J. Agric. Sci. Mansoura Univ., 27(11): 7237 - 7246, 2002

RESPONSE OF SUGAR BEET TO LEVELS AND TIMES OF POTASSIUM FERTILIZATION UNDER SALINITY CONDITIONS AT NORTHERN DELTA OF EGYPT.

Kandil, A.A. ; M.H. EL-Hindi ; A.M. Said and Y.I. Gomaa
Agronomy Dept., Faculty of Agric., Mansoura University.

ABSTRACT

Two field experiments were performed in a saline clay soil at EL-Hamoul Center, Kafr EL-Sheikh Governorate during two successive seasons of 1998/99 and 1999/2000 to study the effect of potassium fertilization levels and its application times on growth, yield and yield components as well as quality of sugar beet (*Beta vulgaris*, L.) cv Pelleno.The experiments were laid-out in a split plot design with four replicates. Each experiment included sixty treatments comprising four K- fertilization levels (12, 24, 36 and 48 kg K_2O/fad) and four K-application times i.e.1/2, 2/3, 1/3 of every K-level before the first irrigation and the remaining splits were applied before the second irrigation, while, in the fourth treatment, potassium was splitted into three equal portions applied before the first, second and third irrigations, respectively. Potassium

Obtained results can be summarized as follows :

Combined analysis of data collected after 120 and 150 days from planting in the two seasons revealed that K-levels affected both fresh and dry weights of sugar beet roots, foliage fresh weight, both root length and root diameter (cm), foliage length(cm), leaf area index (LAI), crop growth rate (CGR) in g/day. Relevant results showed, also, that K levels affected other growth variables under study such as relevant growth rate (RGR) and net assimiltion rate (NAR),however, the differences failed to reach the level of significance at 5%.

As far as times of K- application was concerned, combined analysis of data for the two seasons revealed that most of growth characters were not significantly affected by this factor .However, potassium fertilizer levels splitted into two equal portions or into two thirds and one third applied before the first and second irrigations, respectively, seemed to be ,in general, more favourable under conditions of the current study.

Likwise, the interactions between potassium fertilization levels and potassium application times did not induce clear effects on the averages of most characters except leaf area index (LAI) since the highest means were recorded due to K-level of 36 or 48 kg K_2O/fad applied as 2/3+ 1/3 or 1/2+1/2 before the first and second irrigations, respectively.

With regard to both root and top yields(t/fad) as well as sugar yield (t/fad), it was noted that incremental doses of K-application favoured these variables upto 36 kg K_2O/fad .Increasing K_2O level upto 48 kg K_2O /fad did not exhibit signficant increases as far as that these characters were concerned since higher concentrations of Na^+ could replace K^+, in part, for uptake by sugar beet plants under such soil circumstances of the present study.

It is worthy to note, also, that neither levels of K-fertilization nor times of it, application affected significantly total soluble solids (TSS), sucrose % and apparent purity % in any of the two seasons and combined analysis ,as well.

INTRODUCTION

The Egyptian national plan proposes to expand sugar beet area to cover the increasing demand on sugar since sugar beet crop is highly

adapted to grow ever in poor soil, in addition to its limited water requirements compared to sugar cane. Therefore, the crop becomes the second important crop for sugar production in Egypt. Moreover, the importance of this plant to agriculture is not only confined to sugar production but also, to its by–products which are used for alcohol production and livestock feeding. It, also has a wide adaptability to grow in poor, saline, alkaline and calcareous soils. Besides, sugar beet makes the soil in good condition for the benefit of the following cereal crops. In Egypt, sugar beet covered about 135,623 fad in 2000 season, meanwhile, the notional plan proposed to expand this area to 200,000 fad which ,consequently , require sugar beet factories to be increased .Kafr El-sheikh Governorate was slected for the current field trial since sugar beet cultivated area in this Governorate covered 63.01%of the Northern Egypt and 54.85%of the whole country contributing with 47.70% of the total productivity .Additionally, the greatest new cultivated expanding area was found at Kafr El-sheikh Governorate ,it reached 14.18% of total cultivated area in the Northern Egypt and 13.44% of the total cultivated area in the whole country ,which ranks this Governorate as the first sugar beet production region in Egypt (Agricutural Statistics 2000).

