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RESPONSE OF SOME SUGAR BEET GENOTYPES TO NITROGEN FERTILIZATION UNDER NEWLY RECLAIMED LAND CONDITIONS

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ABSTRACT: *Two field experiments were conducted during 2010/11 and 2011/12 seasons in Sahl El-Tina Port Said Governorate. The major goal was to study the response of fifteen multigerm sugar beet varieties namely; Oscar poly Kawemera, Top, Lola, Mont Bianco, Gloria; Desprez poly N, Dema poly; Farida, Atoth poly, Pleno; Ras poly, Nejma, H poly and Carola to four nitrogen fertilizer rates. A split plot design with four replications was used. Main plots were devoted to nitrogen fertilization rates of 80, 100, 120 and 140 kg N/fad and the sub-plots for sugar beet varieties. Combined analysis over two seasons was carried out.*

The obtained results revealed that nitrogen rate of 120 kg N/fad maximized yield productivity, i.e. average root weight, root and sugar yields/faddan. However, juice impurities and sugar loss to molasses were increased as nitrogen rate was increased to 140 kg/fad. On the contrary, a gradual reduction in sucrose% and extracted sugar% (sugar recovery) has been detected with the increase in nitrogen rate over 80 kg N/fad.

Significant variations in yield productivity and root quality among the tested varieties were observed. Kawemira and Gloria varieties gave the highest sugar yield (4.67 and 4.61 tons/fad, respectively), followed by Nejma variety (4.53 tons/fad.). The varieties next in order were Desprez poly N (4.43 tons/fad.) and Dema poly (4.41 tons/fad.). On the other hand, Lola exhibited the lowest sugar yield (3.52 tons/fad).

Under the conditions of this work, interaction data between both variables cleared that a nitrogen rate of 120 kg N/fad is quite sufficient to cover the nitrogen needed by most of the tested sugar beet varieties which maximized sugar yield per unit area through high root yield and better quality traits. Significant varietal response to added N was detected where some varieties were more efficient (Oscar poly and Carola) and others (Ras poly, Kawemera and Mont bianco) were more responsive to added nitrogen.

Key wards: *Varieties, Nitrogen Rate.*

INTRODUCTION

Nitrogen application to sugar beet cultivation has been found essential for yield determination. This is because nitrogen has pronounced effects on growth and physiological processes of sugar beet, even to the extent of causing large changes in the physiological and chemical characteristics of yield at harvest. Root quality is a combination of all chemical and physical aspects of beet root which influence processing and hence yield of sugar and its product. Root quality, comprises several parameters i.e. sugar content, impurities or non sugars such as potassium, sodium and alpha-amino nitrogen (De Nie and Van Den hill 1989). The optimum dose of nitrogen needed by sugar beet is greatly affected by many factors such as soil type, length of growing period, irrigation system, sugar beet variety……etc. In general, the literature cleared that sugar beet did not produce profitable crop under shortage of nitrogen. Nevertheless, high N rates decrease sucrose content and hence increased the content of molasses-forming compounds, especially the amount of alpha-amino N (Vandergeten and Venstallen, 1991; El-Kassed *et al,* 1993; Besheit *et al,* 1994 and 1995; Ramadan and Nassar, 2004 and Rosa *et al,* 2006).

Contemporary, high yielding sugar beet varieties are released. Meantime, Halverson and Hartman (1980); Carter and Traveller, (1981); El-Hinnawy *et al* (2002) and Ramadan and Nassar (2004) found great variation in quality and yields and its components among sugar beet varieties.

The present study was carried out during to determine the proper nitrogen rates for some sugar beet varieties under the agro-climatic conditions of Sahl El-Tina Port Said Governorate.

MATERIALS AND METHODS

Two experiments were conducted at Sahl El-Tina Port Said Governorate during 2010/2011 and 2011/2012. The soil is sandy having: clay of 3.5, silt of 3.8 and sand of 96.7 with pH of 7.6 and available nitrogen content of 4.2 ppm and a high $CaCO_3$ content of 10.4%, in 2010/11 season. These contents were 4.1% clay, 5.2%silt and 88.2% sand with pH of 7.7 and available nitrogen content of 8.2 ppm and $CaCO_3$ content of 9.6% in 20011/012 season.

