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EFFECT OF ORGANIC MANURE AND INORGANIC N FERTILIZERS ON GROWTH , YIELD AND SOME PHYSIOLOGICAL CHARACTERS OF SUGARBEET ON CALCAREOUS SOIL

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ABSTRACT: A field experiment was conducted in Noubaria calcareous soil to investigate the response of sugar beet to 10 ton/fed of fresh or composted farmyard manure (FFYM or CFYM) in presence of 40 kg N/fed (as urea, ammonium nitrate or diluted nitric acid). Plant samples were taken after 16 and 25 weeks of planting. Some vegetative characteristics such as plant height, leaf numbers, root length and width were recorded. Shoots and roots were chemically and biochemically analyzed. The combination of CFYM and amm. nitrate showed the best results of plant growth, yield, sugar concentration and purity. Positive correlations were found between sugar purity and potassium content in leaves of 16 and 30 week ages (r=0.297 and 0.296 respectively) as the only significant ones. Reducing sugar content was more sensitive to the studied treatments than the total soluble sugar content.

Key Words: Calcareous soil, FYM, Mineral N fertilizers, Sugar beet

INTRODUCTION

Sugar beet is the second crop for sugar production in Egypt and is widely planted in the newly reclaimed areas such as the calcareous soil at Noubaria. Therefore, more attention must be paid to increase its yield and to improve its sugar production.

In fact, this crop is sensitive to time of nitrogen fertilization which should be available between 4 to 8 weeks of planting, (Dragovic *et al.*, 1996). On the other hand, excessive nitrogen application after middle season increases impurities in produced sugar, (Carter, 1986 a), moisture content in root (Carter, 1986b) and consequently lowering in extractable sucrose and sucrose percent (Carter and Travellar, 1981). Urea was incorporated by disking into sandy clay loam soil of pH 8 in a rate of 0, 75 and 150 kg N/ha during sugar beet seedbed preparation in a trial conducted by Oliveira *et al.,* (1993). They found that N significantly increased root yield, sucrouse concentration and sugar yield but NO_3 concentrations in petioles were not significantly affected by fertilization.

Negm *et al.,* (2003) found that just after organic manure application to calcareous soil, slight increase cation exchange capacity, as well as, reducing soil pH in a small amount by advancing time. Available N, P and K in soil increased after the application of manure and reduced gradually by time of harvest. Moreover, soil organic matter content was increased due to organic matter application, where the curve reached its peak after harvest stage.

Regarding to sugar and carbohydrate contents (the main products of sugar beet) Petrovic and Kastori (1992) reported that leaf may synthesize at optimum condition 30 g of sugar/m^2. Drogvic *et al.,* (1996) emphasized also that leaf area and photo-synthetic activity was a primary factor in sugar beet and sugar yields.

Mohamoud *et al.,* (1990) and Saif (1991) indicated that nitrogen fertilizer increased photosynthetic leaf area which resulted in increasing photo-synthesis in sugar beet plant.

Selim and El-Ghinbihi (1999) indicated that adding nitrogen in high rate (120 kgN/fed) caused a significant increase in the concentration of chlorophylls A, B and carotenoids in sugar beet leaves.

The aim of the present work is to find out if the prepared organic fertilizer, in combination with mineral fertilizer for sugar beet in the calcareous soil at Noubaria for; optimizing both organic and mineral fertilizer application, increasing the sugar beet yield and to improve its sugar production.

MATERIALS AND METHODS

A field experiment was conducted at Noubaria experimental Farm, Agric. Res. Station, Egypt. The main soil prosperities are shown in Table (1). In split plot design with 4 replicates, the studied treatments were planed in plots of 3.5× 6 m^2.

The main treatments were (A), (B) application of 10 ton/fed bulk weight of fresh or composted farmyard manures (FFYM and CFYM), respectively. (The main characters of each are presented in Table 2) and (C) control without manuring. The sub main ones were (1), (2) or (3) 40 kg nitrogen/ fed added in the form of ammonium nitrate, urea, or diluted HNO_3 solution respectively. The latter was added just after irrigation as fertigation technique and (4) control without mineral N application.

