Sugar Beet Response to Bio- and Chemical Fertilization in Newly Reclaimed Soils at Nubaria

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ABSTRACT: Two field experiments were carried out in a Research Farm in Nubaria, Sugar and Refining Company (NSRC), Behaira government, during the two successive fall seasons of 2015/2016 and 2016/2017 to determine the effect of four bio-fertilizer treatments, and four nitrogen fertilizer levels on yield and its components as well as quality of sugar beet (*Beta vulgaris* L) cv. Gazel. A split plot design with three replications was used, where the nitrogen fertilizer levels were allocated in the main plots and bio-fertilizer treatments were distributed in the sub plots. The results indicated that increasing nitrogen fertilizer rates significantly increased yield characters, roots, top, biological and sugar yields (tons fed^{-1}), since the highest rates of nitrogen (90 kg N fed^{-1}) produced the highest roots, top, biological, and sugar yields, for the 1st and 2nd seasons, respectively. Increasing nitrogen rate up to (90 kg N fed^{-1}) significantly increased of some quality parameters, total soluble solids (T.S.S) and sucrose concentration in roots juice, since the maximum T.S.S% and sucrose % was achieved by adding 90 kg N fed^{-1}, for the two seasons. Moreover, bio-fertilizers treatments, (T.S®) gave the maximum of roots, top, biological, and sugar yields, in the two seasons and significantly increased of some quality parameters, total soluble solids (T.S.S) and sucrose concentration in roots juice by bio-fertilizer treatments, since the maximum T.S.S% (20.00 and 21.52%) and sucrose % (18.79 and 18.27%) was achieved by adding (T.S®), for the two seasons of 2015/2016 and 2016/2017, respectively. The interaction between nitrogen rates and bio-fertilizers indicated that the highest all harvested yield, total soluble solids (T.S.S) and sucrose % was obtained by application (T.S® + 90 kg N fed^{-1}) in both seasons. So, bio-fertilizer treatments proved a major role in crop production optimization and expected to reduce the pollution of the agricultural environment.

Keywords: sugar beet, yield characters, nitrogen fertilizer rates, bio-fertilizer treatments.

INTRODUCTION

Sugar beet ranks the second sugar crop after sugar cane in the world as it provides about 40% of the world sugar production. The average cultivated area of sugar beet in Egypt increased from about 17 thousand feddan in 1982 to 555.585 feddan in 2015/2016. (Sugar Crops Council, 2017). It became the first sugar's production source in Egypt, where the production of sugar from sugar beet account for 57.61 % (1,366 Million tons) of sugar production in Egypt, while, the sugar cane account for 42.39% (0.931 Million tons) (Sugar Crops Council, 2017).

Now, Egypt faces many problems that affect the productivity of crops in general and sugar crops in particular, including sugar beet; some of the main problems include the expected water shortage after building El-Nahda Dam and the high prices of fertilizers, particularly nitrogen.

High mineral nitrogen levels were added to sugar beet in order to maximize its productivity in clay soils (Abou-Zeid and Osman, 2005). The use of N-fixing bacteria is economically important to modern agriculture as they can partially replace the cost of mineral fertilizers so lower production costs and reduce environmental pollution, while ensuring high yields. Bio-fertilizers have emerged as a promising component of integrating nutrients supply system in intensive agriculture. Therefore, attempts have been made to use bio-fertilizers as being the most cheap and safe for agricultural application. They are extremely beneficial in enriching soil fertility with those micro-organisms, which fix atmospheric N and make plant nutrients more available (Aly *et al.,* 2009)

Bio-fertilizer technologies are based on enhancing and improving the naturally existing nutrient transformation activities in the soil profiles, when the inoculants should be able adapted to the environmental conditions prevailing in the site of application. Seeds inoculation of various C_3 and C_4 plants with associative nitrogen-fixing bacteria led to improve plant growth and yield (Eid, 1982). Biological nitrogen fixation of sugar beet with non-symbiotic nitrogen fixers play an important role in increasing growth and yield, as well as decreasing chemical nitrogen fertilizer requirements, and consequently minimizing environmental pollution by mineral fertilizers and save production costs (Cakmakci *et al*., 2001).

