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Effect of bio and mineral nitrogen fertilization on growth and quality of some sugar beet cultivars

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Abstract

Two field experiments were carried out at a private farm in Sharkia Governorate, Egypt, during 2017/2018 and 2018/2019 seasons to study the effect of bio and mineral nitrogen fertilization on yield and its components of some sugar beet cultivars. Each field experiment was carried out in split split-plot design with four replicates. The main-plots were occupied with cultivars (Hossam, Asus poly and Glorious). The sub-plots were allocated with biofertilization treatments *i.e.* treated Phosphorin, Cerealine and Potassiumag (450 g/fed of each) and control treatment. The sub sub-plots were devoted with nitrogen levels (70, 90 and 110 kg N/fed). The results showed that Hossam cultivar significantly surpassed other studied cultivars in root fresh weight/plant, root/top ratio, root length and diameter, root and sugar yields/fed at harvest. However, Asus poly cultivar registered the highest values of foliage fresh weight/plant and top yield/fed. Treated soil with Cerealine produced the highest values of all studied yield and its components. Fertilizing with 110 kg N/fed resulted in the highest values of yield and its components, followed by 90 kg/fed and lastly 70 kg N/fed. It can be concluded that fertilizing Hossam cultivar with 110 kg N/fed and treating soil with Cerealine at 450 g/fed to achieve highest productivity of sugar beet. While, to maintain high productivity of sugar beet at the same time reduce production costs and environmental pollution, it can be recommended that mineral fertilizing Hossam cultivar with 90 kg N/fed and treating soil with Cerealine under the environmental conditions similar to study region.

Keywords: Sugar beet, cultivars, varieties, biofertilization, nitrogen fertilizer levels, yield components, yields.

Introduction

Recently, sugar beet (*Beta valgaris* var. *saccharifera* L.) has an important position in Egyptian crop rotation as winter crop not only in the fertile soils, but also in poor, saline alkaline and calcareous soils. Thus, in Egypt, sugar beet has becomes an important crop for sugar production, hence the total cultivated area in 2018 season reached about 521427 faddan and the total production exceeded 11.223 million ton roots with an average of 21.523 t/fed (**FAO, 2020**). The total amount of sugar produced is not adequate enough to our consumption. So, increasing the cultivated area and sugar production per unit area is considered one of the important national targets to minimize the gap between sugar consumption and production. Developing high yielding cultivars and improving agricultural practices such as; bio and mineral nitrogen fertilization are essential to enhance sugar beet productivity.

Chosen the high yielding ability cultivars undoubtedly is very important to elevate sugar beet productivity per unit area. Significant varietal differences in yield components and yields of sugar beet were observed by many investigators. In this concern; **Aly *et al.* (2015)** found that sugar beet cultivars (Top, Sultan and Kawemira) significantly differed in root length, diameter and root fresh weight g/plant, root/top ratio and yields of root and sugar/fed. **Enan *et al.* (2016)** indicated that Polat cultivar showed the superiority over the other two tested cultivars and recorded the highest values of root diameter, shoot and root fresh weights/plant. **Ahmed *et al.* (2017)** showed that sugar beet cultivars differed significantly in root length, root, top and sugar yields/fed. **El-Emary (2017)** indicated that root and leaves fresh weight at harvest, root/top ratio, root length and diameter, showed cultivars highest values with Charlston, Lamiaa, Nefertitis, Salma and Beta 398 varieties. **Mohamed and Afifi (2017)** revealed that the cultivars of sugar beet (AThospoly, Maximus and Sirona) significantly differed in root length and diameter. **Mohamed and El-Sebai (2019)** stated that all studied cultivars (Sara, Dina and Oscar poly) significantly differed in root dimension, root and sugar yields/fed. **Mohamed *et al.* (2019)** indicated that all studied cultivars *i.e.* Raspoly, Kawemira and Montibianco significantly differed in productivity (root and sugar yields). The highest mean values of sugar beet yield were recording by Montbianco *cv*.

