ChemTech

International Journal of ChemTech Research
CODEN(USA): IJCRGG ISSN: 0974-4290
Vol.9, No.03pp 60-65,2016

Relationships between soil characters and nutrients uptake of three sugar beet varieties grown in newly reclaimed soil

O.A. Nofal, H.I. El Eila and S.A.A. El Sayed

Plant Nutrition Dept., National Research Centre, Dokki, Cairo, Egypt.

Abstract: Three sugar beet varieties i.e., E. poly, Chems and R. poly which grown in calcareous soil at Fayoum Governorate, Egypt, were evaluated for their nutrients uptake relationship to soil characters during two successive seasons (2008/2009 and 2009/2010).
Results indicated that a remarkable and significant difference between root nutrients uptake and soil characters were found for the three sugar beet varieties in two growing seasons.
Root-P of R. poly variety was significantly affected by soil pH. In addition, positively affects were obtained between O.M and both of N-uptake of E. poly variety as well as B-uptake of Chems and R. poly varieties. Moreover, Chems and R. poly varieties could not take enough nutrient requirements i.e, P and K for high clay content. Also, data revealed that there were negatively affects between soil-N and root-K of E. poly variety. However, positively affects were gained with root-B for the same variety in two tested seasons.
It can be concluded that the disturbance in nutrition of the three sugar beet varieties was accompanied by physical and chemical soil characters and genetically factors.
Key words:Sugar beet – varieties - nutrients uptake - soil characters.

Introduction

Two sources of sugar in Egypt, Sugar cane is the first source by (about 70%) and sugar beet is the next by (about 30%). The total production of sugar is 1.582 million ton and consumption is 2.485 million tons•. The cultivated area is limited and for facing its gap, enhancing the cultivation area such as, newly reclaimed areas with using different varieties sugar beet to overcome the deficit of productivity.

There is a great need to assimilate the nutritional requirements for sugar beet varieties grown in calcareous soil at Fayoum Governorate, Egypt, to determine the balanced fertilizing program for each one.

It was observed by[1] that using leaf and soil analysis is an important method for monitoring plant nutritional requirements and nutrients shortage of newly reclaimed soils mostly cases related to their alkalinity, clay content and low organic matter. Previous studies indicated that the genetic specifity is found in a great number of plant species where the contents of different elements vary greatly between genotypes of the same plant species [2,3,4,5]

The present investigation was therefore, undertaken to evaluate the nutritional status of three sugar beet varieties under new reclaimed soil of Fayoum Governorate, Egypt.

- Sugar Crops Development of Program, Sugar Crops Research Institute, Giza, Egypt.

Materials and Methods

At Ebshway district, Fayoum Governorate, Egypt, two field experiments were carried out during two consecutive seasons i.e. 2008/2009 and 2009/2010. Three sugar beet varieties (E. poly; Chems and R. poly) were tested to evaluate the nutritional status under new reclaimed soil of Fayoum Governorate. The soil surface (0-30 cm depth) sample was taken before sowing. The physical and chemical analysis of soil sample was determined according to procedures suggested by[6] .The normal cultural practices for sugar beet were applied as recommended. The experimental design was a randomized complete blocks with three replications in both two seasons. The area of each plot was 12 m^2 sowing took place on middle of August 2008 and 2009 respectively. One variety was in hill 25 cm apart using 3-4 seeds per hill.

At crop harvest, roots representing were taken at random from each plot to analysis according to procedures of**[6].**

Results and Discussion

Values of physical and chemical properties of the experimental site are reported in Table (1). These results revealed that the soil is low in most nutrients and high in pH, $CaCO_3$ and clay content. Such results are indicated by **[7,8].** In addition, **[1]** suggested that the disorder in availability status of plant nutrients is a reflection of soil conditions especially pH, organic matter and clay content.

Table (1).Some physical and chemical characters of soil experimental site during 2008/2009 and 2009/2010 seasons.

Soil Characters			2008/2009	2009/2010
Physical characters :				
pH (1 : 2.5 H_2O)			8.50 H	8.47 H
E.C (dS/m)			1.20 L	1.15 L
O.M (%)			0.80 L	0.84 L
$CaCO_3$(%)			15.18 H	15.64 H
Clay (%)			48.25 H	47.50 H
Texture			Clay	Clay
Chemical characters :				
Available	N	mg 100 g $soil^{-1}$	7. 97 L	8.20 L
	P		1.19 M	1.22 M
	K		19.80 L	18.76 L
	B	mg kg $soil^{-1}$	31.0 H	29.0 H

[9]Soil and Plant Analysis. A & L Agric. Lab. Inc., New York. U.S.A.