Potassium is an essential element for plant growth not only in regard to its concentration in the plant tissues but also with respect to its physiological and biochemical function. Potassium is necessary for activation the starch synthetase enzyme (Nitoses and Evans,1969).In adequate K- supply results in accumulation of low molecular weight sugar and amino acids (Nowakowski,1971). The highest up take rate of K often being in the vegetative stage (Mengel and Kirkby,1982). They, also , added that N is only fully utilized for crop production when K supply is adequate and that replacement of K^+ by Na^+ is possible in sugar beet . Many other investigetors discussed the effect of K^+ levels on sugar beet plant. Hassanein (1979) reported that higher level of potassium application resulted in higher yields of both roots and sugar per fad. Similar results were, also, reported by others including Loue (1985), Ahmed (1988), Beringer *et al.*(1988), EL-Mashhadi (1988), Sayed *et al.* (1988), Kandil (1993), EL-Attar *et al.* (1995), EL-Essawy (1996), EL-Maghraby *et al.* (1998), and EL-Yamani (1999). On the contrary, many other workers did not record significant increases in nor root nor sugar yields due to incremental doses of potassium such as EL-Geddawy (1979), Bucher *et al.* (1982), Basha (1984), Assey *et al.* (1985), Genaidy (1988) and Hegazy *et al.* (1990).

From K-addition time point of view, few studies were conducted in this respect. However, James *et al.* (1968) in U.S.A. found that K-application after thinning increased both root and sucrose yields. Khalifa *et al.* (1995) in Egypt, found that K-application at the rate of 48 kg K_2O/fad in two equal doses after thinning and before 3rd irrigation resulted in highest averages of both root and sugar yields per unit area.

Therefore, the aim of this work was established to study the response of sugar beet plant to levels and times of K-fertilization under salinity conditions of Northern Delta of Egypt.

MATERIALS AND METHODS

Two field experiments were carried out in EL-Hamoul Center, Kafr EL-Sheik Governorate, in two successive winter seasons of 1998/99 and 1999/2000 to study the response of sugar beet plants (*Beta vugaris*, L.) cv. Pelleno to levels and times of potassium fertilization under salinity conditions of newly reclaimed soil at Northern Delta of Egypt. The experiments were laid-out in a split plot design with four replications. Each experiment included sixty treatments comprising four K fertilization levels (12, 24, 36 and 48 kg K_2O/fad) and four K-application times i.e. 1/2, 2/3 and 1/3 of potassium dose applied before first irrigation, while the remaining parts were applied before second irrigation. In the fourth treatment every K-level was splitted into three equal portions applied before first, second, and third irrigations, respectively. Potassium fertilization was applied in the form of potassium sulfate (48% K_2O). Each experimental unit included 5 ridges, each of 60 cm apart and 3.5 m length, comprising an area of 10.5 m^2 (1/400 fad). The preceding summer crop was cotten in both seasons. Soil samples were taken from 15 and 45 cm depth in the experimental sites before soil preparation to measure the important chemical and physical soil properties as shown in Table 1.

Table 1: Physical and chemical soil characteristics at the experimental sites during the two seasons of 1998/99 and 1999/2000.

Soil analysis		First season 1998/1999	Second season 1999/2000
A: Mechanical analysis			
Clay (%)		34.31	34.03
Silt (%)		48.00	48.34
Fine sand (%)		16.22	16.35
Coarse sand (%)		1.38	1.29
Texture class		Silty clay loam	Silty clay loam
B: Chemical analysis			
Available Cation (meq/100 g soil)	Ca^{++}	0.61	0.82
	Mg^{++}	0.76	0.79
	Na^{+}	6.95	6.84
	K^{+}	0.05	0.07
Available Anion (meq/100 g soil)	$CO3^{-}$	-	-
	$HCO3^{-}$	1.00	0.82
	CL^{-}	4.11	4.19
	$SO4^{-}$	3.26	3.29
EC (ds/m) at 25 °C		5.68	5.70
Ph		8.00	8.10

Other cultural practices were performed as usual for sugar beet growing. Sugar beet balls were hand sown on one side of the ridge in hills 20 cm apart at the rate of 3-5 balls/hill on November 5th and 8th in the first and second season, respectively.