Biofertilizers can be generally defined as preparations containing live or latent cells of efficient strains of nitrogen fixation, phosphate solubility and silicate decomposers used for application to soil with the objective of acceleration certain microbial processes to augment the extent of the availability of nutrients in a form which can be easily assimilated by plants. Biofertilizers may affect plant growth by one or more mechanisms such as nitrogen fixation, enhancing nutrient uptake, production of organic acids, protection against plant pathogens and excretion growth regulators like IAA and GA_3, which stimulated growth and resulted in high yield. In this regard, **Abdelaal and Tawfik (2015)** showed that application the mixture of Microbeen + Rhizobacterin + Phosphorien produced the highest values of yield and yield components as compared with using each bio-fertilizer alone. **Sayed-Ahmed *et al.* (2016)** indicated that using only biofertilizer gave the lowest values of root length, root diameter, root and foliage fresh weights and sugar yield. While, using bio fertilizer with mixed Microbeen + Rhizobacterin led to increase in values of mentioned. **Marajan *et al.* (2017)** revealed that inoculation with *Azotobacter spp*. and Mycorrhizal fungi in two seasons had effect on sugar beet shoot fresh weight, root fresh weight and shoot to root ratio. **Mohamed and El-Sebai (2019)** stated that bacteria treatments inoculation *i.e.* Phosphate Solubilizing Bacteria and Fungi (control untreated, PSB, PSF and PSB+PSF) improved yield and yield components of sugar beet when compared with the untreated controls.

Nitrogen is an essential element for most field crops, including sugar beet for good growth and high yield with optimum quality. It is generally needed in most sugar beet soils, especially in places where nitrogen responsive modern sugar beet cultivars grown. Nitrogen is referred as the balance wheel of sugar beet nutrition, because of the fact that the efficiency of other nutrients is based on nitrogen, as well as sugar beet productivity. In this concern, **Mekdad *et al.* (2015), Hussein *et al.* (2016), Nemeata Alla (2016), Sayed-Ahmed *et al.* (2016), Abido and Ibrahim (2017), Leilah *et al.* (2017), Makhlouf and Abd El-All (2017), Mohamed *et al.* (2019) and Zarski *et al.* (2020)** concluded that increasing nitrogen mineral fertilizer levels up to 100 or 110 kg N/fed significantly increased root and foliage fresh weight/plant, root length, root diameter, top yield/fed, root yield/fed and sugar yield/fed.

Therefore, this investigation was established to determine the effect of bio and mineral nitrogen fertilization as well as their interactions on growth and quality of some sugar beet cultivars under the environmental conditions of Awlad-Saqr Center, Sharkia Governorate, Egypt.

Materials and Methods

Two series field experiments were carried out at a private farm in Al-Arab Manor, Bani-Hassan Village, Awlad-Saqr Center, Sharkia Governorate, Egypt, during seasons of 2017/2018 and 2018/2019 to study the response of growth and root quality of some sugar beet cultivars to bio and mineral fertilization.

Each field experiment was carried out in split split-plot design with four replicates. The main-plots were occupied with three imported sugar beet cultivars (Hossam, Asus poly and Glorious). The three studied cultivars are multigerm cultivars, and annually imported from Germany (Hossam and Glorious) and Holland (Asus poly) by Sugar Crop Research Institute, Agricultural Research Center, Giza, Egypt.

The sub-plots were allocated with biofertilization treatments *i.e.* treated soil with Phosphorin, Cerealine and Potassiumag at the rate of 450 g/fed of each them in addition without biofertilization (control treatment). Phosphorin, Cerealine and Potassiumag as commercial products were produced by Biofertilizer Unit, Agriculture Research Center (ARC), Giza, Egypt, which included free-living bacteria able to fix phosphorus, atmospheric nitrogen and potassium, respectively in the rhizosphere of soil. The biofertilizer treatments were done before first irrigation directly by mixing the recommended dose of each biofertilizer with fine clay as side-dress near each hills.

The sub sub-plots were devoted at random with mineral nitrogen fertilizer levels (70, 90 and 110 kg N/fed). Nitrogen in forms of ammonium nitrate (33.5 % N) was applied in two equal doses, the first was applied after thinning sugar beet plants (30 days after sowing) and the second was done before the third irrigation (60 day after sowing).

Each experimental basic unit (sub sub-plot) included five ridges, each 60 cm apart and 3.5 m length, resulted an area of 10.5 m^2 (1/400 fed). The preceding summer crop was rice (*Oryza sativa* L.) in the first and second seasons.

Soil samples were taken at random from the experimental field area at a depth of 0-30 cm from soil surface and prepared for both mechanical and chemical analyses, according to **Jackson (1973)**. The results of mechanical and chemical analyses are presented in Table 1.

Table 1: Physical and chemical soil properties of the experimental site during 2017/2018 and 2018/2019 seasons.