Fifteen multigerm sugar beet varieties were used in this study namely Oscar poly introduced from Denmark; Kawemira, Top, Lola, Mont Bianco, Gloria and Carola from Germany; Desprez poly N and Dema poly from France; Farida, Atoth poly and Pleno from Netherland; Ras poly, Nejma and H poly from Sweden. In each experiment, a split plot design with four replications was used. Main plots were devoted for nitrogen fertilization rates (80, 100, 120 and 140 kg N/fad) and sugar beet varieties were arranged in the sub-plots. The sub plot area was 21 m^2 including six rows of 7 m in length and 50-cm apart. Seeds were sown on the 10 th and 15th of October in the first and second seasons, respectively. Nitrogen fertilizer was added in the form of ammonium nitrate (33% N) in two equal doses after thinning and one month later. The other recommended agricultural practices for growing sugar beet were followed.

At harvest, four guarded rows were taken from each plot to determine root fresh weight per plant and root yield/fad. A Sample of ten roots was taken randomly from each plot and analyzed for sucrose, purity, alpha amino nitrogen, sodium and potassium percentages. Sugar polarization (Sucrose%) was polarimetrically determined on a lead acetate extract of fresh macerated root according to A.O.A.C. (1990). Sodium and potassium were determined using "Flame Photometer" as described by Page (1982). Alpha amino nitrogen was determined according to the method of Carruthers *et al* (1962). Sugar loss to molasses and extracted sugar% (sugar recovery) were calculated using the following equations:

Sugar loss to molasses (SM) = (K+Na) 0.14 + α-mino N x 0.25+0.5 according to Devillers (1988). Extracted sugar% (sugar recovery) = sucrose% - (SM - 0.6), according to Dexter et al (1967). Sugar yield (ton/fad) = Root yield (ton/fad) x Sugar recovery%.

Collected data were statistically analyzed according to Gomez and Gomez (1984). According to homogeneity test between both seasons, combined analysis was carried out. Moreover, treatment means were compared using LSD test at 5% rate of probability.

RESULTS and DISCUSSION

A- Root weight/plant and root yield/faddan:

Data in Table (1) indicate that each increase of nitrogen rate up to 120 kg N/fad increased significantly both root weight/plant and root yield/fad. Thereafter, the further nitrogen increment up to 140 kg N/fad was accompanied with insignificant reduction in both traits. Such effect cleared that the response of beet yield to the high nitrogen rate of 120 kg N/fed was expected since the available nitrogen content of sandy soil in the experimental site was low. The obtained results are in line with those of Mahmoud *et al* (1990), El-Kased *et al* (1993) Besheit *et al* (1995), Moustafa, Zeinab *et al* (2000), Ramadan and Nassar (2004) and Rosa *et al* (2006).

Combined data in Table (1) showed significant variations in average root weight/plant and root yield/fed among sugar beet varieties. The highest average root weight and root yield were obtained from of

Ras poly (1.12 kg/plant and 28.04 tons/fad) and Kawemira (1.12 kg & 28.0 tons/fad) followed by Farida (1.11 kg and 27.76 tons/fad) and Oscar poly (1.09 kg and 27.2 ton/fad). On the other hand, Lola variety exhibited the lowest average root weight (0.89 kg) and root yield (22.31 tons/fad). Meantime, the other varieties were in between these limits. Furthermore, varieties showed nearly similar trend in 2010/2011 and 2011/2012 seasons (Table 4). Worth to mention that, the observed variation among the tested varieties in average root weight and root yield may be due to differences in the genetic make up of these genotypes. Numerous reports such as El-Hinnawy *et al* (2002); Mahmoud *et al* (2002); Ramadan and Nassar (2004) and Abd El-Razek *et al* (2006) indicated that yielding ability greatly differed among sugar beet varieties.

Combined and separate data of the two seasons (Tables 1 and 4) cleared that the interaction between nitrogen fertilization rates and sugar beet varieties had a significant effect on average root weight and root yield. Regarding the varietal response to N rate it is quite evident from Table (1) that some of the tested varieties were more efficient and hence less responsive to the increase of N rate. At the lowest N rate (80 kg N/fed) Oscar poly and Carola produced about 25 ton/fed with at par average of 24.05, 23.98 and 23.75 ton/fed produced by Ras poly, Kawemira and Monti bianco, respectively. At the 120 kg N rate, a highest yield of about 30 ton/fed was produced by Desprez poly N and Kawemira with at par average with almost 7 tested varieties. None of the tested varieties responded to the increase of N rate beyond 120 kg N/fed where this increment produced insignificant decrease in most cases.

These results mean that sugar beet varieties showed variation in their N response under the growing conditions. Similar results were reviewed by Ramadan and Nassar (2004) who found that root yield was significantly affected by the interaction between beet varieties and nitrogen rates.