Data recorded and experimental perotocol

Two samples were taken during the growth period, i.e. 120 and 150 days from sowing. Five guarded plants were chosen at random from each sub plot to determine the following characters:

I- Growth parameters: presented as root fresh weight. (g), root dry wt. (g), foliage fresh wt. (g), foliage dry wt. (g), root length (cm), root diameter (cm), foliage length (cm) and leaf area index (LAI), crop growth rate (CGR) in g/week, relative growth rate (RGR) in g/g/week, net assimilation rate (NAR) in g/m^2/day, crop index (CI), leaf area ratio (LAR)[cm^2/g] and leaf weight ratio (LWR) which were computed according to Watson (1958) who studied the dependence of net assimilation rate on leaf area index and Radfords (1967) who studied analysis formulae and their use in plant growth.

II-Yield components: at maturity (200 days from sowing), five plants were chosen at random from the central ridges of each sub plot to determine fresh wt. of both root and foliage (g/plant), root length (cm), root diameter (cm) and root/top ratio.

III-Yield quality: five roots were chosen at random from the central two ridges of each plot for estimating total soluble solids (TSS) using Hand Refractometer, Sucrose percentage (%) was determined polarimetrically on lead acetate extract of fresh macerated roots according to the method of Le-Docte (1927) and apparent purity percentage (%)was also estimated.

IV-Yield: at harvest, plants that produced from the two inner ridges of each sub-plot were collected and cleaned. Roots and tops were separately weighted in kilograms, then converted to estimate both root and top yields as tons /fad beside sugar yield (t/fad), which was calculated by multiplying root yield by root sucrose percentage. Moreover, harvest index (HI) was, also, calculated by dividing root yield/plant on biological yield/plant (root + foliage).

Statistical analysis:

All the data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split- plot design and LSD method was used to test the differences between treatment means as published by Gomez and Gomez (1984).

RESULTS AND DISCUSSIONS

A- Growth parameters :-

Effects of K- fertilization levels and times of its application on both root fresh and dry weights (g),both foliage fresh and dry weights (g) , both root length and diameter (cm) and leaf area index (LAL) after 120 days from sowing are demonstrated in Table (2). It is evident that these variables were favoured gradually with every incremental dose of K except foliage dry weight and root length which followed the same trend , however , the differences did not reach the levels of significance

On the other hand , most of growth variables tabulated in the same table were not affected significantly due to different times of k- application , however , root diameter as well as foliage length (cm) were favoured when k-level was splitted into 2/3 + 1/3 or 1/2+1/2 applied before the corresponding irrigations .

Table 2: Effect of k- fertilization levels and times of its application on some growth parameters of sugar beet after 120 days from sowing (Averages at combined analysis for the two seasons 1998/99 and 1999/200099 and 1999/2000 .

Characters / Treatments	Root fresh wt. (g)	Root dry wt . (g)	Folige fresh wt.(g)	Foliage dry wt (g)	Root length (cm)	Root diameter (cm)	Foliage length (cm)	L. A.I
A: potassium fertilization levels (kg K_2O/fad):								
12	201.3	43.1	160.4	39.7	26.3	6.8	30.4	3.0
24	243.0	48.5	180.1	40.6	26.7	7.3	32.2	3.3
36	278.7	52.4	248.3	41.8	26.8	7.5	35.9	3.3
48	309.5	59.2	307.9	43.0	27.5	8.0	38.3	3.4
F. test	*	*	**	N.S.	N.S.	**	**	**
LSD 5%	57.1	9.8	24.2	-	-	0.47	2.8	0.2
B: potassium addition time:								
2/3 + 1/3	265.4	57.7	248.6	42.9	27.7	7.7	34.4	3.4
1/2 + ½	271.1	52.9	265.0	43.1	27.2	7.8	34.9	3.6
1/3 + 2/3	270.2	47.8	199.6	39.4	26.7	7.1	33.2	3.0
1/3 + 1/3 1/3	225.5	44.6	183.3	39.8	25.7	7.1	33.3	3.0
F. test	N.S.	N.S.	N.S.	N.S.	N.S.	*	*	N.S.
LSD 5%	-	-	-	-	-	0.4	0.2	-

Combined analysis of data collected in the two seasons after 150 days from sowing on these growth variables followed approximately the same trend as that after 120 days from sowing (Table 3) .