Soil analysis	**First season 2017/2018**	**Second season 2018/2019**
A: Mechanical analysis:		
Sand (%)	23.81	23.51
Silt (%)	29.74	29.95
Clay (%)	46.45	46.54
Texture	Clay	Clay
B: Chemical analysis		
Soil reaction pH	7.86	7.95
EC ds m^{-2}	1.40	1.35
Organic matter (%)	1.09	1.12
Available N (ppm)	46.63	47.8
Available P (ppm)	1.36	1.15
Exchangeable K (ppm)	160.12	151.26

Sugar beet seeds (balls) were hand sown on the first week of October at the rate of 3-5 balls/hill using dry sowing method on one side of the ridge in hills 20 cm apart in both seasons. The plots were irrigated immediately after sowing directly. Plants were thinned at the age of 30 days from planting to obtain one plant/hill (35000 plants/fed). Potassium sulphate (48 % K_2O) at the rate of 50 kg/fed was applied before the third irrigation. Other cultural practices for growing sugar beet were performed as recommendations of Ministry of Agriculture, except the factors understudy. Sugar beet plants harvesting at 210 days after planting in both seasons.

Studied characters:

A. Yield components:

At maturity (after approximately 210 days from planting) five plants were chosen at random from the outer ridges of each sub sub-plot to determine yield components and quality characters as follows:

1. Root fresh weight (g/plant).
2. Foliage fresh weight (g/plant).
3. Root/top ratio.
4. Root length (cm).
5. Root diameter (cm).

B. Yield characters:

At harvest, plants that produced from the two inner ridges of each sub sub-plot were collected and cleaned. Roots and tops were separated and weighted in kilograms, then converted to estimate:

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

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for split split-plot design as published by **Gomez and Gomez (1984)**. Least significant of difference (LSD) method was used to test the differences among treatment means at 5 % level of probability as described by **Snedecor and Cochran (1980)**. All statistical analyses were performed using analysis of variance technique (ANOVA) by means of "MSTAT-C"computer software package.

Results and Discussion

1. Cultivars performance:

As shown from the obtained data in Tables 2 and 3 in this study, there were significant differences among studied sugar beet cultivars (Hossam, Asus poly and Glorious) in root and foliage fresh weights/plant, root/top ratio, root length and diameter, root, top and sugar yields/fed at harvest during the two growing seasons. Hossam cultivar significantly surpassed other studied cultivars (Asus poly and Glorious) in root fresh weight/plant, root/top ratio, root length and diameter, root and sugar yields/fed at harvest, which recorded the highest values of these characters in the two growing seasons. However, Asus poly cultivar registered the highest values of foliage fresh weight/plant and top yield/fed at harvest in both seasons. Whereas, Glorious cultivar recorded the lowest values of root and foliage fresh weights/plant, root/top ratio, root length and diameter, root, top and sugar yields/fed at harvest in both seasons of this study. The former results might be related to genetic factors make up by the studied sugar beet cultivars. These results are parallel with those reported by **Aly *et al.* (2015)**, **Enan *et al.* (2016), Ahmed *et al.* (2017), El-Emary (2017), Mohamed and Afifi (2017), Mohamed and El-Sebai (2019) and Mohamed *et al.* (2019)**.

2. Effect of biofertilization treatments:

Regarding the effect of biofertilization treatments *i.e.* treated soil with Phosphorin (450 g/fed), Cerealine (450 g/fed) and Potassiumag (450 g/fed) in addition without biofertilization (control treatment) on root and foliage fresh weights/plant, root/top ratio, root length and diameter, root, top and sugar yields/fed at harvest, it was significant in the two seasons of study (Tables 2 and 3). All studied yield components and yield characters were markedly increased and achieved maximum values in treatment of treated soil with Cerealine before first irrigation directly as compared with other biofertilization treatments in the first and second seasons of this study. The arrangement of biofertilization treatments after Cerealine treatment was Potassiumag and Phosphorin treatment, then control treatment with respect their desirable effect on yield components and yield characters during the two seasons. This effect of biofertilization treatments may be ascribed to its role in improving plant growth, vigor of plant and yields through fixing atmospheric nitrogen and mineralization and/or mineralizing organic compounds as well as release of certain growth regulators, stimulatory compounds and nutrients in soil by the introduced organisms. Comparable results were also corresponding by **Abdelaal and Tawfik (2015)**, **Sayed-Ahmed *et al.* (2016), Marajan *et al.* (2017) and Mohamed and El-Sebai (2019)**.