B- Root quality:

B.a. Sucrose percentage:

Data in Table (1) indicated that sucrose percentage was gradually and significantly decreased as nitrogen rate was increased. For combined data, sucrose % was decreased by 4.46, 7.73 and 12.32% corresponding to 100, 120 and 140 kg N/fad., respectively, as compared with the lowest nitrogen rate (80 kg N/fad.). The same trend was also detected in the two seasons, where the reduction in sucrose% amounted to 7.65, 8.6 and 11.74% in the first season and 1.23, 7.27 and 12.9% in the second one (Table 4). Such effect is known as a "dilution effect" where the increase in assimilate accumulation in roots is always on the expense of their contents from sucrose. Results in Table (1) showed that each increment up to 120 kg N/fed resulted a significant increase in average root weight and root yield. Though the further N increment up to 140 kg N/fed decreased both traits, however this decrease was insignificant. The possibility that this N increment of top yield on the expense of root yield can not be neglected in this respect and could account for the decrease of sucrose content in roots observed herein. The obtained results are in accordance with those of Halverson and Hartman (1980); Carter and Traveller (1981); Besheit *et al* (1995); Moustafa, Zeinab *et al* (2000); Ramadan and Nassar (2004) and Rosa *et al* (2006) who reported that increasing N rates negatively affected root sucrose content.

Combined and separate data (Tables 1 and 4) showed that sucrose percentage differed significantly among the evaluated varieties. The highest sucrose sugar beet varieties were Dema poly (19.53%); Gloria (19.48%); Kawemira (19.10%) and Desprez poly N (19.05%). The intermediate sucrose percentage varieties were Ras poly (18.41%), Lola (18.39%), Atoth poly (18.16%), H.poly (18.09%) and Top (18.04%). Otherwise, the lowest sugar content ones were Pleno (17.74%), Montbianco (17.60%), Oscarpoly (17.57%) and Farida (17.52%). Meantime, in the two seasons, varieties nearly had similar average (Table 4). Variation in sucrose

Table 1

content of beet varieties were reported by El-Hinnawy *et al* (2002), Mahmoud *et al* (2002) and Abd El-Razek *et al* (2006).

The interaction between both factors had a significant effect on sucrose% in 2010/2011 and 2011/2012 seasons (Table 4) and their combined data (Table 1). Moreover, the lowest N dose (80 kg N/fad) exhibited the highest root sugar content for all varieties, while the increase in nitrogen rate up to140 kg N/fad showed a vice versa trend. Meantime, combined data (Table1) cleared that Lola variety was the highest tolerant variety to the negative effect of high nitrogen addition on this trait, where, the percent of reduction in sucrose percentage recorded 4.64, 3.74 and 3.33 % corresponding to each increase in nitrogen rate from 80 to 140 kg N/fad., respectively. It is evident also that, Atoth poly was the most sensitive variety, where the reduction in sucrose percentage was 19.24% as nitrogen rate was increased from 80 to 140 kg N/fad. Similar results were reviewed by Ramadan and Nassar (2004) who found that sugar content was significantly affected by the interaction between beet varieties and nitrogen rates.

B.b. Impurities and sugar losses in molasses:

Data in Tables 2, 3 and 4 showed that juice impurities, i.e. K, Na and alpha amino nitrogen and sugar loss to molasses were gradually and significantly increased as nitrogen rate was increased up to 140 kg N/fad. Similar results were reported by El-Kassed (1993), Besheit *et al* (1995), Moustafa, Zeinab *et al* (2000), El-Hinnawy et al (2002) and Ramadan and Nassar (2004).

Data of the two seasons (Table 4) and their combined (Tables 2 and 3) manifested that impurities and sugar loss to molasses differed significantly among sugar beet varieties. In the both seasons, the varieties almost had the same trend (Table 4). Combined data (Tables 2 and 3) cleared that Dema poly variety exhibited the lowest Na and α-amino N (0.66 and 1.67 mg/100 g beet), while the lowest K (3.91 mg/100 g beet) and sugar loss to molasses (1.67%) were recorded by Ras poly. On the other hand, the highest values of K, Na and α-mino N were of Nejma, H-poly and Farida varieties, respectively. Also, Farida variety exhibited the highest sugar loss to molasses. Varieties may be differed in their nutrient absorption ability reflecting the genetic make-up among varieties. In this connection, Halverson and Harteman (1980), Carter and Traveller (1981), Ramadan and Nassar (2004) and Abd El Razek *et al* (2006) showed that beet varieties were apparently different in their quality aspects.