Crop growth rate (CGR), relative growth rate (RGR) and net assimilation rate (NAR) as affected by k- fertilization levels and times of its application are presented in Table 4. It is evident that any of the treatments did not have a clear effect on these growth parameters except crop growth rate which was increased gradually with every increase in k- level fertilization

B. **Yield and yield quality of sugar beet :**

Combined and analysis of data collected in the two seasons of yield and quality of sugar beet plant presented in table (5) . Root yield was increased gradually due to incremental doses of K-level up to 36 kg K_20/fad. Highest does of 48 kg K20 / fad did not exhibit a significant increase in root yield / fad over that of 36 kg K20 / fad. The same trend was observed as top yield (t/fad) was concerned.

Table 3: Effect of k- fertilization levels and times of its application on some growth parameters of sugar beet after 150 days from sowing (Averages at combined analysis for the two seasons 1998 / 99 and 1999/2000

Character / Treatments	Root fresh wt .(g)	Root dry wt. (g)	Foliage fresh wt .(g)	Foliage dry wt.(g)	Root length (cm)	Root diameter (cm)	Foliage length (cm)	L.A.I
A: potassium fertilization levels (kg K_2O/fad):								
12	269.9	52.2	213.8	39.3	27.8	8.5	34.4	3.4
24	403.2	100.8	261.1	57.7	28.9	9.1	36.6	3.5
36	492.2	112.9	376.4	67.0	29.2	9.8	38.7	3.7
48	614.6	147.4	452.6	78.3	29.6	10.1	39.2	3.5
F. test	**	**	**	N.S.	N.S.	**	**	**
LSD 5%	114.9	36.0	8.8	-	-	0.5	0.2	0.2
B: potassium addition times:								
2/3 + 1/3	502.1	122.5	350.6	61.4	29.8	9.5	38.7	3.8
1/2 + ½	463.8	110.0	347.7	74.9	29.4	9.4	37.4	3.7
1/3 + 2/3	432.9	98.5	315.7	52.4	28.3	9.3	36.6	3.3
1/3 + 1/3 1/3	381.1	82.1	290.8	53.3	28.2	9.3	36.2	3.2
F. test	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**	NS
LSD 5%	-	-	-	-	-	-	0.2	-

Table 4: Effect of K-fertilization levels and times of its application on crop growth (CGR), relative growth rate (RGR) and net assimilation rate (NAR) – (Combined analysis for data of the two seasons).

Characters / Treatments	Crop growth rate (CGR)	Relative growth rate (RGR)	Net assimilation rate (NAR)
K-levels (kg/fad)			
12	1.18	0.152	4.55
24	1.24	0.157	4.60
36	1.46	0.163	4.64
48	1.68	0.160	5.06
F. test	*	NS	NS
L. S .D .at 5%	0.16		
k-application times			
2/3 +1/3	1.47	0.160	4.98
1/2 +1/2	1.49	0.156	4.86
1/3 +2/3	1.31	0.157	4.49
1/3+1/3 +1/3	1.32	0.160	4.52
F. test	NS	NS	NS
L.S.D at 5%			

Regarding times of potassium application , it was found that both root and top yields(t/fad) were favoured when K-dose was splitted into 2/3 + 1/3 or 1/2 + 1/2 applied before the first and second irrigations , respectively .

With respect to sugar yield (t / fad) , it was quite clear that K-level of 36 kg K20 / fad produced the highest sugar yield (3.78 tons / fad) while the

highest k- level of 48 kg K20 / fad produced sugar yield which averaged 3.66 tons / fad . Similarly , k – level splitted into 2/3 + 1/3 applied before the first and second irrigations , respectively , produced the highest sugar yield of 3.75 tons / fad .

Neither k- fertilization levels nor times of its application to sugar beet plant affected the harvest index (HI) . Accordingly , the interaction between there two factors did not significantly influence this trait , as well .

Combined analysis of data recorded on total soluble solids % (T. S. S .%) revealed that k-level of 48 kg K20 / fad produced the highest TSS% (22.13%) while the lowest TSS% (21.01 %) resulted due to lowest k-level of 12 k K20 / fad however , TSS % did not differ significantly due to different k – levels . Times of K – application , also , did not induce any evident difference as this trait was concerned .