3. Effect of nitrogen fertilizer levels:

With indication to the effect of nitrogen fertilizer levels on yield components (root and foliage fresh weights/plant, root/top ratio, root length and diameter at harvest) and yield characters (root, top and sugar yields/fed at harvest), it is apparent from obtained results that each increase in nitrogen fertilizer levels from 70 to 90 and 110 kg N/fed was accompanied with significant effect in all studied characters in both seasons (Tables 2 and 3). Fertilizing sugar beet with 110 kg N/fed surpassed the other two nitrogen levels and resulted in the highest values of root and foliage fresh weights/plant, root/top ratio, root length and diameter, root, top and sugar yields/fed at harvest, followed by fertilizing with 90 kg/fed and lastly 70 kg N/fed, which recorded the lowest means of these characters in the two growing seasons. The increase in yield components and yield characters by increasing nitrogen levels up to 110 kg N/fad may be attributed to its role in building up metabolites activating enzymes and carbohydrate accumulation which transferred from leaves to developing roots which in turn enhanced root length, root diameter and root fresh weight/plant and finally root yield/fad. The previous results are in good agreement with those obtained by **Abido and Ibrahim (2017), Leilah *et al.* (2017), Makhlouf and Abd El-All (2017), Mohamed *et al.* (2019) and Zarski *et al.* (2020)**.

Table 2: Averages of root and foliage fresh weights/plant, root/top ratio, root length and diameter of sugar beet at harvest as affected by cultivars, biofertilization treatments and nitrogen fertilizer levels as well as their interaction during 2017/2018 and 2018/2019 seasons.

Characters	**Root fresh weight (g/plant)**		**Foliage fresh weight (g/plant)**		**Root/top ratio**		**Root length (cm)**		**Root diameter (cm)**	
Treatments	**2017/2018**	**2018/2019**	**2017/2018**	**2018/2019**	**2017/2018**	**2018/2019**	**2017/2018**	**2018/2019**	**2017/2018**	**2018/2019**
A. Cultivars:										
Hossam.	1156.3	1215.9	417.0	398.6	2.99	3.25	26.86	25.94	9.38	9.01
Asus poly.	1088.6	1085.0	433.2	437.0	2.71	2.84	24.83	25.69	8.61	8.49
Glorious.	1087.7	993.0	399.5	393.9	2.64	2.36	24.72	23.67	8.26	8.31
LSD at 5 %	48.3	54.5	15.8	14.2	0.21	0.25	1.21	1.18	0.14	0.16
B. Biofertilization treatments:										
Phosphorin.	1166.0	1118.8	462.4	461.4	2.47	2.62	25.56	25.30	8.77	8.65
Cerealine.	1181.0	1219.8	475.1	467.9	3.62	3.60	26.46	26.42	9.04	9.14
Potassiumag.	1180.0	1219.0	473.2	467.9	2.57	2.64	25.86	26.05	8.86	8.66
Without.	916.4	834.2	255.5	242.1	2.46	2.41	23.98	22.63	8.34	7.97
BLSD at 5 %	67.8	79.1	23.4	22.6	0.39	0.40	1.17	1.15	0.28	0.29
C. Nitrogen fertilizer levels:										
70 kg N/fed.	803.1	865.9	344.4	336.4	2.53	2.75	22.12	22.74	7.34	7.30
90 kg N/fed.	1026.1	999.8	397.4	391.5	2.70	2.77	25.66	25.08	8.55	8.33
110 kg N/fed.	1503.3	1428.1	508.0	501.6	3.11	2.94	28.62	27.47	10.36	10.19
BLSD at 5 %	60.6	73.0	25.3	24.3	0.20	0.15	0.94	1.03	0.36	0.35
D. Interactions (F. test):										
A × B	*	*	NS	*	*	NS	NS	*	NS	NS
A × C	*	*	NS	NS	*	*	*	*	NS	NS
B × C	*	*	*	*	NS	NS	*	NS	*	*
A × B × C	*	*	NS	NS	*	*	NS	NS	NS	*

Table 3: Averages of root, top and sugar yields/fed of sugar beet at harvest as affected by cultivars, biofertilization treatments and nitrogen fertilizer levels as well as their interaction during 2017/2018 and 2018/2019 seasons.