The interaction between both factors had a significant effect on juice impurities (K, Na and α-mino) and sugar loss to molasses in both seasons (Table 4) and their combined data (Tables 2 and 3). Among tested sugar beet varieties, Dema poly was mostly the least sensitive one as affected by raising N-rate where it recorded the lowest values of K, Na and α-mino N as well as sugar loss to molasses (Tables 2, 3 and 4). However, Farida and Lola varieties were almost the most sensitive varieties to the increase in N rate, where they had the highest contents of impurities. Accordingly, results in Table (3) showed that Farida and Lola varieties recorded the highest values of sugar loss to molasses when N rate was increased from 80 up to 140 kg N/fad. These results are in line with those of Besheit *et al* (1995) and Ramadan and Nassar (2004) who reported that the interaction between nitrogen rate and sugar beet varieties significantly affected juice root impurities and hence sugar loss to molasses.

B.c. Extracted sugar percentage (sugar recovery %):

Gradual significant reduction in sugar recovery% has been detected as nitrogen rate was increased in both seasons and their combined (Tables 3 and 4). Combined data in Table (3) cleared that the reduction sugar recovery reached 6.13%, 11.0% and 17.93% corresponding to the increase in nitrogen rate to 100, 120 and 140 kg N/fad as compared to 80 kg N/fad, respectively. Furthermore, this reduction amounted to 9.65%, 11.37% and 16.91% in the first season and 2.59, 10.63 and 18.61% in the

Table 2

second season, respectively (Table 3). Such effect may be attributed to the increase in juice impurities and sugar loss to molasses. These results are in harmony with those of Besheit et al (1995), El-Shahawy et al (2002) and Ramadan and Nassar (2004) who observed marked reduction in sugar recovery as nitrogen rates were increased.

Combined data in Table (3) showed that the highest sugar recovery% was recorded by Dema poly variety (17.34%), followed by Gloria (17.14%), Kawemira (16.96%) and Desprez poly N (16.58%) without significance differences. However, the lowest sugar recovery% was of Farida variety (14.9 %). Meantime, the other varieties situated between these limits (Table 3). The highest sugar recovery varieties were distinguished with high sucrose percentage (pol%), low impurities and sugar loss to molasses. Vice versa explanation was also recorded for the lowest sugar recovery varieties.

The interaction between both factors significantly affected sugar recovery% over and within each season (Tables 3 and 4). The performance of the tested varieties with respect to sugar recovery% followed the same pattern as sucrose% under the different nitrogen rates. There was significant difference in sugar recovery % when sugar beet varieties Mont bianco, Pleno and H-poly fertilized with 80 and 100 kg N/fad., while the difference was insignificant between 80 and 100 kg N/fad in their effect on sugar recovery % for the other varieties (Table 3). Moreover, no statistical variance was detected between 80 and 120 kg N/fad. in sugar recovery% for Oscar poly, Lola, Ras poly and Desprez poly N varieties. However, the difference between 80 and 120 kg N/fad. was significant for the rest of sugar beet varieties. It was found that Dema poly, Gloria and Kawemira varieties gave the highest sugar recovery % under 80 kg N/fad., while, Atoth poly variety gave the lowest sugar recovery % under 120 kg N/fad.

B.D. Sugar yield (ton/fad.):

Combined and separate season result presented in Tables (3 and 4) showed that sugar yield was gradually and significantly increased with the increase in nitrogen rate from 80 up to 120 kg N/fad. Therefore, increasing nitrogen rate to 140 kg N/fad decreased sugar yield. Such effect may be due to the reduction observed in both root yield and sugar recovery%. These results are in full agreement with those reviewed by Besheit *et al* (1995), Moustafa, Zeinab *et al* (2000), Ramadan and Nassar (2004) and Rosa *et al* (2006).

Results over and within seasons (Tables 3 and 4) revealed that sugar yield significantly differed among sugar beet varieties. Combined data in Table (3) showed that Kawemira and Gloria varieties gave the highest sugar yield (4.67 and 4.61 tons/fad, respectively), followed by Nejma variety (4.53 tons/fad). The varieties next in order were Desprez poly N (4.43 tons/fad) and Dema poly (4.41 tons/fad). On the other hand, Lola exhibited the lowest sugar yield (3.52 tons/fad). Similar trend was almost observed in both seasons (Table 4).

It could be noticed that the highest and lowest sugar yields produced among the tested sugar beet varieties had the same pattern for root yield and sugar recovery% mentioned before. These findings are in agreement with those obtained by Ramadan and Nassar (2004) and Abd El Razek et al (2006).

The interaction between nitrogen rates and varieties significantly affected sugar yield in both seasons and their combined data (Tables 3 and 4). Combined data Table (3) cleared that the highest and lowest sugar yields/fad were of Desprez poly N (5.13 (tons/fad.) and Farida (3.22 tons/fad) when they were fertilized by 120 kg N/fad and 80 kg N/fad, respectively.