Likewise , surcrose % as well as apparent purity % did not show an evident or clear trend due to application of different treatments as shown in table (5), however , the lowest apparent purity percentage of sugar resulted from the highest K- level of 48 kg K20 / fad

Table 5: Effect of k- fertilization levels and times of its application on yield (t/fad) and yield quality of sugar beet (averages of combined analysis of data collected in the two seasons 1998 / 99 and 1999/2000 .

Characters / Treatments	Root yield (t/fad)	Top yield (t/fad)	Sugar yield (t/fad)	Harvest Index (HI)	T.S.S. %	Sucros %	Apparent purity %
A: potassium fertilization levels (kg K_2O/fad):							
12	16.28	9.30	3.02	0.636	21.01	18.55	88.36
24	18.74	10.00	3.40	0.652	21.66	18.71	86.42
36	19.80	11.27	3.78	0.640	21.75	19.34	88.93
48	20.41	11.99	3.66	0.630	22.13	18.27	82.47
F. test	*	*	**	N.S.	N.S.	N.S	N.S
LSD 5%	2.08	1.75	0.09	-	-	-	-
B: potassium addition times:							
2/3 + 1/3	20.26	11.35	3.75	0.640	21.78	18.54	85.17
1/2 + 1/2	19.51	12.01	3.36	0.623	21.68	18.77	86.54
1/3 + 2/3	18.29	9.84	3.48	0.647	21.75	19.03	87.61
1/3 + 1/3 1/3	17.17	9.36	3.21	0.647	21.31	18.50	86.86
F. test	*	*	**	N.S	N.S	N.S	N.S
LSD 5%	2.03	1.48	0.09	-	-	-	-

C- *Interactions* :-

Combined analysis of data collected in the two seasons of study monitored that any of interactions between the different treatments did not induce an evident effect on any of growth on yield variables except leaf area index character (LAI) recorded after 120 days from sowing which seemed to be affected by the interaction between k-fertilization levels and times of its application (Table 6) . The highest value of this trait was resulted due to K – fertilization level of 48 kg k2 / fad splitted into 2/3 + 1/3 applied before the first and second irrigation , respectively .

Table 6 : Averages of combined analysis of leaf area index (LAI) as affected by the interaction between K-fertilization levels and times of its application 120 after sowing during 1998/99 and 1999/2000 seasons .

Times of k-application / Levels of k-application	2/3 +1/3	1/2 +1/2	1/3 +2/3	1/3+1/3+1/3
12	2.79	3.39	2.78	3.13
24	3.13	3.73	3.23	3.10
36	3.71	3.59	3.24	2.69
48	3.90	3.69	3.14	3.07
F.Test	*			
L.S.D.5%	0.51			

CONCLUSIONS

Finally , it could be concluded that K-fertilization level of 36 kg k2 /fad in the from of potassium sulfate (48% K2O) splitted into equal portions added just before the 1st + and 2nd irrigations or splitted into thirds applied before the 1s+ irrigation may be recommended for profitable yield components of sugar beet plant since the highest K – level of 48 kg k2o/fad did not exhibit an evident profit . On the contrary this highest K – level seemed to decrease apparent sugar purity % of sugar beet roots under saline soil condition where the present trial was conducted

REFERENCES

Ahmed, S. H. H. (1988). The fertilization with maximum rates of N, P and K for sugar beet (*Beta vulgaris*, L.) in calcareous soils of Egypt. Egypt. J. of Agron., 13(1-2): 87-100.

Assey, A. A. ; M.A. Mohamed ; I. F. Ramadan and H. A. Basha (1985). Effect of sowing methods, plant population, nitrogen and potassium fertilization on quality of sugar beet. Zagazig J. Agric. Res., 12(1): 215-235.

Basha, H. A. (1984). Effect of sowing methods, plant population and K fertilization on growth and yield of sugar beet. M. Sc. Thesis, Fac. of Agric., Zagazig Univ., Egypt.

Beringer, H. ; K. Koch and T. Engels (1988). Sugar and alkali concentration in the storage root of sugar beet in dependence on cultivars and K fertilization. J. Sugar Landen's Veriag , 787-801 (C. F. Field Crop Abst., 42 (11): 8992, 1989).