The aims of the present study were focused on the effect of nitrogen fertilizer levels, bio–fertilizers and their interactions on yields of roots, sugar, top and juice quality traits of sugar beet plants during 2015/2016 and 2016/2017 seasons under the newly reclaimed soils of Nubaria district.

MATERIALS AND METHODS

Two field experiments were carried out in the Research Farm of Nubaria Sugar and Refining Company (NSRC), El Behaira governorate, during the two successive fall seasons of 2015/2016 and 2016/2017. The main objective of this study was to determine the effect of bio-fertilizer treatments, and nitrogen fertilizer levels and their interactions on the yield and its components as well as quality of sugar beet (*Beta vulgaris* L.).

Bio-fertilizers:

The studied bio-fertilizers included the following: Without Bio-fertilizers (Untreated), Microbeen®, T.S® and Microbeen® + T.S®. The seeds of sugar beet were inoculated with Microbeen® before sowing and away of direct sunlight, while T.S® was added after sowing of sugar beet seeds with the first irrigation after thinning. Microbeen® contains bacteria that fixed atmospheric nitrogen but T.S® contains fungi that facilitated phosphorus absorption which adding with 5 l fed^{-1}. These bio-fertilizers contain living microorganisms that, when applied to seeds, plant surfaces, or soil, colonize the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant.

Nitrogen rates:

The studied nitrogen levels included: Without nitrogen fertilizer (Without), 30 kg N fed^{-1}, 60 kg N fed^{-1}, and 90 kg N fed^{-1} applied as a side-dressing in two equal doses, the first was applied after thinning and the other was applied four weeks later.

The experimental plots were cultivated with sugar beet seeds (Gazel cv.) in 20th, September in the both seasons. However, the harvesting date was in 1st and 10th April in the two studied seasons, respectively.

A split plot design with three replications was used, where, the nitrogen fertilizer levels were allocated in the main plots and bio-fertilizer treatments were distributed in the sub plots. The sub plot area was 21 m^2 (1/200 fed^{-1}), with 6 m in length and 3.5 m width i.e.; six ridges. Sugar beet balls were hand sown (3-5 balls/hill) using dry sowing method on one side of the ridge in hills 15 cm apart and irrigated immediately after sowing. Plants were thinned at the age of 35 days from sowing to obtain one plant/hill. All other agricultural practices were applied at the recommendations of the Egyptian Ministry of Agriculture.

Soil samples were randomly taken pre- sowing form the experimental site at a depth of 0 to 30 cm from soil surface and prepared for both physical and chemical analysis according to Ankerman and Large (1974) as shown in Table (1).

Table (1). Some physical and chemical properties of the experimental soil in 2015/2016 and 2016/2017 seasons

Soil properties	Season	
	2014/2015	2015/2016
A- Mechanical analysis		
Sand %	92	90
Silt %	3.80	5.97
Clay %	4.20	4.03
Soil texture	Sandy	Sandy
B- Chemical properties		
pH 1:1	8.20	8.40
EC (dS/m)	1.10	1.15
1- Soluble cautions (1:2) (meg/kg soil)		
K^+	0.89	1.35
Ca^{++}	2.89	2.73
Mg^{++}	1.98	2.46
Na^+	4.65	4.52
2- Soluble anions (1:2) (meg/kg soil)		
$CO^{=}_3 + HCO^-_3$	4.9	5.8
CL^-	7.90	7.09
$SO^{=}_4$	1.15	0.98
Calcium carbonate (%)	6.23	6.15
Total nitrogen (mg/kg)	2.1	2.2
Available Phosphorus (mg/kg)	0.2	0.2
Organic matter %	0.37	0.38

Data Recorded:

The outer two ridges (1^{st} and 6^{th}) considered a belt, while the other four ridges were kept for yield characters and its components as well as quality determination.

A. Yield characters:

At harvest, all plants from the inner four ridges at each sup-plot were uprooted. Roots and tops were separated and weighted in kilograms to determine:

1. Root yield (ton fed^{-1}).
2. Top yield (ton fed^{-1}).
3. Biological yield (ton fed^{-1}).
4. Sugar yield (ton fed^{-1}).