It could be concluded that under the conditions of Sahl El-Tina district, Port Said Governorate, where sandy soil is prevailing, 120 kg N/fad is quite sufficient to maximize sugar yield per unit area. This N rate is satisfied the nitrogen needed by most of the evaluated sugar beet varieties through maximizing root yield with adequate quality traits. Significant varietal response to added N was detected where some varieties were more efficient (Oscar poly and Carola) and others (Ras poly, Kawemera and Mont bianco) were more responsive to added nitrogen.

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Table (1) Effect of N rate on root weight, root yield and sucrose % of fifteen sugar beet genotypes (Combined over 2010/2011 and 2011/2012**)**

Varieties	Root weight (kg)				Mean	Root yield (ton/fad)				Mean	Sucrose%				Mean
	N rate (kg/fad)					N rate (kg/ fad)					N rate (kg / fad)				
	80	100	120	140		80	100	120	140		80	100	120	140	
Farida	0.78	1.14	1.30	1.22	1.11	19.44	28.58	32.50	30.53	27.76	18.78	17.53	17.23	16.54	17.52
Oscar poly	1.00	1.11	1.11	1.13	1.09	25.11	27.80	27.64	28.25	27.20	18.56	17.70	17.55	16.46	17.57
Mont bianco	0.95	1.06	1.03	1.08	1.03	23.75	26.53	25.85	26.91	25.76	19.16	17.04	17.87	16.35	17.60
Pleno	0.88	0.97	1.13	1.12	1.02	22.11	24.23	28.16	27.99	25.62	19.36	17.91	17.40	16.29	17.74
Top	0.81	1.00	1.20	1.25	1.06	20.34	24.92	29.91	31.29	26.62	19.37	18.94	17.25	16.62	18.04
H-poly	0.87	1.10	1.17	1.11	1.06	21.84	27.51	29.19	27.69	26.56	19.87	17.96	18.12	16.43	18.09
Atoth poly	0.98	1.12	1.14	1.01	1.06	24.53	28.05	28.52	25.33	26.61	19.65	19.25	17.88	15.87	18.16
Lola	0.61	0.87	1.03	1.05	0.89	15.30	21.86	25.77	26.31	22.31	18.95	18.07	18.24	18.32	18.39
Ras poly	0.96	1.15	1.21	1.17	1.12	24.05	28.65	30.25	29.22	28.04	19.25	18.71	18.25	17.42	18.41
Nejma	0.92	0.99	1.05	1.09	1.01	19.60	22.91	24.67	26.24	27.34	19.77	18.81	17.76	17.85	18.54
Desprez poly N	0.78	1.07	1.22	1.21	1.07	19.60	26.81	30.41	30.13	26.74	19.95	19.62	19.27	17.29	19.03
Kawemira	0.96	1.05	1.23	1.24	1.12	23.98	26.29	30.74	31.01	28.00	20.35	20.16	18.48	17.77	19.10
Gloria	0.84	1.12	1.15	1.19	1.08	21.11	27.98	28.87	29.63	26.90	20.51	20.23	18.84	18.36	19.48
Dema poly	0.83	0.97	1.10	1.16	1.02	20.70	24.26	27.59	29.08	25.41	20.48	19.87	18.74	19.05	19.53
Carola	1.00	1.11	1.11	1.13	1.09	25.11	27.80	27.64	28.25	27.20	18.56	17.70	17.55	16.46	17.57
Mean	0.87	1.05	1.15	1.14		21.77	26.29	28.69	28.62		19.57	18.70	18.06	17.16	
LSD 0.05															
Nitrogen rate (N)					0.07					2.13					0.38
Varieties (V)					0.05					2.19					0.94
N X V					0.13					2.46					1.54

Table (2): Effect of N rate on alpha-amino nitrogen, potassium and sodium contents of the fifteen sugar beet genotypes (Combined over 2010/2011 and 2011/2012**)**

