Journal of Soil Sciences and Agricultural Engineering

Journal homepage: www.jssae.mans.edu.eg
Available online at: www.jssae.journals.ekb.eg

Effect of different Sources and Rates of Organic Fertilization on Sugar Beet (*Beta vulgaris* var. *Saccharifera* L.) Yields and its Quality Grown under Newly Reclaimed Sandy Soils

Fatma A. M. Ghaly[1]; H. M. Sarhan[2*]; A. S. Abdel-Hamied[1] and T. M. A. Mansour[2]

[1]Soil Department, Faculty of Agriculture, Damietta University, Egypt.
[2]Sugar Crops Research Institute, Agriculture Research Center, Giza, Egypt.

ABSTRACT

At Kalabsho Experimental Farm, Dakahlia Governorate, Sugar Crops Research Institute, Agricultural Research Center, two experiments were done in the field throughout seasons of 2016/2017 and 2017/2018 to decide the effect of sources of organic fertilizers (farmyard manure "FYM", compost "CO" and poultry manure "PM") and its rates (0, 3, 5 and 7 t fed^{-1}) on yields and its components and quality of sugar beet cv. Plino under newly reclaimed sandy soil conditions. A strip-plot design with 3 replications was used in these experiments. The obtained results showed that organic fertilizing of sugar beet plots with PM induced a gradual increment and produced in the utmost values of all studied yields and its components and quality parameters as contrasted with supplementary treatments within the two growing seasons. Application the utmost rate of organic fertilizers (7 t fed^{-1}) formed the utmost values of yield and yield components and N, P and K contents in roots and foliage in mutually seasons. Although, the utmost values of sucrose and quality percentages resulted from using the organic fertilizers at 3 t fed^{-1} and the utmost values of sodium percentage were resulted as of control treatment in mutually seasons. Thus, it is suggested that fertilizing sugar beet fields with poultry manure (PM) at 7 t fed^{-1} would get the most out of sugar beet over the environmental circumstances of newly reclaimed sandy soils in Kalabsho distract, Dakahlia Governorate, Egypt.

Keywords: Sugar beet, farmyard manure, compost, poultry manure, yields, quality.

INTRODUCTION

Sugar beet (Beta vulgaris var. saccharifera L.) is well thought-out recently the first imperative source for edible sugar contribute than sugar cane in Egypt. Sugar beet considered an industrial crop as its produces various products. There is a gap connecting sugar consumption along with production attributable to the fixed increments of the country population in addition to the normal consumption of sugar alongside the imperfect cultivated area in Egypt. So, growing the educated area of sugar beet and the production of the entity area is considered as imperative national objective in order to diminish the gap connecting sugar consumption along with production. In the study we examine the suitable sources and rates of organic fertilization.

Organic fertilizers provides a stable supply of both macro- and micronutrients, improves the soil physical, chemical and biological properties, and consequently supports the maximum plant growth and yield (Belay *et al.*, 2001). Many investigators used organic matter to fertilize sugar beet. In this consider, Negm *et al.* (2003) deduced that the application of organic manure reduced soil pH and augmented slightly available soil NPK and reduced gradually by time to harvest. Marinhovic *et al.* (2004) established that the use of organic fertilizer increased the yield from 1.41 to 2.13 t/ha. 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 in roots. Organic fertilizers also increased the efficiency of mineral fertilizer utilization (Sheikha, 2016).

The farmyard manure fertilizer (FYM) is the majority imperative organic fertilizer, due to its content of most the nutrients needed for crop growth. Prasad *et al.* (2002) pointed out that manures recycling through land application can provide large quantities of plant nutrients and organic materials to assemble nutrient requirements and maintain soil fertility. Saidia and Mrema (2017) revealed that the use of FYM as an organic soil amendment can be useful in increasing yield especially in areas with low fertile soils and low moisture content. Heidarian *et al.* (2018) deduced that the combined use of 50% nitrogen fertilizer and 50% farmyard manure resulted in increased root yield of sugar beet by 28 and 32% compared with a single application of nitrogen and farmyard manure fertilizers, respectively. Abd El-Lateef *et al.* (2019) revealed that the application of farmyard manure to sugar beet significantly surpassed both the compost and chicken manure in root length, root, shoot and biological yields per plant and per feddan.