Table (1): Some physico-chemical characteristics of the studied soil.

Soil characteristics	Depth (cm) 0-20	20-40	Soil characteristics	Depth (cm) 0-20	20-40
Particle size distribution %:			Soluble ions (meq/l):		
Coarse sand	20.18	19.30	Ca^{2+}	4.48	4.12
Fine sand	28.90	28.40	Mg^{2+}	1.98	1.58
Silt	21.20	24.60	Na^+	6.79	5.37
Clay	29.00	27.60	K^+	0.66	0.45
Texture class	SCL	SCL	CO_3^{2-}	---	---
Total $CaCO_3$ %	23.95	23.20	HCO_3^-	2.73	1.89
Available nutrients (ppm):			Cl^-	7.14	5.96
P	8.80	8.10	SO_4^{2-}	4.04	4.67
K	390.8	300.0	pH (1:5) soil :water susp	8.18	8.23
Fe	1.90	1.60	Saturation per cent (Sp)	35.8	33.9
Mn	3.20	2.90	Organic matter %	0.92	0.86
Zn	1.00	1.25	Organic carbon %	0.55	0.50
Soil water extract (1:1):			Total N	0.05	0.05
T.S.S. %	0.28	0.29	C/N ratio	11.0	9.43

On November 10^{th} 2001, fresh and composted (FFYM and CFYM) quantitities were added. Sugar beet (*Beta vulgaris L*) seeds were sown on the day later. Irrigation was excited every 15 days through flooding system. The common cultivation practices were followed till plant harvesting on May 5^{th} 2002. Ammonium nitrate and urea were added in two split equal doses at 5^{th} and 7^{th} week of planting, while diluted HNO_3 solution was added in 8 equal doses along with irrigation every 15 days starting from the 3^{rd} irrigation day.

Plant samples were taken after 16 weeks from planting and also at harvest (after 25 weeks). Plant samples were transferred immediately to the laboratory, washed with tap water to get rid of adjacent soil particles, air dried, separated into leaves and roots and weighed to determine the fresh weight of both. The leave and root samples were oven dried at 70 °C till constant weight to determine total dry matter of leaves and roots according to A.O.A.C. (1990).

The following determinations were recorded:

Contents of chlorophyll A, B and carotene were measured according to Talling and Driver (1963). N, P and K contents were estimated using micro-kjeldahl procedure, stannous chloride method and flam photometer, respectively, (Black, 1965). Total carbohydrates of both dried leave and roots were determined by Dubios *et al.,* (1951). Sucrose percentage was plametrically determined using lead acetate extract of fresh root according to the method of Le. Docte (1927); the total soluble solids (T.S.S) were measured by hand refratomter (A.O.A.C., 1990).

Table (2): Analysis of the used bio-compost.

Composition	Compost FYM	Fresh FYM
O.M %	38.38	43.64
Carbon %	22.26	25.37
Total N %	0.65	0.44
C/N ratio	34.25	57.65
Total P %	0.85	0.23
Total K %	0.68	1.09
Available N (ppm)	420.0	223.0
Available P (ppm)	280.0	259.0
Available K (ppm)	1695.0	2800.0
E.C. 1:5 (soil:water) extract	8.30	7.40
pH	7.30	8.50

RESULTS AND DISCUSSION

1- Vegetative characters:

Table (3) revealed that organic manuring gave a positive significant effect on plant height either after 16 or 25 weeks from planting when compared to the control treatment. Composting FYM increased plant height in both ages and the difference was significant at 25 weeks from planting. Nitrogen fertilization had also significant effect in increasing plant height at both ages regardless the source of added nitrogen. The interaction effect of FYM manuring and mineral N fertilization followed the previous trend under both utilized manures giving the highest value (32 cm) for the composted FYM combined with ammonium nitrate treatment in the two ages, while the lowest one (20 cm) was resulted from the control without FYM-N treatment.

