Influence of Interaction Use of Organic Manuring and Mineral Nitrogen on Sugar Beet Production in a Salt Affected Soil

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Abstract: This work was held in South Port Said in the growing season 2015-2016 to study the effect of the use of organic manure and mineral nitrogen fertilization on the production of sugar beet (*Beta vulgaris* L.) in a salt affected soil. Thirty four different treatments were performed on sugar beets between organic manure, mineral N fertilization and mixture between them .The growing plant parameters were recorded in terms of root yield (tons/fad) and total sugars percent ,the best results were obtained using mineral nitrogen, the second treatment (T280 kg fed), because it exceeded the total sugar production. Samples of plants were analyzed after harvest that included estimating nitrogen concentrations. Where the results showed a response in most of them for nitrogenous additives and organic manuring.

Keywords: Sugar beet, Mineral Nitrogen, Organic Manure, Root Yield, Sucrose

INTRODUCTION

Sugar beet (*Beta vulgaris* L.) belongs to Chenopodiaceae family. It is a biennial plant and one of the most important sugar crops in the world (Watson and Dallwitz, 1992), it considered the second important sugar crop in Egypt (and all over the world) after sugar cane crop. About forty percent of world sugar production is obtained from sugar beet. The importance of sugar beet crop to agriculture is not confined only to sugar production, but also it is adaptation to saline, sodic and calcareous soils. Sugar beet fertilization aims to achieve high yields of both beet and sugar. Fertilization especially with nitrogen in particular must aim to balance between large yield of root and large sugar content. The application of too little N results reduced root yield. Contrary, high amount of applied N is the cause of imbalanced partitioning of assimilates among leaves and storage root, and lead to decrease of root sucrose concentration. Its oversupply, increases also concentrations of impurities, such as α-amino-N, K, Na, in turn decreasing storage root quality (Malnou *et al*., 2008).

Abdelaal *et al.* (2015), nitrogen fertilizer levels caused significant differences in all yield and quality of sugar beet. In addition sugar percentage was significantly decreased by increasing nitrogen rate (Stevens *et al*., 2011; Mahmoud *et al*., 2012).

Ouda (2011) confirmed that root sucrose content of sugar beet were responded to nitrogen fertilizer level up to 75 kg N/fed. Kandil *et al*. (2002) found that the highest root and sugar yield were obtained by 108 kg N ha^{-1} fertilization and the highest sugar content obtained by 54 kg N ha^{-1}, while increased nitrogen fertilization caused decrease in sugar content.

Magro *et al*. (2015) observed that organic compost fertilization is important to increase beet root production. Masri *et al.* (2015) indicated that, without used compost recorded the highest sucrose on the contrary application of 5 ton/fed of compost gave the highest value of root yield/fed. Marinkovic *et al.* (2004) found that the application of organic fertilizer increased the yield. Hassan (2005) indicated that the application of the organic fertilizers induced increases in the root yield, sugar yield, sucrose content, purity % and the concentrations of NPK.

MATERIALS AND METHODS

The present work was carried out at south Port Said Governorate eastern Delta (North South) The current study was conducted on salt affected clay loamy soil at El-Radwan-south of Port Said Governorate. This area was irrigated from El-Salam Canal which is one of the national promising projects involves the reuse of drainage water, after reducing its salinity levels by mixing the Nile water with Bahr Hadoos drains (1:1), (DRI, 1993). In the growing seasons of 2015-2016 this work was carried out to study the influence of integrated use of organic manure and mineral nitrogen fertilization on sugar beet (*Beta vulgaris* L.) production in a salt affected soil.

The study included 34 treatments described below:-

1. Control: Without organic or mineral nitrogen (T34)
2. Mineral fertilization: Mineral fertilization in the form of urea (46%) only at three rates (60, 80,100 kg N/fed) as (T1, T2, and T3)
3. Organic manuring: Organic fertilization was used as cattle manure (1.4% N) only at three rates 5, 7.5 and 10 ton/fed (T4, T5 and T6).
4. Interaction:

Interaction between mineral nitrogen and organic manure as follows:

25% Min + 75% org	
15 kg + 3.5 tons/fed	T7
15 kg +5.625 tons/fed	T8
15 kg +7.5 tons/fed	T9
20 kg + 3.5 tons/fed	T10
20 kg + 5.625 tons/fed	T11
20 kg + 7.5 tons/fed	T12
25 kg + 3.5 tons/fed	T13
25 kg + 5.625 tons/fed	T14
25 kg + 7.5 tons/fed	T15
50% Min + 50% org	
30 kg + 2.5 tons/fed	T16
30 kg + 3.75 tons/fed	T17
30 kg + 5 tons/fed	T18
40 kg + 2.5 tons/fed	T19
40 kg + 3.75 tons/fed	T20
40 kg + 5 tons/fed	T21
50 kg + 2.5 tons/fed	T22
50 kg + 3.75 tons/fed	T23
50 kg + 5 tons/fed	T24