The compost is formed from biodegradable of organic matter and reprocess of nutrients likes C, N, Mg, S, Ca, P and microelements. Compost also can be applied directly into the soil in large amounts with slight risk of buildup of overload nutrients to promote the grade of organic matter and the gross soil fertility (Marschner, 2012). Lehrsch *et al.* (2015) showed that the sugar and root yields resulting from the application of compost were equivalent to that

*** Corresponding author.**
E-mail address: dr.hazemsarhan2004@gmail.com
DOI: 10.21608/jssae.2020.79170

resulting from urea application. Adugna (2016) reported that usage of the compost to the soil improves the chemical, physical, and biological characteristics of soils. It improves water retention and soil structure by increasing the stability of soil aggregates. Maharjan and Hergert (2019) showed that there is no adverse effect of composted manure in beet production and it underscores the potential of depending solely on composted manure to meet nitrogen requirements in beet production.

Poultry manure is favored amid other animal wastes for the reason that its high content of macro-elements. The application of poultry manure as (an organic fertilizer) is important in humanizing productivity of soil and production of crops. In this consider, Abou El-Seoud *et al.* (2009) established that increasing poultry manure rates from zero to 10 and 20 t/fed tended to significantly increase the means of growth attributes and sugar beet quality parameters in both seasons. Dikinya and Mufwanzala (2010) revealed that the use of chicken manure enhanced significantly productivity of soil and increase N and P percentages. Hasanen *et al.* (2013) showed that fresh weights of shoot and root, length of root, yields of root and sugar for sugar beet were amplified by the application of poultry manure (PM) than farmyard manure (FYM), but the estimating effect was higher for PM than FYM. The technological characters of sugar beet e.g. sugar percentage, purity, K, Na and ἀ -amino-N were increased with the application of PM or FYM. Curvelo *et al.* (2018) reported that the organic (chicken manure) surpassed conventional (mineral fertilizer) treatment for horizontal and vertical diameters of the roots (cm) and root fresh weight/plant (g). Jagadeesh *et al.* (2018) found that root length was maximum with FYM (50%) + poultry manure (50%), whereas root diameter was maximum with poultry manure (100%). The utmost root yield was recorded with poultry manure (100%), which was at par with vermin-compost (100%).

This experiment was done in order to investigate the reaction of sugar beet cv. Plino to sources and rates for different organic fertilization in order to attain the greatest productivity and quality of sugar beet over the environmental circumstances of newly reclaimed sandy soils in Kalabsho district, Dakahlia Governorate, Egypt.

MATERIALS AND METHODS

At Kalabsho Experimental Farm (latitude of 31.14^0 N and longitude of 31.22^0 E and 15 m above sea level), Dakahlia Governorate, Sugar Crops Research Institute, Agricultural Research Center, two experiments were done in the field throughout seasons of 2016/2017 and 2017/2018 to decide the effect of sources of organic fertilizers (farmyard manure "FYM", compost "CO" and poultry manure "PM") and its rates (0, 3, 5 and 7 t fed^{-1}) on yields and its components and quality of sugar beet cv. Plino under newly reclaimed sandy soil conditions.

A strip-plot design with 3 replications was used in these experiments. The vertical-plots were occupied with three sources of organic fertilization e.g. farmyard manure, compost and poultry manure. Farmyard manure (FYM) and poultry manure (PM) were use in each experiment area before soil preparation. Compost (CO) was added after plowing and leveling and before ridging. Chemical analysis of FYM, PM and Co used in both seasons is accessible in Table 1.

Table 1. Chemical analysis of FYM, PM and CO used in both seasons.

Organic fertilizer		Farmyard manure		Poultry manure		Compost	
Properties		**2016/2017**	**2017/2018**	**2016/2017**	**2017/2018**	**2016/2017**	**2017/2018**
N (%)	Total	0.91	0.95	2.25	2.31	1.15	1.11
	Available	0.37	0.39	0.88	0.85	0.43	0.41
P (%)	Total	0.58	0.57	0.91	0.95	0.72	0.75
	Available	0.25	0.27	0.43	0.47	0.31	0.38
K (%)	Total	0.67	0.69	1.23	1.27	0.88	0.79
	Available	0.31	0.35	0.79	0.83	0.41	0.43

The horizontal-plots were assigned to four rates (without, 3, 5 and 7 t fed^{-1}) of each organic fertilizer (farmyard manure, compost and poultry manure).

Samples of soil surface (0-30 cm depth) from experimental field area were taken randomly to estimate mechanical and chemical analysis (according to Jackson, 1973). Mechanical and chemical analyses results of the of the experimental field are presented in Table 2. Also, used irrigation water chemical properties are obtainable in Table 3.