Varieties	Alpha-amino N (mg/100g)				Mean	K (mg/100g)				Mean	Na (mg/100g)				Mean
	N rate (kg/fad)					N rate (kg/fad)					N rate (kg/fad)				
	80	100	120	140		80	100	120	140		80	100	120	140	
Farida	1.61	1.91	3.12	5.12	2.94	4.1	4.36	4.36	4.62	4.36	0.97	1.16	1.10	1.92	1.28
Oscar poly	1.56	2.28	2.65	2.75	2.30	3.85	4.62	4.62	5.38	4.62	0.93	0.93	0.93	1.39	1.05
Mont bianco	1.49	2.30	2.27	3.42	2.37	3.59	3.59	4.87	4.62	4.17	0.81	1.05	1.33	1.30	1.12
Pleno	1.45	2.23	2.59	2.75	2.25	4.10	4.87	5.13	5.13	4.81	0.85	1.17	1.28	1.55	1.21
Top	1.61	2.55	2.68	4.01	2.71	4.36	4.36	4.62	4.87	4.55	0.78	0.94	1.44	1.02	1.05
H-poly	1.29	1.75	2.12	4.65	2.45	3.85	3.85	3.85	4.62	4.04	0.96	1.04	1.55	1.80	1.34
Atoth poly	1.41	1.68	2.07	3.08	2.06	3.85	4.18	3.51	5.38	4.23	0.63	0.79	0.81	1.86	1.02
Lola	1.37	2.37	3.77	4.06	2.89	3.85	4.10	5.13	4.62	4.42	1.27	1.41	1.22	1.35	1.31
Ras poly	1.40	1.81	1.90	2.42	1.88	3.85	3.85	3.59	4.36	3.91	0.80	0.94	1.18	1.31	1.06
Nejma	1.43	2.35	2.68	2.86	2.33	4.10	4.62	5.64	5.13	4.87	0.75	0.95	0.96	0.96	0.91
Desprez poly N	1.53	1.81	2.50	4.43	2.57	3.85	3.85	3.85	4.62	4.04	0.70	0.90	1.02	1.52	1.04
Kawemira	1.21	1.81	2.54	3.30	2.22	3.33	4.36	4.87	5.38	4.49	0.54	0.87	0.96	1.25	0.91
Gloria	1.44	1.65	2.21	2.87	2.04	3.85	3.59	4.36	5.13	4.23	0.67	1.01	0.89	1.27	0.96
Dema poly	1.10	1.23	1.82	2.52	1.67	3.59	4.10	4.62	4.36	4.17	0.54	0.55	0.63	0.90	0.66
Carola	1.56	2.28	2.65	2.75	2.30	3.85	4.62	4.62	5.38	4.62	0.93	0.93	0.93	1.39	1.05
Mean	1.42	1.98	2.49	3.40		3.85	4.10	4.62	4.87		0.80	0.98	1.09	1.39	
LSD 0.05															
Nitrogen rate (N)					0.32					0.24					0.29
Varieties (V)					0.78					0.57					0.43
N X V					0.87					1.01					1.38

Table (3): Effect of N rate on sugar loss to molasses %, sugar recovery % and sugar yield (ton/fad) of the fifteen sugar beet genotypes. (Combined over 2010/2011 and 2011/2012**)**

Varieties	Sugar loss to molasses%				Mean	Sugar recovery %				Mean	Sugar yield (ton/fad.)				Mean*
	N rate (kg/fad)					N rate (kg/fad)					N rate (kg/fad)				
	80	**100**	**120**	**140**		**80**	**100**	**120**	**140**		**80**	**100**	**120**	**140**	
Farida	1.61	1.75	2.04	2.70	**2.02**	16.57	15.18	14.59	13.24	**14.90**	3.22	4.34	4.74	4.04	**4.13**
Oscar poly	1.56	1.85	1.93	2.14	**1.87**	16.40	15.25	15.02	13.72	**15.10**	4.12	4.24	4.15	3.88	**4.11**
Mont bianco	1.49	1.72	1.94	2.18	**1.83**	17.07	14.72	15.33	13.57	**15.17**	4.05	3.90	3.96	3.65	**3.91**
Pleno	1.56	1.90	2.04	2.12	**1.91**	17.20	15.41	14.76	13.57	**15.23**	3.80	3.73	4.16	3.80	**3.90**
Top	1.62	1.88	2.02	2.33	**1.96**	17.15	16.46	14.63	13.69	**15.48**	3.49	4.1	4.38	4.28	**4.12**
H-poly	1.50	1.62	1.79	2.56	**1.87**	17.77	15.74	15.73	13.27	**15.62**	3.88	4.33	4.59*	3.67	**4.15**
Atoth poly	1.48	1.62	1.62	2.28	**1.75**	17.57	17.03	15.66	12.99	**15.81**	4.31	4.78	4.47	3.29	**4.21**
Lola	1.56	1.86	2.33	2.35	**2.02**	16.79	15.61	15.31	15.37	**15.77**	2.57	3.41	3.95	4.04	**3.52**
Ras poly	1.50	1.62	1.64	1.90	**1.67**	17.15	16.49	16.01	14.92	**16.14**	4.12	4.72	4.84	4.36	**4.53**
Nejma	1.54	1.87	2.09	2.07	**1.89**	17.63	16.34	15.07	15.18	**16.05**	4.04	4.03	3.95	4.15	**4.06**
Desprez poly N	1.52	1.62	1.81	2.42	**1.85**	17.83	17.40	16.86	14.22	**16.58**	3.49	4.67	5.13	4.29	**4.43**
Kawemira	1.34	1.68	1.95	2.25	**1.81**	18.41	17.88	15.93	14.92	**16.69**	4.41	4.70	4.90	4.63	**4.67**
Gloria	1.49	1.56	1.79	2.11	**1.74**	18.42	18.07	16.45	15.65	**17.14**	3.89	5.06	4.75	4.64	**4.61**
Dema poly	1.35	1.46	1.69	1.87	**1.59**	18.53	17.81	16.45	16.58	**17.34**	3.84	4.32	4.54	4.82	**4.41**
Carola	1.58	1.83	1.91	2.11	**1.86**	16.30	15.35	15.07	13.62	**15.09**	4.15	4.28	4.35	3.90	**4.17**
Mean	**1.51**	**1.71**	**1.92**	**2.23**		**17.46**	**16.39**	**15.54**	**14.33**		**3.80**	**4.31**	**4.46**	**4.10**	
LSD 0.05										0.98					0.21
Nitrogen rate (N)					0.12					1.13					0.11
Varieties (V)					0.25					1.56					0.49
N X V					0.13										