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75% Min + 25% org

45 kg + 1.25 tons/fed	T25
45 kg + 1.875 tons/fed	T26
45 kg + 2.5 tons/fed	T27
60 kg + 1.25 tons/fed	T28
60 kg + 1.875 tons/fed	T29
60 kg + 2.5 tons/fed	T30
75 kg + 1.25 tons/fed	T31
75 kg + 1.875 tons/fed	T32
75 kg + 2.5 tons/fed	T33

Treatments were arranged in randomized complete block (RCB) design with three replications .Plot area was 12.6 including 3 rows of 7 m length and 60 cm apart and spacing between hills was 20 cm. The soil of experimental site was clay loam in texture influenced by the salts. Nitrogen fertilizer was applied in the form of urea (46% N) in two equal doses; the first dose was added after thinning (45 days sowing) and the second one was applied one month later. Organic manure (1.4% N) was used as cattle manure adds during preparing the soil for planting.

In addition, 100kg P_2O_5 in the form of superphosphate 15.5% per feddan were added before sowing. The preceding crop was cotton. Sugar beet variety Cleopatra (poly-France) was used. Soil samples were randomly taken from the experimental field area 0-30 cm and prepared for analysis to determine the mechanical, chemical and physical properties, according to Jackson (1973). The results are presented in Tables (1, 2, 3 and 4).

The following data was recorded:

1. Root yield (tons/fed)

The harvest (age 182 days from sowing) plants of sugar beet from each plot were harvested and cleaned .Roots were weighed to estimate root yield (tons/fed).

2. Total sugar percent

It was estimated in fresh samples of sugar beet by using saccharometer according to the method described by AOAC (2005).

3. Analysis of plant after harvesting

At harvest, sample of 7 plants of sugar beet was taken at random from each plot for chemical analysis, and cleaned with tap water, dried at 70 for 48 hours and grater into cassettes and mixed thoroughly and grounded. A 0.5 g sample was digested by sulfuric acid and hydrogen peroxide according to Jackson (1967) in order to determine of total Nitrogen by Kjeldahl method.

Statistical analysis of data was carried out SPSS. The analyses of soil which used in experiments are showed in Tables (1, 2, 3 and 4). The texture of soil was clay loamy as showed in Table (1), it is contain 39.5% clay, 31.7% silt and 28.8% sand. Table (2) showed that the hydraulic conductivity was 3.6 cm/day and bulk density was 1.39 g/cm^3.

Table (1): Particle size distribution % of the soil used in the present study

Texture	Clay %	Silt%	Sand%
clay loam	39.5	31.7	28.8

Table (2): Some physical properties of soil sample from the experimental site before planting

Sample No.	HC, cm/day	Bulk density, g/cm^3	Porosity, %	SP, (%)	CEC meq/100g soil	K	Na	Mg	Ca
						Exchangeable Nutrients meq/100g soil			
1	3.6	1.39	48.3	85	15.4	0.67	1.12	1.56	9.51
2	4.0	1.36	49.6	82	17.6	0.89	1.68	1.92	11.22

The chemical properties of soil were showed in Tables (3 and 4). The salinity of used soil was 7.71 dS/m and this showed saline soil which > 4 dS/m. pH of soil 8.16 that is mean high sodicty. Soil samples showed low organic matter content and low level contents of cations and anions. Availability of macronutrients and micronutrients are showed in Table (4). The analyses refer to low and medium concentration of nutrients.

Table (3): Some chemical properties of soil sample from the experimental site before planting

Sample No.	EC d Sm^{-1}	pH	O.M., %	Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	Cl^{-}	SO_4^{--}
				meq/l							
1	6.88	8.16	0.75	24	15	27.2	0.92	-	3.5	59.8	4.2
2	7.71	8.12	0.32	26.0	18.0	28.4	0.98	-	3.5	62.0	7.68

Table (4): Some available nutrients of soil sample from the experimental site before planting

Sample No.	Total N	P	K	Fe	Mn	Zn	Cu
	mg/kg soil						
1	60	27.1	634	3.9	9.88	6.78	3.30
2	65	28.2	639	4.1	10.2	6.79	3.41