Concerning leaf number, manuring with FFYM or CFYM was significantly effective in increasing leaf number per plant with significant difference between both FYM cases at the two ages.

Nitrogen application increased leaf number significantly at both ages with an exception at 16 week age in case of urea (which reached as an average value 20.67 leaves/plant) as compared with N untreated plots. It was observed that no significant differences among the used N sources in both ages with one exception. The exception was the superiority of diluted HNO_3 in leaf number/plant to urea at 25 week age. Generally. the highest values of leaf number was obtained from combination of fresh FYM either with amm.nitrate after 16 weeks or with HNO_3 after 25 weeks of planting.

The superior plant growth resulted in superior plant fresh and dry weights as shown in Table (3). Each of applied manure or mineral N was significantly raised the shoots fresh and dry weights. Among treatments, CFYM was superior in its shoots fresh and dry weight at both ages. The corresponding fresh and dry weights were 1.3 and 2.1 kg, 377 and 609g, respectively. On the other hand, ammonium nitrate was superior to the other two nitrogen forms in both age samples and diluted HNO_3 to urea in the middle plant age.

Generally, the combination of composted FYM and ammonium nitrate resulted in the highest fresh weight values through all plant ages. The enhancing effect of N on plant growth may be attributed to its beneficial effects on stimulation of the meristimatic activity for producing more tissues and organs. Moreover, N plays a major role on protein, nucleic acids synthesis, and protoplasm formation (Marschner, 1986). Similar results were obtained by (Habib *et al.*, 2001), Tugnoli (2002) and Moursi *et al.*, (1984) who found that nitrogen application increased significantly the fresh and dry weights of sugar beet leaves.

Table (3): Effect of FYM and nitrogen treatments on some growth characters of sugar beet leaves.

Parameters	Age weeks	FYM	Nitrogen sources (1)	(2)	(3)	(4)	Mean	L.S.D (at 0.05 level)	
Plant height (cm)	16	A	28	26	27	24	26.25	FYM	3.40
		B	32	30	29	28	29.75	N	3.30
		C	20	22	23	18	20.75	FYM.N	5.72
		mean	26.70	26.00	26.30	17.50			
	25	A	55	58	53	46	53.00	FYM	4.90
		B	64	58	60	54	59.00	N	2.98
		C	52	50	46	40	47.00	FYM.N	5.16
		mean	57.00	55.30	53.00	46.70			
Number of leaves	16	A	24	23	28	20	23.75	FYM	2.40
		B	28	27	25	24	26.00	N	3.40
		C	15	12	14	10	12.75	FYM.N	5.89
		mean	22.33	20.67	22.33	18.00			
	25	A	44	42	46	33	41.25	FYM	5.82
		B	46	45	48	43	45.50	N	2.99
		C	32	33	35	27	31.75	FYM.N	5.18
		mean	40.67	40.00	43.00	34.33			
Fresh weight (kg)	16	A	1.20	1.05	1.10	0.75	1.03	FYM	0.07
		B	1.30	1.12	1.17	0.94	1.13	N	0.07
		C	0.90	0.80	0.85	0.37	0.73	FYM.N	0.11
		mean	1.13	0.95	1.04	0.69			
	25	A	1.80	1.60	1.56	1.23	1.55	FYM	0.07
		B	2.10	2.05	2.00	1.87	2.00	N	0.07
		C	1.20	1.11	1.10	0.83	1.06	FYM.N	0.14
		mean	1.70	1.59	1.55	1.31			
Dry weight (g)	16	A	348.0	304.5	319.0	217.5	297.3	FYM	69.86
		B	377.0	324.8	339.3	272.6	328.4	N	86.30
		C	261.0	232.0	246.5	107.3	211.7	FYM.N	149.0
		mean	328.6	287.1	301.6	198.9			
	25	A	522.0	464.0	452.4	356.7	448.8	FYM	88.24
		B	609.0	594.5	580.0	542.3	581.5	N	116.5
		C	348.0	321.9	319.0	240.7	307.2	FYM.N	201.0
		mean	493.0	459.9	450.5	379.9			