Table (4): Effect of nitrogen rate on yield and quality aspects of the fifteen sugar beet genotypes during 2010/2011 and 2011/2012 seasons

Factors	Aver. root weight kg	Root yield (ton/fad.)	Sucrose %	K	Na	&-amino N	Sugar loss to	Sugar recovery	Sugar yield

Response of some sugar beet genotypes to nitrogen fertilization under………

													molasses		%		(t/fad.)	
	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12
Overall mean	1.06	1.04	26.63	26.06	18.25	18.50	4.29	4.39	0.96	1.17	2.23	2.40	1.80	1.87	15.85	16.03	4.22	4.18
Significance	Ns		*		NS		NS		NS		*		NS		*		NS	
Varieties																		
Farida	1.0	1.22	25.7	29.82	17.2	17.84	4.29	4.43	1.21	1.35	2.89	2.99	2.01	2.03	14.59	15.21	3.75	4.54
Oscar poly	1.06	1.12	26.1	28.30	17.3	17.84	4.71	4.53	1.20	0.90	2.21	2.39	1.84	1.90	14.86	15.34	3.88	4.34
Mont bianco	1.08	0.98	27.1	24.42	17.3	17.9	4.02	4.14	1.19	1.05	2.19	2.55	1.80	1.86	14.9	15.44	4.04	3.77
Pleno	0.89	1.15	23.9	27.34	17.4	18.08	4.65	4.97	1.18	1.24	2.19	2.31	1.87	1.95	14.93	15.33	3.57	4.25
Top	1.60	0.52	25.9	27.34	18.0	18.08	4.43	4.67	0.99	1.11	2.69	2.73	1.93	1.99	15.47	15.49	4.01	4.24
H-poly	1.02	1.1	27.9	25.22	18.3	17.88	4.1	3.98	1.30	1.38	2.37	2.53	1.86	1.88	15.84	15.4	4.42	3.88
Atoth poly	0.96	1.16	28.3	24.92	18.1	18.22	4.16	4.30	1.0	1.04	2.11	2.01	1.73	1.77	15.77	15.85	4.46	3.95
Lola	0.79	0.99	23.9	20.72	18.2	18.58	4.39	4.45	1.28	1.34	2.71	2.07	1.99	2.05	15.61	15.93	3.73	3.30
Ras poly	0.21	1.04	27.1	28.98	18.3	18.52	3.78	3.95	1.03	1.09	1.75	2.01	1.58	1.76	16.12	16.16	4.37	4.68
Nejma	0.98	1.04	26.1	24.48	18.4	18.68	4.79	4.95	0.95	0.78	2.25	2.41	1.88	1.90	15.92	16.18	4.16	3.96
Desprez poly N	1.03	1.11	26.1	27.38	18.9	19.16	3.95	4.13	1.1	0.89	2.45	2.69	1.81	1.89	16.49	16.67	4.30	4.56
Kawemira	1.09	1.15	27.4	28.60	18.7	19.5	4.41	4.57	0.82	1.0	2.14	2.30	1.78	1.84	16.32	17.06	4.47	4.88
Gloria	1.01	1.15	27.1	26.70	19.3	19.66	4.21	4.25	0.89	1.03	1.97	2.11	1.72	1.76	16.98	17.30	4.60	4.62
Dema poly	0.99	1.05	27.6	23.22	19.4	19.66	4.19	4.15	0.61	0.71	1.40	1.94	1.55	1.63	17.25	17.43	4.76	4.05
Carola	0.89	0.95	23.3	22.7	18.6	19.2	4.34	4.21	0.62	0.67	1.43	1.36	1.53	1.65	15.45	16.23	3.87	4.21
Significane	*	*	**	**	**	**	*	*	*	*	*	*	*	*	**	**	**	**
Nitrogen rates																		
80 kg/fad.	0.92	0.82	22.1	21.44	19.6	19.54	3.79	3.91	0.79	0.81	1.36	1.48	1.49	1.53	17.51	17.41	3.81	3.74
100 kg/fad.	0.98	1.12	27.5	25.08	18.1	19.3	4.02	4.0	0.86	1.1	1.78	2.09	1.68	1.74	15.82	16.96	4.35	5.25
120 kg/fad.	1.30	1.0	29.1	28.28	18	18.12	4.59	4.65	0.96	1.22	2.56	2.42	1.88	1.96	15.52	15.56	4.52	4.40
140 kg/fad.	1.05	1.23	27.8	29.44	17.3	17.02	4.76	4.98	1.22	156	3.21	3.59	2.15	2.25	14.55	14.17	4.05	4.17
Significance	*	*	**	**	**	**	*	*	*	*	**	**	**	**	**	**	**	**
Interaction significance	**	**	**	**	**	**	*	*	*	*	**	**	**	**	**	**	**	**