Table (5): Mineral and organic added nitrogen to different treatments

No	Treatments	Added mineral nitrogen (kg)	Added organic Nitrogen (kg)	Total added nitrogen (kg)	No	Treatments	Added mineral nitrogen (kg)	Added organic Nitrogen (kg)	Total added nitrogen (kg)
1	**100%mineral 60 kg N/fed**	60	-	60	18	m: 50% of 60 kg/fed (30 kg) Or: 50% of 10 tons (5 ton/fed)	30	70	100
2	**100% mineral 80 kg N/fed**	80	-	80	19	m: 50% of 80 kg/f (40 kg) Or: 50% of 5 tons/fed (2.5 tons/fed)	40	35	75
3	**100% mineral 100 kg N/fed**	100	-	100	20	m: 50% of 80 kg/f (40 kg) Or: 50% of 7.5 tons/fed (3.75 tons/f)	40	52.5	92.5
4	**100% organic 5 tons/fed**	-	70	70	21	m: 50% of 80 kg/f (40 kg) Or: 50% of 10 tons/fed (5 tons/fed)	40	70	110
5	**100% organic 7.5 tons/fed**	-	105	105	22	m: 100 kg/f (50 Kg) Or: 5 tons/fed (2.5 tons/fed)	50	35	85
6	**100% organic 10 tons/fed**	-	140	140	23	m: 50% of 100 kg/f (50 Kg) Or: 50% of 7.5 tons/fed (3.75 tons/fed)	50	52.5	102.5
7	**mineral: 25% of 60 kg/fed (15 kg) Organic: 75% of 5 tons/fed (3.75 tons/fed)**	15	52.5	67.5	24	m: 50% of 100 kg/f (50 kg) Or: 50% of 10 tons/fed (5 tons/fed)	50	70	120
8	**mineral: 25% of 60 kg/fed (15 kg) Organic: 75% of 7.5 tons/fed (5.625 tons/fed)**	15	78.75	93.75	25	m: 75% of 60 kg/f (45 kg) Or: 25% of 5 tons/fed (1.25 tons/fed)	45	17.5	62.5
9	**Mineral: 25% of 60 kg/fed (15 kg) Organic: 75% of 10 tons/fed (7.5 tons/fed)**	15	105	120	26	m: 75% of 60 kg/f (45 kg) Or: 25% of 7.5 tons/fed (1.875 tons/fed)	45	26.25	71.25
10	**m: 25% of 80 kg/f (20 kg) Or: 75% of 5 tons/fed (3.75 tons/fed)**	20	52.5	72.5	27	(45 kg) m: 75% of 60 kg/f Or: 25% of 10 tons/fed (2.5 tons/fed)	45	35	80
11	**m: 25% of 80 kg/fed (20 kg) Or: 75% of 7.5 tons/fed (5.625 tons/fed)**	20	78.75	98.75	28	m: 75% of 80 kg/f (60 kg) Or: 25% of 5 tons/fed (1.25 tons/fed)	60	17.5	77.5
12	**m: 25% of 80 kg/fed (20 kg) Or: 75% of 100 tons/fed (7.5 tons/fed)**	20	105	125	29	m: 75% of 80 kg/f (60 kg) Or: 25% 0f 7.5 tons/fed (1.875 tons/fed)	60	26.25	86.25
13	**m: 25% of 100 kg/fed (25 kg) Or: 75% of 5 tons/fed (3.75 tons/fed)**	25	52.5	77.5	30	m: 75% of 80 kg/f (60 kg) Or: 25% of 10 tons/fed (2.5 tons/fed)	60	35	95
14	**m: 25% of 100 kg/fed (25 kg) Or: 75% of 7.5 tons/fed (5.625 tons/fed)**	25	78.75	103.75	31	m: 75% of 100 kg/f (75 kg) Or: 25% of 5 tons/fed (1.25 tons/fed)	75	17.5	92
15	**m: 25% of 100 kg/fed (25 kg) Or: 75% of 10 tons/fed (7.5 tons/fed)**	25	105	130	32	m: 75%of 100 kg/f (75 kg) Or: 25% of 7.5 tons/fed (1.875 tons/fed)	75	26.25	101.25
16	**m: 50% of 60 kg/fed (30 kg) Or: 50% of 5 tons/fed (2.5 ton/fed)**	30	35	65	33	m: 75% of 100 kg/f (75 kg) Or: 25% of 10 tons/fed (2.5 tons/fed)	75	35	110
17	**m: 50% of 60 kg/fed (30 kg) Or: 50% of 7.5 tons/fed (3.75 ton/fed)**	30	52.5	82.5	34	Control without nitrogen	-	-	-

RESULTS AND DISCUSSION

1. Effect of nitrogen fertilization rates on root yield

Means of root yield (ton/fed) as affected by mineral nitrogen fertilizer levels, cattle manure CM, and interaction between them on root yield of sugar beet (ton/fed) are listed in Table (6).