A: FFYYM B: CFYM and C: Control

1: amm. Nitrate 2: urea 3: Diluted HNO_3 and 4: Control

2. Bio-chemical composition of leaves:

The effect of organic manure and mineral nitrogen fertilizer on chlorophyll A, B and carotin could be concluded from the data of Tables 4a and b for ages of 16 and 25 weeks, respectively, as follows. CFYM was significantly superior to FFYM which was also significantly superior to control in increasing chlorophyll A and carotin contents in leaves of both 16 and 25 week ages while CFYM was of the same effect of FFYM significantly higher than the control in case of chlorophyll B. Nitrogen forms were statistically as the same at 16 week age but 1>2>3 significantly at 25 week age in their effects on chlorophyll A, B and carotin. Nitrogen fertilization was in all cases significantly superior to control (treatment 4) with exception of carotin content in 16 week age leaves. This may be due to increasing photosynthesis activity in sugarbeat leaf area by N fertilization as reported by Mahmoud *et al.*, (1990) and Saif (1991). The higher chlorophyll contents of leaves increased activity of key stomata enzymes of the Calvin cycle (Roob and Terry. 1994).

Concerning total soluble sugar (T.S.S.) and reducing sugar (R.S.) concentrations (Tables 4 a and b), each of 16 and 25 week ages followed similar trend as follows. CFYM was significant superior to control in increasing T.S.S% while the differences between CTYM> FFYM> control were significant in case of R.S.%. Nitrogen forms were statistically as the same as control in spite of amm.nitrate (treatment 1) which had significant difference over the control (Treatment 4) in case of T.S.S.%. On the contrary N forms were of significant effects on R.S.% in the order 1> 2> 3>4. Thus reducing sugar was more sensitive to the used treatments than T.S.S.%. The results indicated that the use of organic fertilizer significantly enhanced leaf chlorophyll, carotene, total carbohydrates and mineral contents over control plant at both ages. The effect of organic fertilizer on photosynthetic pigments and nutritional status of the sugar beet leaves could be attributed to the role of non symbiotic N2-fixing bacteria, the availability of nutrients and the modification of root growth morphology and physiology through hormonal exudates of organic fertilizer bacteria, resulting

Table (4a): Effect of FYM and nitrogen treatments on some biological and chemical components of sugar beet leaves at 16 week age.

Parameters		FYM	Nitrogen sources (1)	(2)	(3)	(4)	mean	L.S.D (at 0.05 level)	
Photosynthetic pigments (mg/g F.W.)	Chlorof. A	A	9.90	8.65	9.6	7.89	9.00	FYM	0.93
		B	13.63	13.33	12.	9.40	12.30	N	1.10
		C	8.70	7.88	7.2	6.66	7.60	FYM.N	2.12
		mean	10.70	9.90	9.9	7.90			
	Chlorof. B	A	3.44	3.12	3.7	2.88	3.30	FYM	0.95
		B	4.93	4.50	4.0	3.10	4.10	N	0.74
		C	3.30	3.20	2.2	2.14	2.70	FYM.N	1.28
		mean	3.89	3.60	3.3	2.70			
	Carotin	A	1.87	1.62	1.6	1.53	1.67	FYM	0.13
		B	1.75	1.70	1.7	1.65	1.71	N	0.21
		C	1.24	1.28	1.2	1.13	1.23	FYM.N	0.37
		mean	1.60	1.50	1.6	1.50			
Sugars	T.S.S.%	A	1.23	1.10	0.8	0.52	0.93	FYM	0.64
		B	1.43	1.32	1.2	0.68	1.20	N	0.48
		C	0.66	0.65	0.4	0.38	0.54	FYM.N	0.83
		mean	1.10	1.00	0.8	0.52			
	R.S.%	A	0.48	0.40	0.3	0.28	0.39	FYM	0.10
		B	0.65	0.59	0.5	0.38	0.54	N	0.06
		C	0.35	0.25	0.2	0.24	0.28	FYM.N	0.13
		mean	0.49	0.42	0.4	0.30			
Nitrogen %		A	2.00	2.10	2.1	1.47	1.90	FYM	0.15
		B	2.30	2.22	2.2	2.00	2.30	N	0.29
		C	1.58	1.50	1.7	1.36	1.50	FYM.N	0.50
		mean	1.96	1.94	2.0	1.61			
Phosphorus %		A	0.30	0.20	0.3	0.20	0.25	FYM	0.08
		B	0.30	0.30	0.3	0.20	0.26	N	0.05
		C	0.20	0.20	0.3	0.20	0.23	FYM.N	0.09
		mean	0.27	0.24	0.3	0.20			
Potassium %		A	1.40	1.20	1.5	1.00	1.30	FYM	0.19
		B	1.60	1.50	1.3	1.10	1.40	N	0.16
		C	1.20	1.10	1.3	0.80	1.10	FYM.N	0.28
		mean	1.40	1.30	1.4	0.96			