Characters / Treatments	Root yield (t/fed)		Top yield (t/fed)		Sugar yield (t/fed)	
	2017/ 2018	2018/ 2019	2017/ 2018	2018/ 2019	2017/ 2018	2018/ 2019
A. Cultivars:						
Hossam.	26.834	28.043	11.221	11.372	5.877	6.186
Asus poly.	26.705	25.921	11.321	11.519	5.475	5.440
Glorious.	26.435	25.811	10.573	10.591	5.397	5.110
LSD at 5 %	0.350	0.383	0.506	0.537	0.336	0.356
B. Biofertilization treatments:						
Phosphorin.	28.184	28.094	12.339	12.273	5.818	5.740
Cerealine.	28.629	29.145	12.824	12.776	6.054	6.294
Potassiumag.	28.493	28.506	12.610	12.729	6.018	6.199
Without.	21.327	20.623	6.379	6.866	4.441	4.081
BLSD at 5 %	0.751	0.675	0.501	0.435	0.363	0.337
C. Nitrogen fertilizer levels:						
70 kg N/fed.	24.483	24.513	9.166	9.141	4.014	4.522
90 kg N/fed.	26.318	26.144	10.712	11.041	5.385	5.248
110 kg N/fed.	29.174	29.118	13.236	13.301	7.350	6.966
BLSD at 5 %	0.759	0.699	0.358	0.343	0.370	0.386
D. Interactions (F. test):						
A × B	*	*	*	*	*	*
A × C	*	*	*	*	*	*
B × C	*	*	*	*	*	*
A × B × C	*	*	*	*	*	*

4. Effect of interactions:

There are many significant interaction effects among studied factors (cultivars, biofertilization treatments and nitrogen fertilizer levels) on most of studied yield components and yield characters in both seasons as shown in Tables 2 and 3. We present only the significant interactions among the studied factors on root, top and sugar yields/fed in both seasons.

Root yield/fed of sugar beet at harvest during 2017/2018 and 2018/2019 seasons was significantly affected by the interaction among cultivars, biofertilization treatments and nitrogen fertilizer levels. From obtained results it could be observed that the highest values of root yield/fed of sugar beet at harvest (33.477 and 33.687 t/fed in 2017/2018 and 2018/2019 seasons, respectively) were obtained when mineral fertilizing Hossam cultivar plants with 110 kg N/fed and treating soil with Cerealine (Table 4). This treatment followed by fertilizing Hossam cultivar plants with 110 kg N/fed and treating soil with Potassiumag without significant differences between them and followed by fertilizing Hossam cultivar plants with 90 kg N/fed and treating soil with Cerealine in both seasons and. On the other hand, the lowest values of root yield/fed of sugar beet at harvest (16.250 and 18.103 t/fed in 2017/2018 and 2018/2019 seasons, respectively) were resulted from fertilizing Glorious cultivar plants with 70 kg N/fed without biofertilization treatment.

Table 4: Averages of root yield (t/fed) of sugar beet at harvest as affected by the interaction among cultivars, biofertilization treatments and nitrogen fertilizer levels during 2017/2018 and 2018/2019 seasons.

Cultivars	Biofertilization treatments	Nitrogen fertilizer levels					
		70 kg N/fed	90 kg N/fed	110 kg N/fed	70 kg N/fed	90 kg N/fed	110 kg N/fed
		2017/2018 season			2018/2019 season		
Hossam	Phosphorin	24.827	27.220	29.550	26.413	27.683	29.940
	Cerealine	25.990	31.267	33.477	27.573	33.193	33.687
	Potassiumag	25.990	28.283	33.390	27.363	29.293	33.473
	Without	22.737	23.580	24.747	19.673	22.890	25.333
Asus poly	Phosphorin	26.200	28.083	28.870	25.073	26.017	28.260
	Cerealine	27.423	30.433	30.790	26.907	30.673	31.100
	Potassiumag	27.227	28.423	30.477	26.037	28.243	30.750
	Without	18.297	20.200	24.317	18.713	19.403	21.600
Glorious	Phosphorin	25.353	27.573	27.953	25.213	27.907	28.773
	Cerealine	27.100	28.927	29.377	26.677	29.750	29.967
	Potassiumag	26.397	27.783	29.367	25.463	27.320	28.947
	Without	16.250	18.293	23.523	18.103	18.940	20.947
LSD at 5 %		2.521			2.420		

Top yield/fed of sugar beet at harvest was significantly affected by the interaction among cultivars, biofertilization treatments and nitrogen fertilizer levels in both growing seasons. From obtained results it could be observed that the highest values of top yield/fed (15.890 and 15.810 t/fed) were obtained when mineral fertilizing Asus poly cultivar plants with 110 kg N/fed and treating soil with Cerealine in the first and second seasons, respectively (Table 5). This treatment followed by fertilizing Hossam cultivar plants with 110 kg N/fed and treating soil with Cerealine without significant differences between them in both season. On the other hand, the lowest values of top yield/fed of sugar beet at harvest (5.230 and 5.047 t/fed) were resulted from fertilizing Glorious cultivar plants with 70 kg N/fed without biofertilization treatment in the first and second seasons, respectively. **Amin *et al.* (2013)** confirmed these results.