1.1. Effect of mineral nitrogen rates on sugar beet root yield

Results presented in Table (6) showed the effect of nitrogen fertilizer levels on sugar beet root yield**.** The results cleared that application of nitrogen fertilization levels as urea produced significantly increased in root yield compared to control .Yield of sugar beet roots was significantly responded to mineral N rates. A gradual increase was observed in sugar beet root yield as mineral N rate increased up to 100 Kg/fed. Increasing mineral nitrogen fertilizer levels from 0 to 60, 80 and 100 kg N/fed tended to increase root yield from 7.90 to 20.47, 21.76 and 23.19 tons/ fed and this increase amounted 159, 6.2 and 6.6 %, respectively between mineral nitrogen treatments. Increase in root yield more than double N unfertilized plots (control). This reflects the main role of nitrogen in salt-affected soil. The highest and significant mean root yield values were recorded by addition of 100 Kg/fed.

This increase possible due to the influence of N on plant growth, stimulating the meristematic growth activity which contributes to the increase in number of cells in additions to cell enlargement, or by increasing vegetative growth through enhancing leaf initiation, increment chlorophyll content in leaves which may reflected in improving photosynthesis process which reflected on root yield. Similar results were reported by Ouda (2001) and Kandil *et al*. (2002), Abdelaal *et al.* (2015) and Masri *et al*. (2015).

Table (6): Effect of mineral nitrogen fertilization and organic manuring rates and their interactions effects on root yield, total sugars percent (%) and N (%) in sugar beet plants

Treatments	Root yield (tons/fed)	Total sugar percent	N%	Treatments	Root yield (tons/fed)	Total sugar percent	N%
1	20.5	22.8	3.70	18	20.3	20.7	4.06
2	21.8	21.7	3.77	19	18.8	23.4	4.00
3	23.2	19.1	4.20	20	20.4	19.9	4.42
4	14.9	20.2	3.77	21	21.5	19.5	4.12
5	17.3	20.1	3.77	22	21.8	21.7	4.2
6	20.8	19.0	4.56	23	21.2	19.8	4.14
7	15.1	21.2	3.53	24	22.4	17.3	4.06
8	17.5	21.4	3.78	25	18.1	23.6	4.28
9	20.9	19.3	3.92	26	18.9	23.7	4.28
10	16.4	20.4	3.64	27	19.9	22.2	4.42
11	19.4	20.2	3.75	28	21.1	22	4.15
12	21.0	18.3	4.40	29	21.2	20.4	4.59
13	17.4	21.3	3.70	30	21.8	20.9	4.83
14	19.7	20.6	3.89	31	21.9	19.7	4.70
15	21.9	18.3	4.48	32	22.8	18.8	5.12
16	16.7	23.7	3.91	33	23.3	18.5	4.87
17	18.7	23.3	3.92	34	7.9	19.4	3.72
L.S.D ≤ 0.05					**0.42**	**0.23**	**0.62**

1.2. Effect of organic manure rates on sugar beet root yield (ton/fed)

As shown from results in Table (6), significant differences were noticed in root yield by applying of cattle manure CM in response to three treatments in the rats of 5, 7.5 and 10 tons/fed. The roots were produced from such treatments, were 14.86, 17.30 and 20, 84 tons/fed. These results showed the increase in root yield by increasing organic manure fertilizer levels and such increases amounted 16.4 and 18.4% respectively. The application of 10 ton/ fed of CM gave the highest value of root yield while the lowest value obtained under (control) treatment. This increase may be due to the effect of organic matter which improve soil health and availability of plant nutrients, Guillaumes *et al.* (2006). Organic manure results in suppression of pathogens and improvement of C: N ratio, and is easy to handle, store, transport and apply in soil compared with non-composted organic residues, (Hachicha *et al*., 2006). Shaban *et al*. (2011) and Sherif *et al*. (2012) indicated that the applying of organic matter significantly increased the availability of N, P, K, Fe, Mn and Zn in soil as compared with control. Similar observations were stated by Marinkovic *et al.* (2004), Wallace and Carter (2007), (Malnou *et al*., 2008), Mahmoud *et al.* (2012), Masri *et al.* (2015).