A: FFYYM B: CFYM and C: Control
1: amm. Nitrate 2: urea 3: Diluted HNO_3 and 4: Control

Table (4b): Effect of FYM and nitrogen treatments on some biological and chemical components of sugar beet leaves at 25 week age.

Parameters		FYM	Nitrogen sources (1)	(2)	(3)	(4)	mean	L.S.D (at 0.05 level)	
Photosynthetic pigments (mg/g F.W.)	Chlorof. A	A	11.50	11.00	10.77	8.90	10.50	FYM	0.08
		B	13.45	13.77	13.00	11.50	12.90	N	0.08
		C	10.70	9.75	9.00	8.87	9.58	FYM.N	0.01
		mean	11.90	11.50	10.90	9.80			
	Chlorof. B	A	4.34	4.18	3.88	3.00	4.48	FYM	0.21
		B	4.88	4.72	4.60	3.88	4.52	N	0.12
		C	3.80	3.75	3.22	2.66	3.40	FYM.N	0.21
		mean	4.34	4.20	3.90	3.18			
	Carotin	A	2.72	2.70	2.68	2.36	2.60	FYM	0.02
		B	3.98	3.90	3.85	3.20	3.70	N	0.23
		C	2.63	2.55	2.60	2.00	2.40	FYM.N	0.04
		mean	3.11	3.05	3.00	2.52			
Sugars	T.S.S.%	A	11.76	10.48	10.00	8.82	10.30	FYM	1.40
		B	12.00	11.82	11.57	10.00	11.40	N	1.80
		C	11.00	9.80	9.68	9.56	10.00	FYM.N	3.10
		mean	11.60	10.70	10.40	9.50			
	R.S.%	A	2.69	1.64	1.53	1.45	1.80	FYM	0.14
		B	2.86	1.77	1.68	1.58	2.00	N	0.10
		C	1.66	1.45	1.42	1.25	1.40	FYM.N	0.17
		mean	2.40	1.62	1.50	1.40			
Nitrogen %		A	2.37	2.25	2.45	2.00	2.30	FYM	0.16
		B	2.40	2.30	2.37	1.79	1.70	N	0.11
		C	1.89	1.55	1.97	1.42	1.70	FYM.N	0.19
		mean	2.22	2.00	2.30	1.70			
Phosphorus %		A	0.30	0.30	0.30	0.30	0.30	FYM	0.08
		B	0.30	0.40	0.40	0.30	0.35	N	0.08
		C	0.30	0.30	0.30	0.30	0.29	FYM.N	0.13
		mean	0.30	0.34	0.30	0.28			
Potassium %		A	1.70	1.80	1.60	1.30	1.60	FYM	0.03
		B	1.70	1.90	1.50	1.30	1.60	N	0.09
		C	1.40	1.30	0.90	0.60	1.60	FYM.N	0.15
		mean	1.60	1.70	1.30	1.07			