Table 2. Mechanical and chemical soil properties at the experimental site throughout the two seasons.

Physical characteristics					
Properties Seasons	**Sand (%)**	**Silt (%)**	**Clay (%)**	**Soil texture**	**$CaCO_3$ (%)**
2016/2017	91.90	4.55	3.55	Sandy	0.77
2017/2018	91.80	4.75	3.45	Sandy	0.73

Chemical characteristics														
Properties	pH	EC	OM	Available nutrients (mg kg^{-1})			Soluble cations (meq l^{-1})				Soluble anions (meq l^{-1})			
Seasons	(1:2.5)	dSm^{-1}	(%)	N	P	K	Ca^{++}	Mg^{++}	Na^+	K^+	$CaCO_3$	HCO_3	Cl^-	SO_4^{--}
2016/2017	7.73	2.23	0.189	18.50	6.75	105.0	4.10	1.45	16.35	0.150	0.00	5.90	6.81	9.30
2017/2018	7.77	2.28	0.195	21.30	6.97	101.0	4.40	1.51	16.70	0.140	0.00	6.10	7.10	9.50

Table 3. Chemical properties of irrigation water in the site of study during the two seasons.

Chemical characteristics											
Properties	**pH**	**EC**	**B**	**Soluble cations (meq l^{-1})**				**Soluble anions (meq l^{-1})**			
Seasons	**(1:2.5)**	**dSm^{-1}**	**(mg kg^{-1})**	**Ca^{++}**	**Mg^{++}**	**Na^+**	**K^+**	**$CaCO_3$**	**HCO_3**	**Cl^-**	**$SO4^{--}$**
2016/2017	7.65	3.55	0.30	4.70	1.70	17.80	0.90	0.00	6.70	3.40	14.90
2017/2018	7.73	3.63	0.33	4.90	1.50	18.50	0.95	0.00	6.80	3.60	15.40

Every one experimental unit integrated 5 ridges, which was 60 cm apart and 7.0 m long (21.0 m^2). The investigational field well was organized and then divided into the investigational units. Calcium superphosphate (7% P) at a rate of 200 kg fed^{-1} was use throughout soil preparation. The cultivation took place on the 5th and the 2nd October in the 1st and 2nd seasons, respectively. Sugar beet seeds were hand cultivation (3-5 balls/hill) by dry sowing method in hills 20 cm apart on single side of the ridge. Nitrogen fertilizer in the form of urea (46.5 % N) was applied at the recommended rate in the newly reclaimed sandy soils (100 kg N fed^{-1}) in five equivalent doses previous to 2nd, 3rd, 4th, 5th and 6th irrigations, respectively. Potassium was additional in the type of potassium sulphate (48 % K_2O) at 48 kg K_2O fed^{-1} in two equivalent portions before the 2nd and 4th irrigations. Except the factors under study, additional cultural practices for growing sugar beet were done according to the recommendations of the Ministry of Agriculture.

At harvesting time, 5 plants were randomly chosen from the outer ridges of each plot to determine:

1- Weight of fresh roots (g $plant^{-1}$).
2- Weight of fresh foliages (g $plant^{-1}$).
3- Length of root (cm).
4- Diameter of root (cm).

At harvest, all the all the plants in two inner ridges from each plot were composed and cleaned. Then, roots and tops were estranged, weighed and then converted to estimation the following traits:

1- Root yield (t fed^{-1}).
2- Top yield (t fed^{-1}).
3- Sugar yield (t fed^{-1}). It was calculated by multiplying root yield by sucrose percentage.

Yield quality parameters were determined in Dakahlia Sugar Company Laboratories at Bilkas District, Sugar Factory ,Dakahlia Governorate as follows:

1- Sucrose (%). According to Carruthers and OldField (1960) method sucrose percentage was Polarimetrically determined on lead acetate extract of fresh macerated roots.
2- Sodium (Na) (%) in dry roots.
3- Quality (%)
4- Nitrogen (N), phosphorus (P) and potassium (K) percentages in dry roots and foliages of sugar beet by wet digested.

Nitrogen (N %) was determined by means of Kjeldahl method as described by Jackson (1967). Phosphorus (P %) was colorimetrically determined (Jackson, 1967). Potassium (K %) using a flame photometer determined (Black, 1965).