In comparison between the three sugar beet varieties tested in their root nutrients uptake regardless of soil characters, results presented in Tables (2, 3) indicate significant differences among varieties in both seasons. It is pointed that root-P of R. poly variety was significantly affected by soil-pH in two growing seasons. In this connection, **[10,11]** mentioned that occurrence of ruling high pH, could possible decrease the availability of majority nutrients to plants. It can be noticed from Tables (2, 3) that soil-E.C was negatively affected on root-N in both seasons where only significantly in first season. As for, the effect of O.M on nutrients uptake, it can be seen from Table (1) that low organic matter in soil considerably reduced availability of most nutrients to plants **[11]**. However, results in Tables (2, 3) show that there were positive effect between O.M and both N of E. poly variety as well as B of Chems and R. poly varieties than the others. These results were significantly in the two seasons. These results are in line with those obtained by **[12,8,4]**Which they cleared that the varieties varied on the same soil, in their nutrient concentration and uptake of both two growth seasons. With respect to the effect of clay content on nutrients uptake of sugar beet varieties, data in Tables (2, 3) show that sugar beet root of Chems and R. poly varieties could not take enough nutrient requirements i.e., P and K. This may be attributed to high clay content of soil, leading the disturbance of plant physiological performance. Similar results were reported by **[13,14].**

Table (2).Correlation coefficient between soil characters and root nutrients uptake of different varieties of sugar beet in First Season (2008/2009).

Physical & Chemical Properties of Soil	Nutrient uptake by sugar beet varieties											
	E. poly				Chems				R. poly			
	N	P	K	B	N	P	K	B	N	P	K	B
Soil reaction (pH)	0.143 ns	0.836**	-0.990**	0.994**	0.327ns	-0.392ns	0.434ns	-0.454ns	0.433ns	-0.563	-0.928**	0.994**
Electric conductivity (E.C)	-0.556 ns	-0.991**	0.953**	-0.943**	-0.703*	-0.043ns	-0.780**	0.024ns	-0.780**	0.151ns	0.997**	0.007ns
Organic matter (O.M %)	0.655*	-0.132ns	0.545ns	-0.569ns	0.500ns	0.952**	0.397ns	0.971**	0.397ns	0.993**	0.327ns	0.967**
$CaCO_3$ (%)	0.434 ns	0.962**	-0.986**	0.981**	0.596ns	1.000**	0.684*	-0.165ns	0.684*	-0.289ns	-0.997**	-0.149ns
Clay (%)	0.655*	-0.132ns	0.545ns	-0.569ns	0.500ns	-0.371ns	0.397ns	0.971**	0.397ns	0.993**	0.327ns	0.967**
Soil nitrogen availability	0.327 ns	0.924**	-0.999**	0.997**	0.500ns	0.990**	0.596ns	-0.277ns	0.596ns	-0.397ns	-0.982**	-0.261ns
Soil phosphorus availability	0.655*	0.132ns	-0.545ns	0.569ns	-0.500ns	0.371ns	-0.397ns	-0.971**	-0.397ns	-0.993**	-0.327ns	-0.967**
Soil potassium availability	0.480 ns	-0.339ns	0.710*	-0.731*	0.305ns	-0.559ns	0.194ns	0.898**	0.194ns	0.947**	0.520ns	0.890**
Soil boron availability	0.963**	0.840**	-0.526ns	0.500ns	0.997**	0.681*	0.999**	0.632*	0.999**	0.528ns	-0.715*	0.645*

NS : Non Significant, ***, **** Significant at 0.05 and 0.01 probability levels, respectively, r 0.05 = 0.602 r 0.01 = 0.735

Table (3).Correlation coefficient between soil characters and root nutrients uptake of different varieties of sugar beet in Second Season (2009/2010).

Physical & Chemical Properties of Soil	Nutrient Uptake by sugar beet varieties											
	E. poly				Chems				R. poly			
	N	P	K	B	N	P	K	B	N	P	K	B
Soil reaction (pH)	0.655*	0.377ns	0.576ns	-0.982**	-0.954**	0.945**	-0.999**	-0.471ns	-0.459ns	-0.715*	-0.999**	0.590ns
Electric conductivity (EC)	-1.000**	0.500ns	0.240ns	0.500ns	0.397ns	-0.371ns	0.628*	-0.359ns	-0.371ns	0.996**	0.624*	-0.996**
Organic matter (%)	0.756**	-0.945**	-0.817**	0.189ns	0.300ns	-0.327ns	0.034ns	0.882**	0.888**	-0.700*	0.039ns	0.807**
$CaCO_3$ (%)	0.974**	-0.682*	-0.452ns	-0.292ns	-0.181ns	-0.997**	-0.437ns	0.560ns	0.571ns	-0.953**	-0.433ns	0.990**
Clay (%)	1.000**	-0.478ns	-0.216ns	-0.522ns	-0.420ns	-0.944**	-0.648*	0.336ns	0.348ns	-0.998**	-0.644*	0.994**
Soil nitrogen availability	-0.500ns	-0.500ns	-0.721*	1.000**	0.993**	0.212ns	0.988**	0.629*	0.619*	0.569ns	0.989**	-0.427ns
Soil phosphorus availability	0.961**	-0.721*	-0.500ns	-0.240ns	-0.127ns	-1.000**	-0.388ns	0.604*	0.614*	-0.935**	-0.383ns	0.980**
Soil potassium availability	0.554ns	-0.998**	-0.941**	0.444ns	0.543ns	-0.782**	0.299ns	0.976**	0.979**	-0.484ns	0.304ns	0.621*
Soil boron availability	1.000**	-0.500ns	-0.240ns	-0.500ns	-0.397ns	-0.952**	-0.629*	0.359	0.371ns	-0.997**	-0.624*	0.997**

NS : Non Significant, ***,**** Significant at 0.05 and 0.01 probability levels, respectively, r 0.05 = 0.602 r 0.01 = 0.735

Concerning the effects of soil-nutrients in Tables (2, 3) data reveal that there were negatively affects between soil-N and root-K of E. poly, however, positively affects were found with root-B for the same variety in two tested seasons.