B- Juice quality characters:

1- Total soluble solid percentage (TSS %).

$$\text{T.S.S \%} = \frac{\text{Sucrose \%}}{\text{Purity\%}}$$

2- Sucrose percentage (%).

It was measured in juice of fresh roots by using Hand Refractometer according to Me Ginnis (1982).

Statistical analysis

All collected data were subjected to the statistical analysis following the procedure described by Gomez and Gomez (1984). The least significantly differenced test (L.S.D) at 0.05 was used to compare between means of the different treatments.

RESULTS AND DISCUSSION

The results in Tables (2 to 5) showed the effect of nitrogen fertilizer levels and bio–fertilizers (Microbeen® and T.S®) and their interactions on sugar beet yield characters, and juice quality parameters during the two successive fall seasons of 2015/2016 and 2016/2017.

I- Yield characters:

1- Top yield (tons fed^{-1})

The data in Table (2) showed that increasing nitrogen rates significantly increased top yield (ton fed^{-1}). The highest significant top yield gave 8.71 and 7.90 (ton fed^{-1}) followed by 7.23 and 6.91 (ton fed^{-1}) for 90 and 60 kg N fed^{-1} in the first and second seasons, respectively. However, the least values (5.70 and 5.00 ton fed^{-1}) resulted from zero level of nitrogen in the 1^{st} and 2^{nd} seasons, respectively. The application of bio-fertilizer (T.S®) achieved the highest values of top yield 7.95 and 7.29 (ton fed^{-1}), while the untreated check (without application of bio-fertilizer) gave 5.94 and 4.45 (ton fed^{-1}) in the first and second seasons, respectively. In this connection similar results are reported by the work done by El-Fedaly *et al.* (2013).

The effect of the interaction between nitrogen fertilizer levels and bio-fertilizers on top yield (ton fed^{-1}) in Table 3, the treatment of (90 kg N fed^{-1} + T.S®) gave the best results in the values of top yield where, recorded 10.45 and 9.54 (ton fed^{-1}), followed by treatment of (90 kg N fed^{-1} + Microbeen® + T.S®) pointed out 9.75 and 8.53 (ton fed^{-1}), then, the treatment of (60 kg N fed^{-1} + T.S®) gives values 8.19 and 7.86 (ton fed^{-1}) in the first and second seasons, respectively, as shown in Table (3). These results are in agreement with those found by Sarhan (2012) and Abdelaal and Tawfik (2015).

2- Roots yield (tons fed^{-1})

The result in Table (2) cleared that the roots yield (tons fed^{-1}) was significantly increasing with increasing nitrogen rate from [without] to 30, 60, and 90 kg N fed^{-1} Application nitrogen at higher rate (90 kg N fed^{-1}) produced the highest roots yield 25.71 and 24.94 (ton fed^{-1}) compared with untreated check that gave 10.45 and 10.35 (ton fed^{-1}) in the both seasons, respectively.

Also, the data revealed that the application of bio-fertilizer, (T.S®) recorded the highest values of root yield 21.31 and 20.58 (ton fed^{-1}) in the first and second season, respectively, followed by the treatment of (T.S® + Microbeen®) recorded values of 19.76 and 19.75 (ton fed^{-1}) of root yield, in the first and second season, respectively, followed by Microbeen® with values 17.66 and 17.32 (ton fed^{-1}) as compared with the untreated check gave 13.16 and 12.72 (ton fed^{-1}) in the 1st and 2nd seasons, respectively. The results in Table (3) showed that the interaction between nitrogen fertilizer levels and bio-fertilizers had significant effect for root yield. The highest values of root yield 30.46 and 29.43 (ton fed^{-1}), were recorded by the treatment of (90 kg N fed^{-1} + T.S®), followed by (90 kg N fed^{-1} + Microbeen® + T.S®) that recorded 28.53 and 28.54 (ton fed^{-1}), and (60 kg N fed^{-1} + T.S®) with values 25.76 and 24.78 (ton fed^{-1}) in the two seasons, respectively. These results are in agreement with those mentioned by El-Fedaly *et al.* (2013).