As published by Gomez and Gomez (1984) and using means of "MSTAT-C" computer software package, all obtained data were statistically analyzed for strip-plot design. The differences among treatment means were compared by least significant difference (LSD) method (Snedcor and Cochran, 1980).

RESULTS AND DISCUSSION

A- Effect of sources of organic fertilization:

The data presented in Table 4 show that the effect of sources of organic fertilization (farmyard manure, compost and poultry manure) on yields and its components of sugar beet (weights of fresh root and foliage /plant , length and diameter of root , root and foliage fresh weights/plant, root length and diameter, root, top and sugar yields/fed) was significant in the two growing seasons. From obtained results, it could be observed that organic fertilizing sugar beet plots with poultry manure caused a gradual increase and recorded the utmost values of all the studied yields and its components as compared with other treatments in the two growing seasons under the environmental conditions of the studied region (newly reclaimed sandy soils conditions). Fertilizing sugar beet plots with compost ranked after fertilizing with poultry manure treatment, and followed by fertilizing with farmyard manure which produced the lowest values of yields and its components of sugar beet in the two growing seasons.

Table 4. Weights of fresh root and foliage g $plant^{-1}$, length and diameter of root cm, root, top and sugar yields per fed of sugar beet as affected by sources and rates of organic fertilization as well as their interaction during 2016/2017 and 2017/2018 seasons.

Characters Treatments Seasons	Weight of fresh root (g $plant^{-1}$)		Weight of fresh foliage (g $plant^{-1}$)		Length of root (cm)		Diameter of root (cm)		Root yield (t fed^{-1})		Top yield (t fed^{-1})		Sugar yield (t fed^{-1})	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
A- Sources of organic fertilization:														
Farmyard manure.	332.1	344.8	118.9	125.5	16.02	16.49	4.99	5.17	10.392	10.683	3.723	3.889	1.782	1.846
Compost.	375.4	381.3	123.8	127.3	17.04	17.30	5.48	5.81	11.838	12.225	3.896	4.087	2.044	2.114
Poultry manure.	476.9	499.3	171.3	180.0	17.76	18.80	5.95	6.28	15.297	15.718	5.495	5.654	2.640	2.726
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	8.9	9.6	5.3	6.9	0.40	0.38	0.15	0.13	0.333	0.355	0.173	0.185	0.059	0.064
B- Rates of organic fertilization:														
Without	189.2	191.3	59.5	62.2	13.84	14.03	4.14	4.38	6.001	6.186	1.886	2.013	1.009	1.034
3 t fed^{-1}	354.9	375.5	113.2	120.9	16.50	16.86	5.30	5.56	11.133	11.600	3.567	3.717	2.085	2.151
5 t fed^{-1}	456.0	472.1	159.0	167.1	18.45	18.80	5.93	6.23	14.533	14.883	5.067	5.267	2.552	2.641
7 t fed^{-1}	579.1	594.7	220.3	226.8	18.97	20.43	6.52	6.84	18.367	18.833	6.967	7.178	2.973	3.088
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	10.8	11.1	5.6	6.3	0.41	0.35	0.09	0.14	0.369	0.353	0.169	0.190	0.085	0.075
C- Interaction (F. test):														
A × B	*	*	*	*	*	*	*	*	*	*	*	*	*	*

From the obtained results in Table 5, showed that sources of organic fertilization (farmyard manure, compost and poultry manure) significantly affected the quality parameters of sugar beet (sodium percentages in root, nitrogen, phosphorus and potassium contents in roots and foliages), with exception of sucrose and quality percentages in roots in the two growing seasons. Fertilizing sugar beet plots with poultry manure exceeded significantly other studied treatments (farmyard manure or compost) and produced the utmost values of sucrose and quality percentages in root nitrogen (N),phosphorus (P) and potassium (K) contents in roots and foliage in the two growing seasons of this study. Fertilizing sugar beet plots with compost ranked secondly after previously mentioned and followed by organic fertilizing sugar beet plots with farmyard manure concerning its effect on quality parameters of sugar beet in both seasons. Sodium (Na) percentage in root had an adverse trend, where the utmost values resulted from organic fertilizing with farmyard manure and the lowest values obtained when organic fertilizing with poultry manure in both seasons.