1.3. Effect of the interaction between mineral nitrogen fertilization, and organic manure rates on sugar beet root yield (ton/fed)

Effect of mineral nitrogen fertilizer and organic manure on root yield was presented in Table (6). There was significantly increased as effect on root yield due to the interaction between each of mineral nitrogen and CM rates compare to control treatment with respect to their effect on root yield., the values had differentiated from15.08 to 23.3 ton/fed. This significantly increased depending on the increasing of both mineral nitrogen and organic manure rates, it was a general trend. The highest value of root yield (23.3) ton/fed was produced from application 75% of 10 ton/fed organic manure with 25% of 100 kg N/fed mineral nitrogen. On the other hand, lowest value (15.08) ton/fed was produced from application of (75% from 5 ton/fed organic manure with 25% of 60 kg N/fed mineral nitrogen). This improvement in the production of roots by adding both organic manure and mineral fertilization coud may be due to the positive impact. Sarwar *et al.* (2008) reported that the combined application of both organic and inorganic fertilizers improved chemical properties of soil and enriched the fertility status of soil. Sherif *et al.* (2012) indicated such improvement may be due to the chelating effect of the organic components on the nutritive metal ions which keeps them in an available form. These results are in agreement with (Javaheri *et al.*, 2005), Bahman *et al.* (2013), Eman *et al.* (2012), Mogarzan *et al.* (2007).

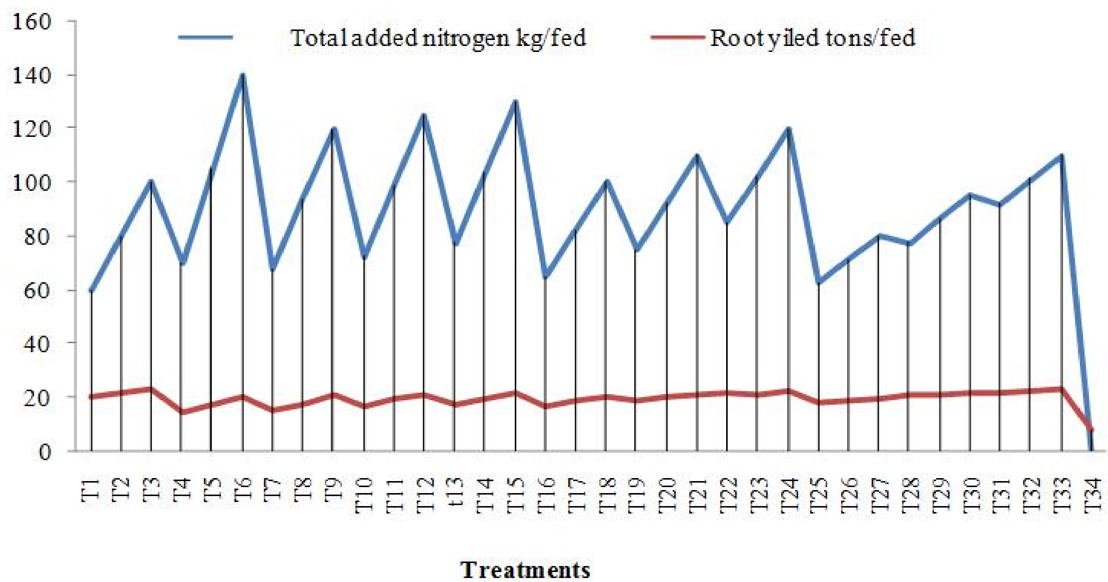

Fig. (1): Effect of mineral nitrogen fertilization and organic manure rates and their interactions on the root yield (ton/fed) in sugar beet plant

2. Effect of organic manuring and mineral nitrogen fertilization rates and their interactions on total sugars percentage (%)

The effect of mineral nitrogen fertilizer rates, CM fertilizer applications, and interaction between them on total sugars percentage in sugar beet are registered in Table (6).

2.1. Effect of mineral nitrogen rates on total sugars percent (%)

Data inscribed in Table (6) indicated that increasing nitrogen levels from 60 to 80 and 100 kg N/fed tended to decrease total sugars percentage (%) from 22.2 to 21.7and 19.1%. These results agree with those suggested by El-Hosry *et al.* (2010) and Osman *et al.* (2010). The highest sugar content was obtained with the application 60 kg N/fed was about 22.2% while the lowest value of total sugars percentage (%) were obtain from application of 100 kg mineral N (19.1%). sugar percentage were significantly decreased by increasing nitrogen rate (Carter and Traveller, 1981; Stevens *et al.*, 2011; Mahmoud *et al.*, 2012).

2.2. Effect of organic manuring rates on total sugars percentage (%)

As shown from tabulated data in Table (6), total sugars percentage (%) was markedly affected as a result of increasing of adding organic manure. The highest value of total sugars percentage (20.2%) was derived from cattle manure application (organic N fertilizer) 5 ton/fed. This percentage was reduced by increasing the amount of organic manure. The lowest value (18.5%) was obtained as a result of 10 ton/fed application treatment. Data indicated that increasing amount of organic manure from 5 to 7.5 and 10 ton/fed decrease total sugars percentage (%) from 20.2 to20.1 and 19%, respectively. These results may be due to that sugar beet is one of crops which most susceptible to nutrients imbalance in the soil because natural soil fertility cannot cover high crop demands which causes high applications of nitrogen fertilizers. Obtained results are in harmony with that found by Magro *et al.* (2015), Masri *et al.* (2015), and Sherif *et al.* (2012).