Bucher, R.; T. Diez and E. Bihler (1982). Results of two long term potassium fertilizer experiments in the loess region of Northern Bararia. Part 1: The influence of increasing rates of potassium on yield, quality and K uptake. Sonderheft, 38: 162-177 (C.F. CD ROM Computer System).

EL-Attar, H. A. ; Y. A. Darweesh ; M. K. El-Haris and F. A. Askar (1995). The effect of NPK fertilization on the yield components of sugar beet at Northern Nile Delta. J. Agric. Sci. Mansoura Univ., 20 (7): 3635-3643.

EL-Essawy, I.I. (1996). Effect of nitrogen, phosphorus and potassium fertilizers on yiled and quality of sugar beet .J.Agric .Rec.Tanta.UNIV.,22(2):270-278.

EL-Geddawy, 1. H. (1979). Effect of nitrogenous and potassium fertilization on morphology, chemical constituent and yield of sugar beet. M. Sc. Thesis, Fac. of Agric, Ain-Shams Univ.

EL-Maghraby,S.S;M.Mona; S.Shehata and Y.T, Tawfik (1998).Effect of soil and foliar application of nitrogen and potassium on sugar beet .Egypt .J.Agric.Res., 76 (2):665-679.

EL-Mashhadi, H.H.M. (1988). The effect of some macro and micro-elements on the nutrition of sugar beet. M. Sc. Thesis, Fac. Of Agric., Ain-Shams Univ., Egypt.

EL-Yamani, M. S. (1999). Influence of irrigation regimes and potassium fertilization levels on yield and quality of two sugar beet varieties. J. Agric. Sci. Mansoura Univ., 24 (3): 1515-1527.

Genaidy, S. A. (1988). Role of potassium, boron and zinc fertilization on yield and quality of sugar beet grown on Northern Delta soils. Alex. Sci. Exch., 9 (1): 25-34.

Gomez, K.N. and A.A. Gomez (1984): Statistical procedures for agricultural research. An International Rice Research Institute Book, John Wiley and Sons, New York, 2nd Ed., pp: 680

Hassanein, M. A. F. (1979). Response of sugar beet to NPK fertilizers under Egyptian conditions. M. Sc. Thesis, Fac. of Agric., Cairo Univ.

Hegazy, M. ; S. A. Gendiy and M. M. Sobh (1990). Effects of NPK fertilization and some micro-nutrients on wheat and sugar beet production in Northern Delta soils. Proc. 4th Conf. Agron., Cairo. 15-16 Sept., Vol. I: 167-178.

James, D.W ; D.C . Kidman;W.H.Weaver and R.L.Reeder (1968).Potassium fertilization of sugar beet in centeral Washington .J.Amer .Soc. sugar beet Techonol.,14 (8):682-694.

Kandil, A. A. (1993). Response of some sugar beet varieties to potassic fertilizers under salinity conditions. Towards the rational use of high salinity tolerant plants. Vol. 2. Agric. and Forestry under marginal soil water conditions. Proc. of the ASWAS Conf., 8-15 Dec. Al-Ain, United Arab Emirates, 199-207.

Khalifa, M. R. ; F. I. Header and A. Rabie (1995). Response of sugar beet to rates and methods of K- fertilizer application under different levels of soil salinity. J. Agric Res. Tanta Univ., 21(4): 803-8 14.

Le-Docte, A. (1927): Commercial determination of sugar beet root using the Sachr Le-Docta process. Ins. Sugar 3., 29: 488-492. (C.F. Sugar beet Nutrition, April, 1927 Applied Sciences Publishers LTD, London, A.P. Draycott).

Loue, A. (1985). Potassium and sugar beet. Potash Subj. 30th Suite, No. 7: 1-25 (C.F. CD ROM Computer System).

Mengel, K. and E.A .Kikby (1982). Principals of plant nutrition.Hand book , Edited by International potash Inst., 367-390.

Nitoses , R.E and H.G. Evans (1969).Effect of univalent cations the activity of particulate starach Synthase .Plant Physiol., 44: 1260-1266.