A: FFYYM B: CFYM and C: Control

1: amm. Nitrate 2: urea 3: Diluted HNO_3 and 4: Control

in more efficient absorption of available nutrients which are main components of photosynthetic pigments (Jagnow *et al.*, 1991). They concluded that the high levels content of glucose in plant grown with N and supplied by bio fertilizer or mineral droved from photosynthesis and not degradation of starch. High N in treatments reduced CO_2 in carporation process into starch by 50%. The reducing sugar or sucrose percentage was increased by increasing N rate up to 90 kg/fed (Kandil, 1993).

Nutrient uptake by leaves:

Data in Tables (4a and b) represent the uptake of N, P and K by growing leaves. Application of organic manures increased significantly the uptake of N, P and K over the control treatment after 16 weeks, N and K after 25 weeks. Nitrogen fertilization was also significantly raised the amounts of N, P and K uptake at both ages of 16 and 25 weeks.

Combination of FYM manuring and mineral N fertilizers also was generally of positive significant effect. These results are in agreement with those obtained by Drogovic *et al.*, (1996); Steven (1998) and Guiping *et al.*, (1998) who reported that N contents of leaves and roots of sugar beet was greater with nitrogen fertilizer than without it (control) and increased up to a plateau at 120 kg N/fed. Such effect may be attributed to a positive correlation between the N supply and dry matter. The positive influences on leaf N and K contents of sugar beet plant were as a result of increasing N dose (Wiedenfeld, 1986).

3- Root characters and yields:

Table (5) represents root length, width and yields as affected by manures and N mineral fertilizers. The statistical analyzed data revealed that organic manuring significantly increased root length and width with superiority of CFYM to FFYM along with growth periods (16 and 25 weeks). The significant increases in the both characters were observed also by mineral N application at the end of the two studied growth periods. Among nitrogen forms, ammonium nitrate was significantly superior to diluted HNO_3 in 16 week root length, urea and diluted HNO_3 in 25 week root length. Urea also was superior to diluted HNO_3 in 25 week root length. In case of root width, all nitrogen sources was statistically as the same at 16 week age but at 25, the trend of ammonium nitrate> diluted HNO_3 > urea was significant.

Table (5): Effect of FYM and nitrogen treatments on some growth of sugar beet roots.

Parameters		FYM	Nitrogen sources (1)	(2)	(3)	(4)	mean	L.S.D (at 0.05 level)	
Plant length (cm)	16	A	22.5	20.8	17.4	17.0	19.55	FYM	2.88
		B	25.0	23.5	24.4	18.9	22.95	N	2.79
		C	19.5	17.8	14.5	12.5	16.10	FYM:	4.80
		mean	22.3	20.5	18.9	16.1			
	25	A	39.5	36.7	34.6	31.6	35.6	FYM	0.14
		B	38.2	36.8	37.0	35.8	36.9	N	0.15
		C	33.5	31.0	28.7	26.8	30.0	FYM:	0.26
		mean	37.1	34.8	33.4	31.4			
Root width (cm)	16	A	28.0	25.5	24.0	20.0	24.25	FYM	1.20
		B	30.0	36.0	32.5	28.4	31.70	N	1.90
		C	18.5	20.5	24.0	14.0	19.25	FYM:	---
		mean	25.5	27.2	26.8	20.8			
	25	A	28.7	46.0	48.0	44.7	46.9	FYM	0.22
		B	50.0	47.9	49.0	44.0	47.9	N	0.18
		C	39.0	37.0	38.0	34.0	37.0	FYM:	0.31
		mean	45.9	43.6	45.2	40.0			
Fresh weight (g)	16	A	1.0	0.95	1.05	0.85	0.96	FYM	0.19
		B	1.8	1.60	1.56	1.30	1.57	N	0.15
		C	0.7	0.50	0.60	0.20	0.50	FYM:	0.26
		mean	1.17	1.00	1.07	0.78			
	25	A	1.85	1.76	1.64	1.11	1.59	FYM	0.07
		B	2.60	2.35	2.30	1.70	2.20	N	0.07
		C	1.40	1.30	1.45	0.80	1.24	FYM:	0.11
		mean	2.00	1.80	1.80	1.20			
Dry weight (g)	16	A	242.0	225.4	251.4	212.5	232.8	FYM	1.00
		B	365.7	308.2	384.5	289.1	336.9	N	0.99
		C	135.3	98.2	145.9	56.7	109.0	FYM:	1.70
		mean	247.7	210.6	260.6	186.1			
	25	A	448.0	416.0	369.0	278.0	377.7	FYM	53.0
		B	528.0	464.0	566.0	378.0	484.0	N	63.0
		C	271.0	255.0	352.0	227.0	267.3	FYM:	109.
		mean	415.7	378.3	429.0	294.3			