Table 5: Averages of top yield (t/fed) of sugar beet at harvest as affected by the interaction among cultivars, biofertilization treatments and nitrogen fertilizer levels during 2017/2018 and 2018/2019 seasons.

Cultivars	Biofertilization treatments	Nitrogen fertilizer levels					
		70 kg N/fed	90 kg N/fed	110 kg N/fed	70 kg N/fed	90 kg N/fed	110 kg N/fed
		2017/2018 season			2018/2019 season		
Hossam	Phosphorin	9.977	11.537	15.423	10.020	12.820	13.975
	Cerealine	10.837	13.130	15.660	10.817	13.742	15.400
	Potassiumag	10.087	12.273	15.583	10.787	12.970	15.227
	Without	5.660	5.830	8.507	5.690	7.198	8.947
Asus poly	Phosphorin	10.690	12.513	14.847	9.703	11.777	15.303
	Cerealine	11.087	13.477	15.890	11.720	13.153	15.810
	Potassiumag	10.970	12.793	15.483	11.160	12.933	15.343
	Without	5.257	5.730	7.887	5.527	6.897	8.397
Glorious	Phosphorin	10.083	11.753	13.383	9.557	11.567	14.150
	Cerealine	10.630	12.137	14.307	9.910	11.850	15.153
	Potassiumag	9.490	11.837	14.083	9.750	11.753	13.650
	Without	5.230	5.533	7.780	5.047	5.827	8.263
LSD at 5 %		1.201			1.187		

Sugar yield/fed of sugar beet at harvest was significantly affected by the interaction among cultivars, biofertilization treatments and nitrogen fertilizer levels in both growing seasons. From obtained results it could be observed that the highest values of sugar yield/fed (8.407 and 8.574 t/fed) were obtained when mineral fertilizing Hossam cultivar plants with 110 kg N/fed and treating soil with Cerealine in the first and second seasons, respectively (Table 6). This treatment followed by fertilizing Hossam cultivar plants with 110 kg N/fed and treating soil with Potassiumag without significant differences between them and then fertilizing Hossam cultivar plants with 90 kg N/fed and treating soil with Cerealine in both season. On the other hand, the lowest values of sugar yield/fed of sugar beet at harvest (3.023 and 3.134 t/fed) were resulted from fertilizing Glorious cultivar plants with 70 kg N/fed without biofertilization treatment in the first and second seasons, respectively. **Amin *et al.* (2013)** confirmed these results.

Table 6: Averages of sugar yield (t/fed) of sugar beet at harvest as affected by the interaction among cultivars, biofertilization treatments and nitrogen fertilizer levels during 2017/2018 and 2018/2019 seasons.

Cultivars	**Biofertilization treatments**	**Nitrogen fertilizer levels**					
		70 kg N/fed	90 kg N/fed	110 kg N/fed	70 kg N/fed	90 kg N/fed	110 kg N/fed
		2017/2018 season			**2018/2019 season**		
Hossam	Phosphorin	4.344	6.367	7.302	5.071	5.622	6.791
	Cerealine	4.783	7.979	8.407	7.691	8.260	8.574
	Potassiumag	4.513	6.697	8.113	5.444	5.861	8.353
	Without	4.004	4.493	7.158	3.626	3.983	5.510
Asus poly	Phosphorin	3.706	4.655	5.762	3.806	4.790	5.093
	Cerealine	4.517	7.658	7.932	4.704	5.936	8.038
	Potassiumag	3.972	5.310	7.709	4.463	5.567	7.622
	Without	3.006	4.170	5.173	3.596	3.921	4.748
Glorious	Phosphorin	3.528	5.016	5.540	4.105	4.998	5.915
	Cerealine	4.638	7.415	7.898	4.388	7.636	7.758
	Potassiumag	4.130	5.489	7.769	4.235	5.901	7.688
	Without	3.023	3.960	4.840	3.134	3.688	4.313
LSD at 5 %			1.282			1.310	

Conclusion

It can be concluded that mineral fertilizing Hossam cultivar plants with 110 kg N/fed and treating soil with Cerealine at the rate of 450 g/fed before first irrigation directly to achieve highest productivity of sugar beet. While, in order to maintain high productivity of sugar beet at the same time reduce production costs and environmental pollution, it can be recommended that mineral fertilizing Hossam cultivar plants with 90 kg N/fed and treating soil with Cerealine under the environmental conditions of Bani-Hassan Village, Awlad-Saqr Center, Sharkia Governorate, Egypt.