3-Biological yield (tons fed^{-1})

The data in Table (2) showed that the applied of 90 kg N fed^{-1} on sugar beet plant recorded the highest effect on biological yield giving 32.10 and 30.95 (ton fed^{-1}), followed by 28.19 and 27.76 (ton fed^{-1}) for T.S®, while with untreated check gave 16.10 and 15.62 (ton fed^{-1}) in the 1st and 2nd seasons, respectively.

From the same Table it combination that adding (T.S®) gave almost a similar effect that took place by adding 60 kg N fed^{-1} as a biological yield recorded values. The same trend also noticed with treatment of (60 kg N fed^{-1} + Microbeen® + T.S®), they was so closed in their effect on sugar beet biological yield.

The results in Table (3) indicated that the interaction between nitrogen fertilizer levels and bio-fertilizers was significant effect for biological yield. The highest values of biological yield were 38.18 and 36.01 (ton fed^{-1}) were obtained with the treatment of (90 kg N fed^{-1} + T.S®), followed by (90 kg N fed^{-1} + Microbeen® + T.S®) recorded 35.11 and 31.86 (ton/fed) and (90 kg N fed^{-1} + Microbeen®) with values 33.22 and 32.51 (ton fed^{-1}) in the two seasons, respectively. These results are in accordance that the obtained by Leilah *et al.* (2005) and Khogali *et al.* (2012).

4-Sugar yield (tons fed^{-1})

Data In Table (4) showed that sugar yield, sucrose percentage and total soluble solids (T.S.S) were gradually increasing with increasing nitrogen fertilizer rates. The highest significant value was produced from the highest rate of nitrogen fertilizer of 90 kg N fed^{-1}, followed by 60 kg N fed^{-1} and 30 kg N fed^{-1}compared with untreated check in the two seasons for all characters. Also, high significant values for all aforementioned traits were recorded with of T.S® or Microbeen® + T.S® as bio fertilization in both years.

The present data in Table (5) revealed that the interaction between nitrogen fertilizer levels and bio-fertilizers had significant effect for sugar yield. The highest values of sugar yield 4.71 and 4.48 (ton fed^{-1}) were obtained with the treatment of (90 kg N fed^{-1} + T.S®), followed by (90 kg N fed^{-1} + Microbeen® +T.S®) that recorded 3.76 and 4.35 (ton fed^{-1}), and (60 kg N fed^{-1} + T.S®) with values 4.36 and 4.16 (ton fed^{-1}) in the 1st and 2nd seasons, respectively the results in agreement with that obtained by Hasanen *et al.* (2013), and Hozayn *et al.* (2014).

Table (2). Top, root and biological yields (ton fed^{-1}) for sugar beet as affected by nitrogen fertilizer levels and bio-fertilizers during 2015/2016 and 2016/2017 seasons

Treatment	Top yield (ton fed^{-1})		Root yield (ton fed^{-1})		Biological yield (ton fed^{-1})	
	2015/2016	2016/2017	2015/2016	2016/2017	2015/2016	2016/2017
A) N-levels						
Without	5.70	5.00	10.45	10.35	16.10	15.62
30	6.62	6.16	15.33	15.37	20.80	22.03
60	7.23	6.91	20.40	19.72	27.04	26.63
90	8.71	7.90	25.71	24.94	32.10	30.95
F-test	*	*	**	**	**	*
L.S.D. $_{0.05}$	0.51	0.50	1.24	1.52	1.49	2.15
B) Bio-fertilizers						
Untreated	5.94	4.45	13.16	12.72	17.08	16.73
Microbeen®	6.78	6.22	17.66	17.32	24.39	24.01
T.S.®	7.95	7.29	21.31	20.58	28.19	27.76
Microbeen®+T.S.®	7.58	7.01	19.76	19.75	26.35	26.72
F-test	*	*	**	**	*	*
L.S.D. $_{0.05}$	0.83	0.69	2.46	2.75	4.83	5.10

*,** indicates significance at 0.05 and 0.01 levels, respectively.
L.S.D.: Least Significant Differences.