*, **, N.S indicate Significant, highly significant and non significant, respectively.

استجابة بعض التراكيب الوراثية لبنجر السكر للسماد النيتروجينى تحت ظروف الأراضى حديثة الاستصلاح

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الملخص العربي

أجريت تجربتان حقليتان في موسمى 2011/2010 ، 2012/2011 فى منطقة سهل الطينة – محافظة بور سعيد . بهدف دراسة استجابة 15 تركيب وراثى من بنجر السكر وهى أوسكار بولى ، كاوميرا ، توب ، لولا ، مونت بيانكو ، جلوريا ، ديسبريز بولى إن ، ديما بولى ، فريدا ، أتوث بولى ، بلينو ، راس بولى ، نجما ، إتش بولى ، كارولا لأربعة معدلات من التسميد النيتروجنى هى 80 ، 100 ،120 و140 كجم ن/فدان. استخدم فى ذلك تصميم القطع المنشقة مرة واحدة بحيث كانت معدلات النيتروجين فى القطع الرئيسية والأصناف فى القطع الشقية. أوضحت النتائج ما يلى:

أدى زيادة مستوى التسميد حتى 120 كجم نيتروجين/فدان إلي تعظيم قيم الانتاجية المتمثلة فى متوسط وزن الجذر ومحصول الجذور للسكر للفدان ، بينما استمرت الزيادة فى الشوائب والسكر المفقود فى المولاس بزيادة مستوى النيتروجين الى 140 كجم / فدان. وعلى العكس من ذلك فقد لوحظ انخفاض تدريجى فى النسبة المئوية لكل من السكروز والسكر المستخلص بزيادة مستوى النيتروجين مقارنة بالمستوى الأقل (80 كجم ن/ف). كما لوحظ اختلاف كبير بين الاصناف المستخدمة فى الانتاجية وصفات الجودة .

كما أوضحت النتائج أنه تحت ظروف هذه الدراسة ومن واقع التداخل بين عاملى الدراسة أن التسميد النيتروجينى بمعدل 120 كجم نيتروجين/فدان كان كافياً تماماً لتغطية احتياجات معظم الأصناف المستخدمة من السماد النيتروجينى وتعظيم انتاجية حاصل السكر بالطن/فدان عن طريق زيادة محصول الجذور وصفات جودة العصير.

وتوضح نتائج الاستجابة الصنفية لزيادة معدل التسميد النيتروجينى أن بعض الأصناف كان أكثر كفاءة عند معدل التسميد المنخفض (80 كجم ن/ف) حيث سجلت حوالى 25 طن/فدان وهى الأصناف أوسكار بولى وكارولا بينما كانت الأصناف راس بولى وكاوميرا ومونت بيانكو أكثر استجابة لزيادة مستوى التسميد عند اضافة 120 كجم ن/ف ، بينما يوضح أن التركيب الوراثى للأصناف تحت الدراسة لعب دوراً أساسياً فى تعظيم انتاجيتها من حيث محصول السكر/فدان بفضل زيادة محصول الجذور/فدان وبعض صفات جودة العصير.