The desirable effect of fertilizing sugar beet plots with organic fertilizers was reflected on yield and yield components and quality parameters. This is due to its effect on providing stable supply of both macro- and micronutrients. Also, it improved soil physical, chemical and bio properties (Belay *et al.*, 2001). The application of organic manures, increased slightly cation exchange capacity, reduced soil pH, increased available N, P and K in the soil after the application and reduced gradually by time of harvest (Negm *et al.*, 2003). In addition, farmyard manure is commonly recommended to offset the decrease in soil organic carbon (Ladha *et al.*, 2003). Besides, the application of compost to the soil improved chemical, physical and biological characteristics of soils, water retention and soil structure by increasing the stability of soil aggregates (Adugna, 2016), as well as, increasing the efficiency of mineral fertilizers utilization by crops and improving its performance (El-Sheikha, 2016). Furthermore, poultry manure is preferred amongst other animal wastes because of its high concentration of macro-nutrients so it improves soil productivity and crop production. Poultry manure was superior than farmyard manure and compost in its effect on yields and its components and quality parameters. This is due to the fact that PM provides adequate amounts of organic matter and higher concentration of macronutrients like N, P and K in both total and available froms (Table 1). This provides lead to balanced crop requirements and improved plant growth, dry matter accumulation as well as yield, yield components and quality of sugar beet. These results were confirmed by Dikinya and Mufwanzala (2010) who stated that the addition of chicken manure enhancing significantly soil productivity and increased soil nitrogen and phosphorus percentages. Also, Hasanen *et al.* (2013) showed that shoot and root fresh weights, root length, root and sugar yield as well as the technological characters of sugar beet (sugar percentage, purity, K, Na and alfa-amino-N) were increased by the application of PM than FYM. Curvelo *et al.* (2018) reported that the organic chicken manure surpassed mineral fertilizers in regard to roots diameters and root fresh weight/plant.

Table 5. Sucrose, sodium (Na) and quality percentages, nitrogen (N), phosphorus (P) and potassium (K) percentages in dry roots and foliage of sugar beet as affected by sources and rates of organic fertilization as well as their interaction during 2016/2017 and 2017/2018 seasons.

Characters	Sucrose (%)		Na (%) in dry roots		Quality (%)		N (%) in dry roots		P (%) in dry roots		K (%) in dry roots		N (%) in dry foliage		P (%) in dry foliage		K (%) in dry foliage	
Treatments Seasons	**2016/ 2017**	**2017/ 2018**	**2016/ 2017**	**2017/ 2018**	**2016/ 2017**	**2017/ 2018**	**2016/ 2017**	**2017/ 2018**	**2016/ 2017**	**2017/ 2018**	**2016/ 2017**	**2017/ 2018**	**2016/ 2017**	**2017/ 2018**	**2016/ 2017**	**2017/ 2018**	**2016/ 2017**	**2017/ 2018**
A- Sources of organic fertilization:																		
Farmyard manure.	17.28	17.32	0.130	0.131	84.51	84.62	0.600	0.596	0.342	0.343	0.602	0.602	2.677	2.704	0.446	0.420	3.393	3.138
Compost.	17.31	17.31	0.128	0.128	84.72	84.93	0.610	0.609	0.356	0.357	0.616	0.622	2.799	2.814	0.488	0.463	3.185	3.171
Poultry manure.	17.35	17.40	0.127	0.128	84.84	85.12	0.624	0.621	0.370	0.372	0.642	0.648	2.996	3.018	0.554	0.530	3.261	3.272
F. test	NS	NS	*	*	NS	NS	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	-	-	0.002	0.001	-	-	0.005	0.005	0.004	0.006	0.004	0.004	0.031	0.024	0.010	0.013	0.043	0.036
B- Rates of organic fertilization:																		
Without	16.82	16.72	0.132	0.134	84.30	84.77	0.537	0.534	0.314	0.313	0.536	0.540	2.233	2.231	0.375	0.359	2.428	2.428
3 t fed^{-1}	18.69	18.51	0.130	0.130	85.83	86.03	0.587	0.584	0.348	0.351	0.584	0.588	2.697	2.741	0.459	0.429	3.542	3.216
5 t fed^{-1}	17.54	17.74	0.127	0.127	85.38	85.42	0.634	0.632	0.370	0.371	0.644	0.650	3.016	3.020	0.534	0.516	3.489	3.448
7 t fed^{-1}	16.20	16.41	0.126	0.125	83.26	83.33	0.687	0.685	0.392	0.395	0.716	0.718	3.350	3.390	0.616	0.579	3.660	3.682
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.22	0.27	0.002	0.002	0.25	0.20	0.002	0.004	0.003	0.002	0.003	0.005	0.043	0.52	0.013	0.007	0.045	0.047
C- Interaction (F. test):																		
A × B	NS	NS	NS	NS	NS	NS	*	*	*	*	*	*	*	*	*	*	*	*