Table (3). Interaction between nitrogen fertilizer levels and bio-fertilizers on top, root and biological yields (ton fed^{-1}), for sugar beet in 2015/2016 and 2016/2017 seasons

Treatment		Top yield (ton fed^{-1})		Root yield (ton fed^{-1})		Biological yield (ton fed^{-1})	
Bio-fertilizers	**N-levels**	**2015/2016**	**2016/2017**	**2015/2016**	**2016/2017**	**2015/2016**	**2016/2017**
Untreated	**Without**	5.33	4.28	9.28	9.12	14.01	14.18
	30	5.42	5.30	10.78	10.65	15.16	15.89
	60	6.29	5.60	13.98	13.42	17.23	16.43
	90	6.71	6.63	18.60	17.68	21.90	20.42
Microbeen®	**Without**	5.75	5.41	10.30	10.95	15.04	14.38
	30	6.84	6.18	16.82	16.12	21.67	22.86
	60	6.60	6.40	18.28	18.12	27.61	26.30
	90	7.91	6.89	25.23	24.09	33.22	32.51
T.S.®	**Without**	5.93	5.11	11.18	10.62	18.12	17.38
	30	7.24	6.63	17.85	17.50	23.25	24.74
	60	8.19	7.86	25.76	24.78	33.20	32.92
	90	10.45	9.54	30.46	29.43	38.18	36.01
Microbeen®+ T.S.®	**Without**	5.77	5.21	11.05	10.71	17.22	16.54
	30	6.96	6.54	15.87	17.21	22.95	24.61
	60	7.85	7.76	23.58	22.54	30.12	30.85
	90	9.75	8.53	28.53	28.54	35.11	34.86
F-test		*	*	**	**	**	*
L.S.D. $_{0.05}$		0.82	0.86	2.59	2.77	3.80	4.12

*,** indicates significance at 0.05 and 0.01 levels, respectively.
L.S.D.: Least Significant Differences.

Generally, the data showed that treatment of (90 kg N fed^{-1} + T.S®) gave the best results of top yield (ton fed^{-1}), root yield (ton fed^{-1}), biological yield (ton fed^{-1}) and sugar yield (ton fed^{-1}) of sugar beet during the two successive fall seasons of 2015/2016 and 2016/2017.

II- Juice Quality:

1- Total soluble solids percentage (T.S.S %)

Significant difference was noticed for T.S.S % value among nitrogen rates. The highest T.S.S % value was resulted by adding higher and medium nitrogen rate (90 and 60 Kg N fed^{-1}), with an average of (21.91 and 21.81%) and (21.15 and 21.36%), respectively compared with control treatment (20.09 and 20.32%), in the 1st and 2nd seasons, respectively (Table, 4). The data in the same Table (4) indicated that the highest values of Total Soluble Solids percentage (T.S.S) 21.64 and 21.75% were obtained with the application of bio-fertilizer, (T.S®) on sugar beet plant, followed by (Microbeen® + T.S®) gave 20.00 and 21.52% and Microbeen® with values 20.90 and 20.60% as compared with the untreated check that gave 21.46 and 20.70%, in the 1st and 2nd seasons, respectively. The presented results in Table (5) reported that the interaction between nitrogen fertilizer levels and bio-fertilizers had significant effect for total soluble solids percentage (T.S.S). The highest values of Total Soluble Solids percentage (T.S.S) 22.08 and 22.67%, were recorded with the treatment of (90 kg N fed^{-1} + T.S®), followed by (90 kg N fed^{-1} + Microbeen® + T.S®) with values 20.55 and 22.23%, and (60 kg N fed^{-1} + T.S®) that recorded

23.00 and 22.33%, successively, in the 1st and 2nd seasons, respectively. Similar results were reported by Sarhan (2012) Hasanen *et al.* (2013) and Abdou *et al.* (2014).

