 كجم ن/فدان خلال الموسم الثانى. أعطي إضافة الكمبوست فقط أعلي القيم لنسبة النقاوة و معامل القلوية و أقل قيم لنسبة البوتاسيوم و الصوديوم و الآلفا أمينو نيتروجين و السكر المفقود في المولاس في الموسم الثاني. أوضحت النتائج ان التفاعل بين الاصناف و التسميد كان معنويا لجميع الصفات تحت الدراسة.

يوصى طبقا لهذة الدراسة للحصول علي أعلي محصول سكر من بنجر السكر تحت ظروف الاراضي الرملية الملحية بوادي النطرون، يوصي بزراعة الصنفKWS1436 والتسميد بـ 4 طن كمبوست +80 كجم ن/ف (100% ن).

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