Statistical analysis in Tables (2, 3) indicated that root-P of R. poly variety was affected significantly by soil-P in the two seasons, while these influences were in contrast with root-N of E. poly and B of Chems varieties in first season than the another. It is worthy to show from data in Tables (2, 3) that the positively affects between soil-K and root-B of two varieties i.e., Chems and R. poly were statistically.Confirmed that the two seasons and the reverse were true between soil-B and root-K of R. poly variety. The resulting positive or negative correlation of soil characters and its nutrient uptake with almost all root nutrients (Tables 2, 3) may be lead to disturbance in nutrition of plant varieties.

Moreover, [15] reported that the same species and varieties adapted better to unfavorable soil condition than others as well as there are wide differences among varieties in their requirements. [16,4] indicated the same finding. While, [17]mentioned that those differences mainly due to genetically factors.

It can be concluded that sugar beet varieties varied on the same soil in root nutrients uptake and those differences mainly due to genetically factors.

References

1. Nofal, O.A. and R. Kh. M. Khalifa (2002). Nutritional diagnosis of Anna Apple Trees in some Egyptian Soils. Pakistan Journal of Biological Sciences, 5 : 398-400.
2. Brown, J.C. and W.E. Jones (1971). Fitting plant nutritionally to soil. I. Soybean. Crop Sci. 15, 399.
3. Kannan, S. and D.P. Pandey (1982). Absorption and transport of iron in some crop cultivars. J. of Plant Nutrition, 5 (4-7), 395.
4. El-Eila, H.I.; O.A. Nofal and S.A.A. El-Sayed (2014). Nutrient response of three sugar beet varieties grown under reclaimed soils to potassium and boron fertilization. International Journal of Academic Research, 6 : 269-273.
5. Bakry, A.B.; O.A. Nofal; M.S. Zeidan and M. Hozayn (2015). Potassium and zinc in relation to improve flax varieties yield and yield components as grown under sandy soil conditions. Agricultural Sciences, 6 : 152-158.
6. Chapman, H.D. and P.F. Pratt (1978). Methods of Analysis for Soils, Plants and Waters, 50. Univ. of California, Div. Agric. Sci., Pried Publication 4034.
7. Nofal, O.A.; M.F. El-Masri and F.E. Abdalla (1999). Effect of specific balanced fertilization on Anna Apple Yield. J. Agric. Sci. Mansoura Univ., 24 : 4981-4997.
8. Rezk, A.I.; O.A. Nofal and M.F. Masri (2005). A Comparative study on fruit quality parameters and yield of four olive cultivars grown in sandy soil. Arab Univ., J. Agric. Sci., Ain Shams Univ., Cairo, 13 : 891-899.
9. Ankerman, D. and L. Large (1974). Soil and Plant Analysis. A&L. Agric. Lab. Inc., New York. USA.
10. Sillanpaa, M. (1982). Micro nutrients and nutritional status of soils. A. global study. FAO Soil Bull., 48 : 289-300.
11. Wallace, A. (1983).Correction of single and multiple trace element deficiencies in Egypt with foliar sprays. Proc. Conf. on New Trends in Plant Nutrition and Their Impact on Yield Increase. Cairo, Feb. 14-1983.
12. Mobarak, Z.M.; A.A. El-Bendary and F.E. Abdalla (1992). Varietal differences in micronutrient uptake by soybean grown in different soils. African Journal for Agricultural Sciences, 19 : 95-106.
13. Talha, M.; S.Y. Metwally and E. Abu-Gabal (1978). Effect of soil compaction on germination and growth of cotton and wheat in alluvial and calcareous soils. Egypt. J. Soil Sci., 18, 29.
14. Torbert, H.A. and C.W. Wood (1992). Effect of soil compaction and water filled pore space on soil microbial activity and N losses. Commun. Soil Sci. Pl. Anal., 23 (11 + 12), 1321.
15. Zaharieva, T. (1982). Effect of genotype and iron applied to soil on the chemical composition and yield of some plants. In Genetic Speciality of Mineral Nutrition of Plant. Saric, M.A. (ed.), Vol. XIII, No. 3P. 141, Serbia, Academy of Science and Art., Belgrade.

16. Nofal, O.A.; H.I. El-Eila and S.A.A. El-Sayed (2014). Change in growth characters of some sugar beet varieties as affected by potassium and boron fertilization grown in calcareous soil. Egypt. J. of Appl. Sci., 29 : 915-926.
17. Ahmed, F.; A.E.M. Mansour and A.M. Ahmed (1998). A comparative study on fruiting of nine mange cultivars grown under new reclaimed sandy soils. Egypt. J. Hort. 25 : 187-193.

*****