A: FFYYM B: CFYM and C: Control

1: amm. Nitrate 2: urea 3: Diluted HNO_3 and 4: Control

Farmyard manure either fresh or composted increased the fresh and dry weight of beet roots at 16 or 25 week ages significantly over the control. In the same time, CFYM was significantly superior to FFYM in all cases. Nitrogen application reflected also significant increases in fresh and dry root weights in general.

Concerning N forms, ammonium nitrate was significantly higher than urea after 16 weeks, urea and diluted HNO_3 after 25 weeks in case of fresh yield. Diluted HNO_3 was at the top followed with ammonium nitrate and urea with significant difference between each other in case of dry yield after 16 weeks but all forms were as the same statistically after 25 weeks. These results were in agreement with those obtained by Eckhoff (1995), Azzazy (1998) and Basha (1999) who found that nitrogen application enhanced root enlargement respecting to increments both of root length and diameter of sugar beet. Also, Goyal *et al.*, (1982) and Moursi *et al.*, (1984) who demonstrated that nitrogen application increase significantly the fresh and dry yield of roots.

4- Sugar parameters:

Table (6) represents total soluble solids, total soluble sugars, reducing sugar, sucrose, juice purity percentages and sugar yield. In all these parameters, organic manuring caused significant increases with superiority of CFYM to FFYM with exception of total soluble solids and reducing sugar where CFYM was statistical as the same FFYM effect.

Nitrogen application increased these parameters with exception of total soluble solids and reducing sugar. Ammonium nitrate> urea> diluted HNO_3 was the descending order with significant difference between each other due to the effect on total soluble sugar, sucrose percentage and sugar yield while diluted HNO_3 reduced total soluble solids significantly than the other two forms and control and increased juice purity significantly over urea.

Juice purity and sugar yield as affected by leaf chemical composition:

Leaf contents of chlorophyll A, B, carotene, total soluble solids, reducing sugar, nitrogen, phosphorus and potassium were put under consideration

Table (6): Effect of FYM and nitrogen treatments on sugar content, purity and yield in juice of sugar beet roots.