Nowakowski , T. Z.(1971). Effect of potassium and soduium on contents of soluble carbohydrat and nitrogenous compound in grass .Potassium in Biochemistry and physiology .8th College .Intern.Potash inst. Berne.

Radford's P.J. (1967): Growth analysis formulae, their use and abuse. Crop Sci., 7: 171-175.

Sayed, K. M. : E. M. El-Hadidi ; H . A Sonbol and M.Y.S El Arqun (1988). Growth,yield and quality of sugar beet as affected by nitrogen and potassium fertiliztion .J.Agric .Sci.Mansoura Univ, 13 (4):2213-2220

Watson, D.J. (1958): The dependence of net assimilation rate on leaf area index. Ann. Bot. Lond. N.S., 22:37-54.

استجابه بنجر السكر لمعدلات ومواعيد اضافه السماد البوتاسى تحت ظروف الاراضى الملحية بشمال الدلتا .

أحمد ابو النجا قنديل ، محمد حامد الهندى ، العربى مسعد سعد ، يوسف يوسف اسماعيل جمعه

قسم المحاصيل – كلية الزراعة – جامعه المنصورة .

اجريت هذه الدراسة فى تجربتين حقليتين بمركز الحامول – محافظة كفرالشيخ – خلال موسمى ٩٨ /١٩٩٩ ، ٩٩ /٢٠٠٠ م ونفذت كل تجربه فى تصميم القطع المنشقه مرة واحده فى اربع مكررات حيث اشتملت القطع الرئيسية على اربع معدلات للتسميد البوتاسى هى ١٢ ، ٢٤ ، ٣٦، ٤٨ وحده K_2O /فدان بينما احتوت القطع الشقيه على اربع نظم لاضافه السماد البوتاسى كما يلى :

١- اضافه ٣/٢ كميه السماد البوتاسى قبل الريه الاولى والثلث الباقى قبل الريه الثانية
٢- اضافه ½ كميه السماد البوتاسى قبل الريه الاولى والنصف الباقى قبل الريه الثانية
٣- اضافه ٣/٢ كميه السماد البوتاسى قبل الرية الاولى والثلث قبل الرية الثانية
٤- اضافه ٣/١ كميه السماد البوتاسى قبل الريه الاولى والثلث الثانى قبل الريه الثانية اما الثلث الاخير قبل الريه الثالثة .

وتمت دراسة كثير من صفات النمو والمحصول ومكوناته على النحو التالى :.

صفات النمو: (بعد ١٢٠ ، ١٥٠ يوم من الزراعة) حيث اشتملت على بعض الصفات مثل الوزن الغض والجاف لكل من الجذر والعرش ، طول وقطر الجذر ، دليل مساحه الاوراق ،المعدل النسبى للنمو ، صافى التمثيل الضوئى، وغيرها . كما اشتملت على بعض مكونات المحصول بالاضافه الى صفات الجوده مثل النسبه المئوية للمواد الصلبه والسكر والنقاوه وغيرها . اما تقديرات المحصول فقد اشتملت على محصول كل من الجذر والعرش/ فدان بالطن ومحصول السكر ودنيل الحصاد .

وتشير اهم النتائج الى ان التسميد بمعدل ٣٦ وحده K_2O / فدان يعتبر كافيا للحصول على نتائج مرضية لنبات بنجر السكر من حيث محصول كل من الجذر والسكر للفدان بالاضافه الى صفات جودة الناتج حيث ان التسميد بالمعدل الاعلى لليوتاسيوم (٤٨ وحده K_2O / ف) لم يكن له تاثير معنوى فى زيادة الانتاجيه من المحصول ومكوناته بل العكس فقد ادت اضافه الجرعه الاعلى من ذلك الى تدهور بعض الصفات مثل النقاوه وغيرها ..اما بالنسبه لموعد اضافه البوتاسيوم فقد اتضح ان تجزئة السماد الى نصفين متساويين يضاف النصف الاول قبل الريه الاولى اما النصف الثانى فيضاف قبل الريه الثانية او يضاف ثلثى السماد قبل الريه الاولى اما الثلث الباقى فيضاف قبل الرية الثانية وذلك تحت ظروف الملوحه العاليه التى تتصف بها اراضى محافظات شمال الدلتا وبناحيه محافظة كفرالشيخ التى اجريت بها هذه الدراسة.