B- Effect of rates of organic fertilization rates:

Application rates of organic fertilization significantly affected yields and its components (weights of fresh root and foliage /plant, length and diameter of root , root, top and sugar yields fed^{-1}) as well as its quality parameters (sucrose, sodium and quality percentages, nitrogen, phosphorus and potassium contents in roots and foliages) of sugar beet in both seasons as shown in Tables 4 and 5. Yields and its components and nitrogen, phosphorus and potassium contents in roots and foliage were increased significantly as a result of increasing the rates of applying organic fertilizers (farmyard manure, compost and poultry manure) from zero to 3, 5 and 7 t fed^{-1} of each and the differences among them were obvious in both seasons. The application of the utmost rate of organic fertilizers (7 t fed^{-1}) produced the utmost values of yield and its components and nitrogen, phosphorus and potassium contents in roots and foliages in both seasons. While application the organic fertilizers at the rate of 5 t fed^{-1} came in the second rank after aforementioned rate, then application the organic fertilizers at the rate of 3 t fed^{-1}, and lastly control treatment (without application of organic fertilizers) which resulted in the lowest values of yields and its components and nitrogen, phosphorus and potassium contents in roots and foliage in both seasons. In regarded to sucrose, sodium (Na) and quality percentages in sugar beet root, it had a different direction. The utmost values of sucrose and quality percentages resulted from the application of the organic fertilizers at the rate of 3 t fed^{-1} and the lowest values were obtained from the control treatment. However, the utmost values of sodium percentage resulted from the control treatment and the lowest values were obtained from the application of the organic fertilizers at 5 t fed^{-1}. These results are in coincidence with those stated by Abou El-Seoud *et al.* (2009) who found that increasing the poultry manure rates from zero to 10 and 20 t fed^{-1}tended to increase significantly the means of growth attributes and sugar beet quality parameters.

C- Effect of interaction between sources and rates of organic fertilization:

The interaction between both fertilizers sources and rates of application had a significant effect weights fresh root and foliage/plant, length and diameter of root , root, top and sugar yields/fed, nitrogen (N), phosphorus (P) and potassium (K) contents in roots and foliages of sugar beet in both seasons as presented in Tables 4 and 5. The authors will reported enough the significant interaction between sources and rates of organic fertilization on root, top and sugar yields only.

As shown from the data presented in Table 6, the utmost values of root (23.300 and 23.900 t fed^{-1}), top (8.900 and 9.200t fed^{-1}) and sugar (3.749 and 2.726 t fed^{-1}) yields were produced from adding organic fertilizers to sugar beet plots with poultry manure at the rate of 7 t fed^{-1}in the first and second seasons, respectively. The second best interaction treatment between sources and rates of organic fertilization was achieving by organic fertilization of sugar beet plots with poultry manure at the rate of 5 t fed^{-1}, followed by organic fertilizing sugar beet plots with compost at the rate of 7 t $fed^{-1}$and then organic fertilizing sugar beet plots with farmyard manure at the rate of 7 t fed^{-1} in both seasons.

Table 6. Root, top and sugar yields per feddan of sugar beet as affected by the interaction between sources and rates of organic fertilization during 2016/2017 and 2017/2018 seasons.

Characters		Root yield (t fed^{-1})		Top yield (t fed^{-1})		Sugar yield (t fed^{-1})	
Treatments		2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Farmyard manure.	Without	5.967	6.183	1.893	2.023	1.021	1.846
	3 t fed^{-1}	8.900	9.300	2.900	3.100	1.643	2.114
	5 t fed^{-1}	11.800	12.050	4.200	4.400	2.044	2.726
	7 t fed^{-1}	14.900	15.200	5.900	6.033	2.419	1.846
Compost.	Without	6.050	6.200	1.883	2.050	1.007	2.114
	3 t fed^{-1}	10.700	11.200	3.100	3.300	1.994	2.726
	5 t fed^{-1}	13.700	14.100	4.500	4.700	2.421	1.846
	7 t fed^{-1}	16.900	17.400	6.100	6.300	2.752	2.114
Poultry manure.	Without	5.987	6.173	1.880	1.967	1.000	2.726
	3 t fed^{-1}	13.800	14.300	4.700	4.750	2.618	1.846
	5 t fed^{-1}	18.100	18.500	6.500	6.700	3.192	2.114
	7 t fed^{-1}	23.300	23.900	8.900	9.200	3.749	2.726
F. test		*	*	*	*	*	*
LSD at 5 %		0.626	0.786	0.204	0.204	0.227	0.236