References

Abdelaal, Kh.A.A. and Sahar, F. Tawfik (2015). Response of sugar beet plant (*Beta vulgaris* L.) to mineral nitrogen fertilization and bio-fertilizers. Intern. J. Curr. Microbiol. App. Sci., 4 (9): 677-688.

Abido, W.A.E. and Ibrahim, M.E.M. (2017). Role of foliar spraying with biostimulants substances in decreasing mineral nitrogen fertilizer of sugar beet . J. Plant Production Mansoura Univ., Vol. 8 (12): 1335 – 1343.

Ahmed, A.Z. ; A.O. Awadalla and Sakina, R. Abazid (2017). Possibility of sugar beet production in Toshka Region. I-Assessment of the optimum harvesting age. J. Plant Production, Mansoura Univ., 8 (12): 1409-1415.

Aly, E.F.A. ; S.A.A.M. Enan and A.I. Badr (2015). Response of sugar beet varieties to soil drench of compost tea and nitrogen fertilization in sandy soil. J. Agric. Res. Kafr El-Sheikh Univ., 41(4): 1322-1338.

El-Emary, F.A.A. (2017). Botanical characteristics of some sugar beet varieties (*Beta vulgaris* L): comparative study. J. Plant Production, Mansoura Univ., 8(3): 397-403.

Enan, S.A.A.M. ; E.F.A. Aly and A.I. Badr (2016). Effect of humic acid and potassium on yield and quality of some sugar beet varieties in sandy soil. J. Plant Production, Mansoura Univ., 7(2): 289-297.

FAO (2020). Food and Agriculture Organization. Faostat, FAO Statistics Division, March, 2020. http://www.fao.org/faostat/en/#data /QC.

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.

Hussein, M.M. ; M.H. ; Hanan S. Siam ; Safaa A. Mahmoud and A.S. Taalab (2016). Mineral status, growth and yield response of sugar beet (*Beta vulagaris* L.) to nitrogen fertilizer sources and water regime. Adv. in Environ. Bio., 9(27): 1-11.

Jackson, M. L. (1973). Soil Chemical Analysis. Prentica Hall Inc, Engleweed Cliffs, N.J.

Leilah, A.A. ; M.A. Abdel-Moneam ; G.A. Shalaby ; M.A.E. Abdou and Heba, M. AbdEl-Salam (2017). Effect of plant population and distribution and nitrogen levels on yield and quality of sugar beet. J. Plant Production, Mansoura Univ., 8(5): 591-597.

Makhlouf, B.S.I. and A.E.A. Abd El-All. (2017). Effect of deficit irrigation, nitrogen and potassium fertilization on sugar beet productivity in sandy soils. Menoufiya J. Plant Prod., 2 (6): 325-346.

Marajan, W.A. ; M.A. Hadad ; M.O. Gafer ; H.A. Sulfab and M.A. Ali (2017). Effect of mineral and bio-organic fertilizers on sugar beet growth under semi-arid zone. Intern. J. of Sci. and Res., (IJSR), 6 (9): 1020-1025.

Mekdad, A.A.A. (2015). Sugar beet productivity as affected by nitrogen fertilizer and foliar spraying with boron. Intern. J. Curr. Microbiol. App. Sci., 4(4): 181-196.

Mohamed, Hanan Y. and M.M.I. Afifi (2017). Response of some sugar beet varieties to foliar application of boron and fulvic acid. Egypt. J. Biotechnol. 55: 23-45.

Mohamed, Hanan, Y. ; M.M.A. El-Mansoub and A.M.K. Ali (2019). Effect of nitrogen and phosphorus fertilization levels on Cercospora leaf spot disease, yield and quality of some sugar beet varieties. J. Biol. Chem. Environ. Sci., 14(2): 167-194.

Mohamed, Hanan, Y. and T.N. El-Sebai (2019). Effect of bio-stimulant (phosphate solubilizing microorganisms) on yield and quality of some sugar beet varieties. Egypt. J. of App. Sci., 34(7): 114-129.