2- Sucrose percentage (%)

Significant differences were noticed in sucrose percentage among nitrogen fertilizer rates. The highest value of sucrose percentage (20.37 and 19.89%) was produced from the highest rate of nitrogen fertilizer of 90 kg N fed^{-1}, followed by 60 kg N fed^{-1} (18.82 and 17.82%), 30 kg N fed^{-1} (17.68 and 17.38%) and control treatment (16.01 and 16.13%) in the 1st and 2nd seasons, respectively, Table, (4).

The data in the same Table (4) referred that the highest values of sucrose percentage 18.60 and 18.32% were obtained with from application of bio-fertilizer, (T.S®), followed by (Microbeen® + T.S®) gave 18.19 and 18.27% and Microbeen® with values 18.49 and 17.94% as compared with the untreated check that gave 17.00 and 16.69%, in the 1st and 2nd seasons, respectively, The presented data in Table (5) revealed that the interaction between nitrogen fertilizer levels and bio-fertilizers had a significant effect for sucrose percentage. The highest values of sucrose percentage 21.15 and 20.55%, were obtained with the treatment of (90 kg N fed^{-1} + Microbeen® +T.S®), followed by (90 kg N fed^{-1} + T.S®) that recorded 20.00 and 20.67%, and treatment of (60 kg N fed^{-1} + Microbeen® + T.S®) with values 19.64 and 18.26%, in the 1st and 2nd seasons, respectively. These results are in agreement with those obtained by Hasanen *et al.* (2013), and Nemeat Alla *et al.* (2015). Generally, the data showed that treatment of (90 kg N fed^{-1} + T.S®) gave the best results of Total Soluble Solids percentage (T.S.S) and sugar yield (ton fed^{-1}) of sugar beet during the two successive fall seasons of 2015/2016 and 2016/2017.

Table (4). Sugar yield (ton fed^{-1}), Sucrose (%) and T.S.S. (%) for sugar beet as affected nitrogen fertilizer levels and bio-fertilizers during 2015/2016 and 2016/2017 seasons

Treatment	Sugar yield (ton fed^{-1})		Sucrose (%)		T.S.S. (%)	
	2015/2016	2016/2017	2015/2016	2016/2017	2015/2016	2016/2017
A) N-levels						
Without	2.22	2.16	16.01	16.13	20.09	20.32
30	2.96	2.55	17.68	17.38	20.80	21.03
60	3.501	3.36	18.82	17.82	21.15	21.36
90	4.22	3.93	20.37	19.89	21.91	21.81
F-test	**	**	*	*	*	**
L.S.D. $_{0.05}$	0.52	0.51	0.39	0.38	0.52	0.45
B) Bio-fertilizers						
Untreated	2.21	2.06	17.00	16.69	21.46	20.70
Microbeen®	3.01	3.90	18.49	17.94	20.90	20.60
T.S.®	4.92	3.59	18.60	18.32	21.64	21.75
Microbeen®+T.S.®	3.76	3.45	18.79	18.27	20.00	21.52
F–test	*	*	*	*	*	*
L.S.D. $_{0.05}$	0.79	0.68	0.63	0.49	0.62	0.58

*, ** indicates significance at 0.05 and 0.01 levels, respectively.
L.S.D.: Least Significant Differences.

Table (5). Interaction between nitrogen fertilizer levels and bio-fertilizers on sugar yield (ton fed^{-1}), Sucrose (%) and T.S.S. (%) for sugar beet in 2015/2016 and 2016/2017 seasons