2.3. Effect of the interaction between mineral nitrogen fertilization, and organic manure rates on total sugars percentage (%)

With regard to the effect of the interaction between mineral nitrogen, and organic nitrogen rates on total sugars percentage (%) it was significant. The highest values of total sugars percentage (23.7%) This ratio was achieved in three different applications (50% of 60 kg mineral N with 50% of 5 tons/fed of CM fertilizer, 75% of 60 kg mineral N with 25% of 5 tons/fed of CM fertilizer, 75% of 60 kg mineral N with 25% of 7.5 tons/fed of CM fertilizer). While, the lowest value was achieved in the added high levels of mixing of organic and mineral nitrogen (17.3) were obtain from 50% of 100 kg mineral N with 50% of 10 tons/fed of CM fertilizer. These reductions might have been due to the role of high N rate in enhancing beet growth which was reflected in large size and heavy roots which assumed to contain lower content of sucrose this view is in agreement with Aly (2007), Stevens *et al*. (2011) and Hasanen *et al*. (2013). Milford (1973, 1976) showed that concentration of sugar in beet tissues increased proportionally with the mean volume of the cells of which the tissues were composed - but the relationship was linear only up to a particular size, beyond which, less sugar was accumulated per unit of cell volume. On the other hand, the amounts of water and nonsugar dry matter per cell both increased proportionally with cell volume over the whole size range because the surface area of cells increases more slowly than volume, these relationships imply that the cell wall thickens as cells enlarge. The largest cells in the storage root are located in central parenchyma zones that separate adjacent cambial vascular rings and it has been shown that these cells do, indeed, have lower fresh and dry-weight concentrations of sugar than the small-celled parenchyma of the vascular zones (Winner and Feyerabend, 1971; Milford, 1976; Doney *et al*., 1981).

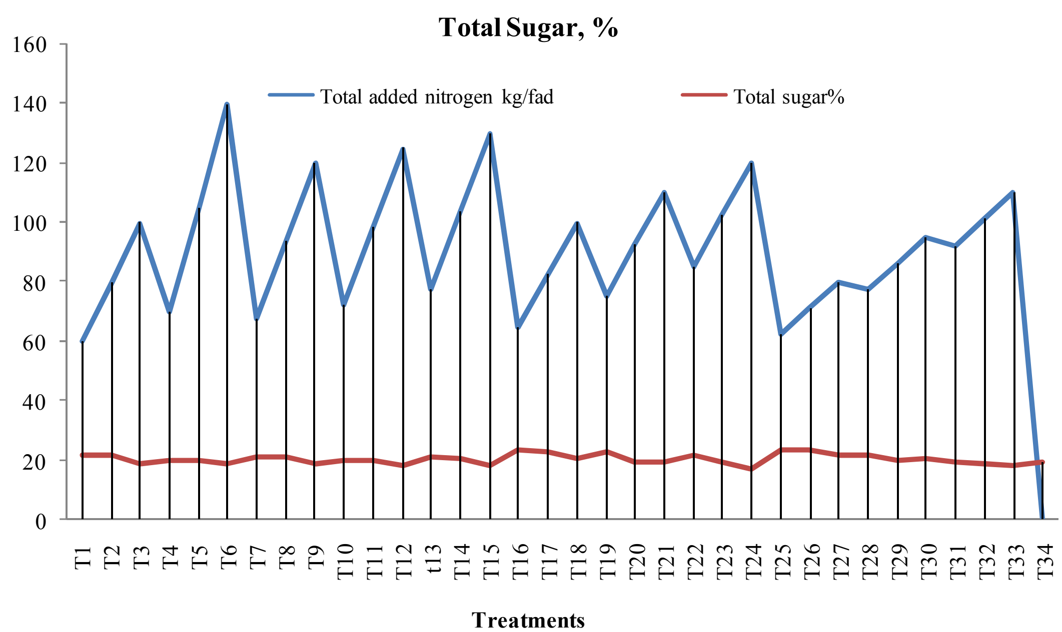

Fig. (2): Effect of levels of mineral nitrogen and organic manure and their interactions on total sugar% in sugar beet plant

3. Effect of organic manuring and mineral nitrogen fertilization rates and their interactions on nitrogen concentration (%) in sugar beet plan

Data presented in Table (6) show the effect of both mineral nitrogen fertilizer and cattle manure and their interactions on the nitrogen concentration % in sugar beet plant.