CONCLUSION

Finally, the obtained results showed that the maximum values of sugar beet yield, yield components as well as its quality parameters were achieved by fertilizing sugar beet fields with PM at the rate of 7 t/fed under the environmental conditions of newly reclaimed sandy soils in Kalabsho district, Dakahlia Governorate, Egypt.

REFERENCES

Abd El-Lateef, E.; M. Abd El-Salam; Aziza, Farrag and Gehan, Amin (2019). Fertilizer inputs impact of different bio-solid sources on sugar beet yield in sandy soil. Intern. J. of Agric., Forest. and Life Sci., 3(1): 106-114.

Abou El-Seoud, I.I.A.; Elham, A. Badr and Elshimaa, A. El-Sayed (2009). Response of two sugar beet varieties to chicken manure and phosphorine application. Alexandria Sci. Exch. J., 30(4): 433-441.

Adugna, G. (2016). A review on impact of compost on soil properties, water use and crop productivity. Acad. Res. J. Agri. Sci. Res., 4(3): 93-104.

Belay, A.; A.S. Classens; F.C. Wehner and J.M. De Beer (2001). Influence of residual manure on selected nutrient elements and microbial composition of soil under long-term crop rotation. South African J. Plant Soil., 18: 1-6.

Black, C. A. (1965). “Methods of soil analysis”. Part 1. Physical and mineralogical. ASA Madison, Wise., USA.

Carruthers, A. and J.F.T. Oldfield (1960). Methods for the assessment of beet quality. Int. Sugar J., 63: 72-74.

Curvelo, C.R.S.; L.H.B. Diniz; A.I.A. Pereira and L.L. Ferreira (2018). Influence of fertilizer type on beet production and post-harvest quality characteristic. Agric. Sci., 9: 557-565.

Dikinya, O. and N. Mufwanzala (2010). Chicken manure-enhanced soil fertility and productivity: Effects of application rates. J. of Soil Sci. and Environ. Management, 1(3): 46-54.

El Sheikha, A.F. (2016). Mixing manure with chemical fertilizers, why? and what is after. Nut. and Food Tech., 2(1): 1-5. DOI.org/10.16966/2470-6086.112.

Gomez, K.A. and A.A. Gomez (1984). Statistical Procedures for Agricultural Research. 2nd Ed., Jhon Wiley and Sons Inc., New York, pp: 95-109.

Hasanen, G.H.P; I.H. Elsokkary; M.Z. Kamel and A.M. Abd Elsamea (2013). Influence of nitrogen and organic fertilization on growth, yield and quality of sugar beet grown in calcareous soil. J. Plant Production, Mansoura Univ., 4(5): 733-743.

Hassan, W.M. (2005). Effect of some organic fertilizers and sulphur application on yield quality and nutrient contents of sugar beet. J. Adv. Agric. Res., 10(4): 965-977.

Heidarian, F.; A. Rokhzadi and F. Mirahmadi (2018). Response of sugar beet to irrigation interval, harvesting time and integrated use of farmyard manure and nitrogen fertilizer. Environ. and Exp. Bio., 16: 169-175.

Jackson, M. L. (1973). Soil Chemical Analysis. Prentice Hall, Inc. Eaglewood Cliffs, pp: 219-221.

Jackson, M.L. (1967). Soil Chemical Analysis. Prentice Hall India Pvt. Ltd., New Delhi, p- 498.

Jagadeesh, C.; M. Madhavi; M. Siva-Prasad and V.V. Padmaja (2018). Effect of organic manures on growth and yield attributes of beetroot cv. Crimson Globe. Intern. J. Curr. Microbiol. App. Sci., 7(11): 3538-3553.

Ladha, J.K.; D. Dawe; H. Pathak; A.T. Padre; R.L. Yadav and B. Singh (2003). How extensive are yield declines in long-term rice-wheat experiments in Asia. Field Crops Res., 81: 159-180.

Lehrsch, G.A.; B. Brown; R.D. Lentz; J.L. Johnson-Maynard and A.B. Leytem (2015). Sugar beet yield and quality when substituting compost or manure for conventional nitrogen fertilizer. Agron. J., 107: 221-231.