Treatment		Sugar yield (ton fed^{-1})		Sucrose %		T.S.S. (%)	
Bio-fertilizers	**N-levels**	**2015/2016**	**2016/2017**	**2015/2016**	**2016/2017**	**2015/2016**	**2016/2017**
Untreated	**Without**	1.58	1.49	15.67	15.42	20.50	19.83
	30	1.76	1.75	16.00	16.33	20.67	20.39
	60	2.18	2.22	17.00	16.67	22.00	21.06
	90	3.31	2.77	19.33	18.33	22.67	21.33
Microbeen®	**Without**	2.21	2.26	16.00	16.67	19.37	20.00
	30	2.25	2.09	18.00	17.34	20.38	21.02
	60	3.26	3.12	18.97	17.73	21.33	20.36
	90	4.33	4.11	21.00	20.00	22.33	21.00
T.S.®	**Without**	2.64	2.42	16.33	16.00	20.36	20.38
	30	3.98	3.29	18.40	18.00	21.13	21.60
	60	4.36	4.16	19.67	18.62	23.00	22.33
	90	4.71	4.48	20.00	20.67	22.08	22.67
Microbeen®+T.S.®	**Without**	2.44	2.45	16.05	16.43	20.11	21.05
	30	3.85	3.05	18.32	17.85	21.01	21.11
	60	4.21	3.94	19.64	18.26	18.26	21.68
	90	4.53	4.35	21.15	20.55	20.55	22.23
F-test		**	*	*	*	*	*
L.S.D. $_{0.05}$		0.92	0.71	0.72	0.56	0.75	0.56

*, ** indicates significance at 0.05 and 0.01 levels, respectively.
L.S.D.: Least Significant Differences.

CONCLUSION

It could be concluded that application of 90 kg N fed^{-1} and T.S® could optimize yield of roots, sugar, tops and juice quality traits for sugar beet and decrease mineral fertilizer costs and environmental pollution.

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الملخص العربي

استجابة بنجر السكر للتسميد الحيوى والكيميائي في التربة المستصلحة حديثاً في النوبارية

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أجريت تجربتان حقليتان في المزرعة البحثية لشركة النوبارية لصناعة وتكرير السكر بمحافظة البحيرة، مصر خلال الموسمين الخريفيين المتتاليين ٢٠١٥/٢٠١٦ و ٢٠١٦/٢٠١٧ لتقدير تأثير أربعة معاملات تسميد حيوى ، أربعة مستويات تسميد أزوتى على المحصول ومكوناته وكذلك صفات جودة بنجر السكر صنف جازل. استخدم تصميم القطع المنشقة مرة واحدة فى ثلاثة مكررات مع وضع معاملات التسميد النيتروجينى فى القطع الرئيسية و معاملات التسميد الحيوى وضعت عشوائياً في القطع الشقية.

أوضحت النتائج أن زيادة معدلات التسميد الأزوتى أدت إلى زيادة فى الصفات المحصولية للجذور ، العرش ، المحصول الكلى ومحصول السكر. أعطت إضافة معدلات التسميد النيتروجيني العالي (٩٠ كجم / فدان) أعلى محصول للجذور ، العرش ، المحصول البيولوجى و السكر فى الموسمين. كما أدت زيادة معدلات التسميد بالنيتروجين حتى ٩٠ كجم نتيروجين / فدان إلى زيادة معنوية فى بعض صفات الجودة مثل المواد الصلبة الذائبة الكلية وتركيز السكروز فى عصير الجذور فكانت أعلى نسبة للمواد الصلبة الذائبة الكلية و نسبة السكروز فى الموسمين. علاوة علي ذلك أعطت معاملات التسميد الحيوى (تى إس) أعلى محصول للجذور ، العرش ، المحصول البيولوجى و السكر فى الموسمين. كما أدت معاملات التسميد الحيوى إلى زيادة معنوية فى بعض صفات الجودة مثل المواد الصلبة الذائبة الكلية و تركيز السكروز فى عصير الجذور حيث أن إضافة التسميد الحيوى (تى إس) أعطى أعلى نسبة فى المواد الصلبة الذائبة الكلية و نسبة السكروز فى الموسمين. أما فيما يتعلق بالتفاعل بين مستويات الأسمدة النيتروجينية والأسمدة الحيوية على المحصول الورقى (طن / فدان)، محصول الجذر (طن / فدان)، المحصول البيولوجى (طن / فدان) ومحصول السكر (طن / فدان) تحققت أعلى إنتاجية باستخدام (٩٠ كجم أزوت / فدان + تى إس) فى كلا الموسمين. لذلك أثبتت معاملات التسميد الحيوى دوراً رئيسياً في إنتاج وتحسين إنتاجية محصول بنجر السكر إلى الحد الأمثل ومنتظر أن تقلل من تلوث البيئة.