Parameters		Nitrogen sources					L.S.D	
	FYM	(1)	(2)	(3)	(4)	mean	(at 0.05 level)	
Total soluble Solids (%)	A	18.00	20.00	18.20	20.00	19.10	FYM	0.64
	B	19.80	22.40	17.00	19.00	19.60	N	0.48
	C	20.40	15.00	15.00	18.80	17.30	FYM.N	0.83
	mean	19.40	19.10	16.70	19.30			
Total soluble sugars (%)	A	56.50	53.20	46.50	32.60	47.20	FYM	2.24
	B	63.20	59.90	53.40	33.25	52.40	N	2.17
	C	39.90	29.80	23.30	20.60	28.40	FYM.N	3.76
	mean	52.90	47.60	41.00	28.80			
Reducing sugars (%)	A	1.70	1.50	1.30	0.90	1.35	FYM	0.36
	B	1.90	1.60	1.40	1.20	1.53	N	0.62
	C	1.30	1.20	1.00	0.70	1.05	FYM.N	1.07
	mean	1.60	1.40	1.25	0.93			
Sucrose (%)	A	14.82	14.50	14.22	13.64	14.29	FYM	0.24
	B	17.63	16.63	14.00	14.68	15.74	N	0.17
	C	12.66	11.00	11.33	10.33	11.33	FYM.N	0.92
	mean	15.00	14.00	13.20	12.90			
Juice purity (%)	A	82.30	71.80	78.00	68.20	75.08	FYM	4.76
	B	86.90	74.20	82.40	77.00	80.13	N	2.41
	C	62.00	73.30	75.50	55.00	66.45	FYM.N	4.17
	mean	77.07	73.10	78.63	66.73	73.89		
Sugar yield (g/plant)	A	218.09	197.8	183.4	187.6	196.76	FYM	124.89
	B	234.43	223.9	210.9	198.6	216.98	N	124.11
	C	189.72	174.0	122.1	113.2	149.76	FYM.N	214.96
	mean	214.08	198.5	172.1	166.5	187.83		

A: FFYYM B: CFYM and C: Control
1: amm. Nitrate 2: urea 3: Diluted HNO_3 and 4: Control

concerning their relation with juice purity or total sugar yield. Correlation coefficients were calculated as Table (7) clarifies. From that table it could be concluded that the only significant ones were that between juice purity and potassium content in leaves whether at 16 or 25 week age. Therefore juice purity could be concepted due to K% in leaves at 16 or 25 week age from the following regression equation; J.P.%=$50.86+14.93K_{16}$% or =$54.12+10.82K_{25}$%, respectively.

Table (7): Correlation coefficients of juice purity and total sugar yield with some effective factors.

The affected factors (Y):	Juice purity		Total sugar yield	
Plant age (weeks)	**16**	**25**	**16**	**25**
The effective factor (X):				
Chlorofill A	-0.023	0.158	-0.060	-0.026
Chlorofill B	0.107	0.188	-0.097	0.007
Carotin	0.135	0.011	-0.126	-0.035
Reducing sugars	0.088	-0.229	-0.075	-0.143
Total soluble solids	-0.229	0.269	-0.018	-0.045
N content	0.157	0.140	-0.019	-0.190
P content	0.043	-0.003	-0.206	-0.251
K content	0.297*	0.296*	-0.082	0.169
The significant limit or Table (r) at d.f 46=± 0.285.				

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أثر الأسمدة العضوية والأسمدة النيتروجينية غير العضوية على نمو ومحصول وبعض الصفات الفسيولوجية لبنجر السكر فى أرض جيرية

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أقيمت تجربة حقلية بأرض جيرية بالنوبارية لدراسة استجابة بنجر السكر لإضافة ١٠ طن/ فدان من سماد بلدى طازج أو مكمور في وجود ٤٠ كجم ن مضافة على صورة يوريا أو نترات أمونيوم أو محلول مخفف من حمض النيتريك وقد أخذت عينات نباتية بعد ١٦، ٢٥ أسبوعا من الزراعة حيث سجلت الأوزان وقدرت بعض القياسات التوصيفية مثل أرتفاع النبات وعدد الأوراق وطول وقطر الجذور. كذلك تم التحليل الكيماوى والكيماوى الحيوى للمجموع الخضرى والجذور.

أبدت معاملة السماد البلدى المكمور مصاحبا لنترات الأمونيوم أفضل النتائج من حيث نمو النبات ومحصوله وتركيز السكر به ونقاوته. وقد وجدت علاقة موجبة بين نقاوة السكر والمحتوى البوتاسى فى الأوراق عمر ١٦، ٢٥ أسبوعا (ر=٠,٢٩٧، ٠,٢٩٦ على الترتيب) حيث كانتا هما العلاقتان الوحيدتان ذاتا المعنوية. وقد كان لمحتوى السكريات المختزلة حساسية أكثر للمعاملات محل الدراسة أكثر مما كان لمحتوى السكريات الذائبة الكلية.