3.1. Effect of mineral nitrogen rates on nitrogen concentration of sugar beet

The results in Table (6) revealed that mineral nitrogen rates a significant increase nitrogen concentration (%) in sugar beet in compared to control treatment. Increasing mineral nitrogen fertilizer rates from 60 to 80 and 100 kg N/ fed increase nitrogen concentration % from 3.72% to 3.77 and 4.20% respectively, increasing mineral nitrogen fertilizer levels from 80 to 100 kg N/fed increased nitrogen concentration (%) from 3.77 to 4.20, in other words, increasing mineral nitrogen fertilizer rates from 60 to 80 and 100 kg N/fed led to increase nitrogen concentration nitrogen by 0.07% and 0.33%. The highest values of nitrogen concentration % of sugar beet (4.20%) was resulted from the higher application rate of mineral nitrogen rate (100 kg/fed N) while the lowest ones (3.70%) were achieved with the lower application of (60 kg/fed N). These results are in agreement with Abdel-Motagally and Attia (2009), Osman *et al.* (2010), Osman (2011), Grzegorzewski (2017), Mampa *et al.* (2017).

3.2. Effect of organic manuring rates on nitrogen concentration (%) in sugar beet plant

Effect of organic manure applications on nitrogen concentration (%) in sugar beet is presented in Table (6) significantly increases were resulted by organic manure addition in compared to control (without N) treatment. Increasing cattle manure fertilizer rates from 0 to 5.0, 7.5, and 10 ton/ fed increased nitrogen concentration % in sugar beet plant on salted affected soil from (3,72%) to, (3.76%), (3.76%) and (4.56%) respectively. The increase organic manuring rates led to an increasing in the concentration of nitrogen in sugar beet plant, The highest values of nitrogen concentration % of sugar beet (4.65%) was resulted from the higher application rate of cattle manure treatments 10 ton/ fed. These results are agreement with Madejon *et al* (1996), Taalab *et al* (2008) and Lehrsch *et al* (2015) that's found that N uptake in Sugar beet increased by increasing the manure rate.

3.3. Effect of the interaction between mineral nitrogen fertilization, and organic manuring rates on nitrogen concentration (%) in sugar beet plant

The interaction between mineral nitrogen fertilization, and organic nitrogen rates resulted in significantly effects on nitrogen concentration (%) in sugar beet plant as shown in Table (6). Significant differences were listed between organo-mineral fertilizer applications and control (N0) treatment. The highest N (%) concentrations (4.83, 4.87 and 5.12%) were resulted from interaction application of (75% of 80 kg mineral N with 25% of 10 ton/fed of organic manuring application treatment, 75% of 100 kg mineral N with 25% of 10 ton/fed of organic manuring, and 75% of 100 kg mineral N with 25% of 7.5 ton/fed of organic manuring), respectively. The lowest values (3.53, 3.70, and 3.72%) were recorded as a results of (25% of 60 kg mineral N with75% of 5 ton/fed of organic manuring, 25% of 100 kg mineral N with 75% of 5 ton/fed of organic manuring, and control treatment without nitrogen), respectively. The data show indicate that the mixing levels treatments of mineral fertilizer and organic manure were produced high levels of nitrogen concentration in sugar beet plant. These results are in agreement with Hassan (2005) and Hafez (2014). Organic matter improves soil health and availability of plant nutrients, (Guillaumes *et al*., 2006). Organic matter results in suppression of pathogens and improvement in the C: N ratio, and is easy to handle, store, transport and apply in soil compared with non-composted organic residues, (Hachicha *et al*., 2006). Helmy *et al*. (2013) found that the application of organic fertilizer + 179 kg mineral N ha-1 caused soil pH to decrease probably due to the effect of microorganisms on decomposing organic matter and hence releasing organic acids. Tandon (2000) indicated that physical properties (hydraulic conductivity, bulk density and total porosity) of salt affected soil greatly improved when compost was applied. Siam *et al*. (2013) found that lowest of soil EC was obtained by 100 kg N/fed as urea combined with compost in the both seasons. Sherif *et al*. (2012) indicated that the applying organic matter significantly increased the availability of N, P, K, Fe, Mn and Zn in soil as compared with control. These results may be due to the chelating effect of the organic components on the nutritive metal ions that keeps them in an available form. Generally, the increases occurred in N% concentrations in roots of sugar beet may be due to decrease in both soil pH, soil salinity and increase of the activity of microorganisms in soil due to the aforementioned of applications effect.