Maharjan, B. and G.W. Hergert (2019). Composted cattle manure as a nitrogen source for sugar beet production. Agron. J., 111: 1-7. DOI:10.2134/ agronj2018.09.0567.

Marinkovic, B.; L. Starevi; J. Crnobarae; G. Jacimovic and M. Rajic (2004). By-products of sugar beet quality animal feed. Glasnik Zastite Bilja, 27(5): 114-118.

Marschner, H. (2012). Mineral nutrition of higher plants. 3rd Ed. Academic Press is imprinted of Elsevier.

Negm, M.A; M.M. Salib and H. El-Zaher (2003). A field trial on bio-composite sulphur application for improving the productivity for soil calcareous in natural Fayoum. J. Agric. Res. and Dev., 17(1): 77-89.

Prassad, P.V.V.; V. Satyanarayana; V.R. Murthy and K.J. Broote (2002). Maximizing yields in rice-groundnut cropping sequence through integrated nutrient management. Field Crop Res., 75: 9-21.

Saidia, P.S. and J.P Mrema (2017). Effects of farmyard manure and activated effective microorganisms on rain-fed upland rice in Mwanza, Tanzania. Org. Agron., 7: 83-93.

Snedecor, G. W. and W. G. Cochran (1980). "Statistical Methods". 7Th Ed. Iowa State University Press, Iowa, USA., PP. 507.

تأثير مصادر ومعدلات التسميد العضوى على إنتاجية وجودة بنجر السكر تحت ظروف الأراضى الرملية حديثة الإستصلاح

فاطمة عبد الرحمن محمد غالى[1] ، حازم محمود سرحان[2] ،أحمد صلاح عبد الحميد[1] وطه محمد عبد الحفيظ منصور[2]

[1] قسم الأراضى - كلية الزراعة – جامعة دمياط – مصر.

[2]معهد بحوث المحاصيل السكرية – مركز البحوث الزراعية – الجيزة - مصر.

تم إجراء تجربتين حقليتين في المزرعة البحثية بقلابشو – مركز بلقاس - محافظة الدقهلية والتابعة لمعهد بحوث المحاصيل السكرية - مركز البحوث الزراعية خلال موسمى 2017/2016 و 2018/2017 لدراسة تأثير مصادر ومعدلات التسميد العضوي المختلفة على المحصول ومكوناته وصفات الجودة فى جذور بنجر السكر صنف بلينو تحت ظروف الأراضى الرملية حديثة الإستصلاح. تم تنفيذ التجربتين في تصميم الشرائح المتعامدة فى ثلاث مكررات. تم تخصيص الشرائح الرأسية لثلاثة مصادر من التسميد العضوي، وهي السماد البلدى والكمبوست وسماد الدواجن. بينما تم تخصيص الشرائح الأفقية لثلاثة معدلات (3 ، 5 و 7 طن / فدان) من كل سماد عضوي (السماد البلدى والكمبوست وسماد الدواجن) ، إلى جانب معاملة المقارنة (بدون تسميد عضوي). أظهرت النتائج التي تم الحصول عليها أن تسميد نباتات بنجر السكر عضويا بسماد الدواجن أدت إلى زيادة تدريجية كما أنتجت أعلى القيم لجميع الصفات المدروسة للمحصول ومكوناته وصفات جودة عصير الجذور مقارنة بالتسميد العضوى بالسماد البلدى أو الكمبوست في كلا الموسمين. أدى تطبيق أعلى معدل للأسمدة العضوية (7 طن / فدان) إلى الحصول على أعلى القيم للمحصول ومكوناته ومحتوي النيتروجين والفوسفور والبوتاسيوم في الجذور والأوراق في كلا الموسمين. بينما نتجت أعلى نسبة مئوية للسكروز والجودة من استخدام الأسمدة العضوية بمعدل 3.0 طن / فدان وأعلى نسبة مئوية للصوديوم بالجذور من معاملة المقارنة في كلا الموسمين. من نتائج هذه الدراسة يمكن التوصية بالتسميد العضوى لحقول بنجر السكر بسماد الدواجن بمعدل 7 طن / فدان من أجل الحصول على أعلى إنتاجية وجودة لجذور بنجر السكر تحت الظروف البيئية للتربة الرملية المستصلحة حديثًا في منطقة قلابشو ، محافظة الدقهلية ، مصر.