Nemeata Alla, H.E.A. (2016). Yield and quality of sugar beet as affected by sowing date, nitrogen level and foliar spraying with calcium. J. Agric. Res. Kafr El-Sheikh Univ., 42(1): 170-188.

Sayed-Ahmed, I.F. ; Ranya M. Abdel Aziz and Sahar H. Rashed (2016). Effect of bio and mineral fertilization on yield and quality of sugar beet in newly reclaimed lands in Egypt. Intern. J. Curr. Microbiol. App. Sci., 5 (10): 980-991.

Snedecor, G.W. and W.G. Cochran (1980). Statistical Methods. 7th Ed. The Iowa State Univ. Press, Iowa, USA.

Zarski, J. ; R. Kusmierek-Tomaszewska and S. Dudek (2020). Impact of irrigation and fertigation on the yield and quality of sugar beet (*Beta vulgaris* L.) in a moderate climate. Agron. 2020, 10, 166; doi:10.3390/agronomy10020166.

تأثر إنتاجية بعض أصناف بنجر السكر بالتسميد النيتروجيني والحيوي

أحمد أبو النجا قنديل، على السعيد محمد شريف وأحمد محمد عبد العظيم عبد الله
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أقيمت تجربتان حقليتان فى مزرعة خاصة بعزبة العرب - قرية بني حسن - مركز أولاد صقر - محافظة الشرقية خلال موسمى الزراعة 2017 / 2018 و 2018/ 2019 م لدراسة تأثر إنتاجية بعض أصناف بنجر السكر بالتسميد النيتروجيني والحيوي. نفذت التجارب فى تصميم القطع المنشقة مرتين فى أربع مكررات. حيث اشتملت القطع الرئيسة على ثلاثة أصناف لبنجر السكر (حسام، أسوس بولي و جلوريوس). كما احتوت القطع الشقية الأولى على أربعة معاملات للتسميد الحيوي وهى؛ معاملة التربة بالفوسفورين ، السيريالين و بالبوتاسيوماج (بمعدل 450 جم/فدان لكل منهم) بالإضافة لمعاملة المقارنة (بدون معاملة). بينما احتوت القطع الشقية الثانية على ثلاث مستويات من السماد النيتروجينى (70، 90 و110 كجم نيتروجين/فدان). أظهرت النتائج أن تفوق الصنف حسام معنوياً على الأصناف الأخرى المدروسة (أسوس بولي ، جلوريوس) في الوزن الغض للجذر ، نسبة الجذر / العرش ، طول الجذر وقطره ، محصول الجذور والسكر / فدان عند الحصاد، حيث سجل أعلى قيم من هذه الصفات في كلا موسمي النمو. ومع ذلك، سجل صنف أسوس بولي أعلى القيم للوزن الطازج للعرش / نبات ومحصول العرش / فدان عند الحصاد في كلا الموسمين. زادت صفات المحصول ومكوناته بشكل ملحوظ وتم الحصول على أعلى القيم من معاملة التربة بالسيريالين قبل الرية الأولى مباشرة مقارنة بمعاملات التسميد الحيوي الأخرى في الموسمين الأول والثاني من هذه الدراسة. تجاوز تسميد بنجر السكر بـ 110 كجم نتروجين / فدان مستويا النيتروجين الآخرين وأسفر عن أعلى قيم لصفات صفات المحصول ومكوناته ، يليه التسميد بـ 90 كجم نتروجين / فدان وأخيراً التسميد بـ 70 كجم نتروجين / فدان والذى سجل أدنى متوسطات لتلك الصفات في كلا موسمي الدراسة. من نتائج هذه الدراسة يمكن استنتاج أن التسميد المعدني لبنجر السكر صنف حسام بـ 110 كجم نيتروجين / فدان ومعاملة التربة بالسماد الحيوي سيريالين بمعدل 450 جم / فدان قبل الرية الأولى مباشرة حقق أعلى إنتاجية. بينما من أجل الحفاظ على إنتاجية عالية وفي نفس الوقت تقليل تكاليف الإنتاج والحد من التلوث البيئي، فيمكن التوصية بالتسميد المعدني لبنجر السكر صنف حسام بـ 90 كجم نيتروجين / فدان ومعاملة التربة بالسماد الحيوي سيريالين تحت الظروف البيئية لقرية بني حسن ، مركز أولاد صقر ، محافظة الشرقية ، مصر.

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