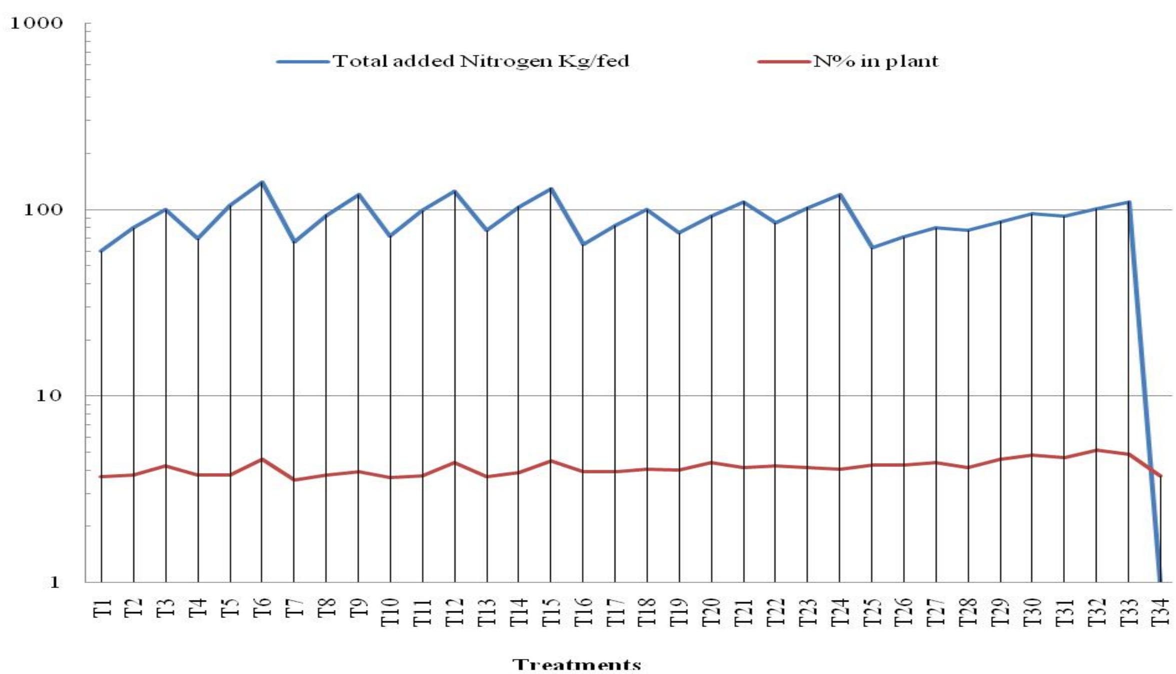

Fig. (3): Effect of mineral nitrogen fertilization, and organic manuring rates, and their interactions on N concentration (%) in sugar beet plant

CONCLUSION

Based on the study findings, it can be concluded that: The application of the mineral and organic nitrogen increases root production but increasing nitrogen fertilizer in high levels caused decrease in total sugar %. The increase in fertilizer doses of nitrogen, especially organic matter, caused significant changes in concentrations of nitrogen in sugar beet plant. The best production of sugar yield is obtained from treatment 80 kg/fad mineral nitrogen T2, and it is recommended to use this treatment for its superiority in the total production of sugar yield.

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التأثير التفاعلي لاستخدام النتروجين العضوي والمعدني على بنجر السكر في الأراضي المتأثرة بالأملاح

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بنجر السكر أحد أهم محاصيل السكر في العالم والذي يمكن زراعته في الأراضي حديثة الاستصلاح. لذا أقيم هذا العمل بجنوب محافظة بورسعيد موسم النمو ٢٠١٥- ٢٠١٦ لدراسة تأثير استخدام كل من التسميد العضوي والمعدني على إنتاج بنجر السكر في تربة متأثرة بالأملاح. حيث أجريت ٣٤ معاملة سمادية مختلفة على بنجر السكر مابين عضوي ومعدني وخليط بينهم وسجلت نتائج تأثير كل معاملة على البنجر من حيث محصول الجذور (طن/فدان) ونسبة السكريات الكلية. وكانت أفضل النتائج هي المتحصل عليها باستخدام النيتروجين المعدني المعاملة الثانية) T2 ٨٠ كجم/فدان) لتفوقه في إجمالي إنتاج السكر. كما تم تحليل عينات النباتات بعد الحصاد لتشمل تقدير تركيز النيتروجين في النبات. أظهرت النتائج تأثر معنوي استجابة للمعاملات السمادية وزيادة في تركيز النتروجين في نبات بنجر السكر بزيادة الكميات المضافة من النتروجين المعدني أو السماد العضوي.