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YIELD AND QUALITY OF TWO SUGAR BEET VARIETIES AS INFLUENCED BY NITROGEN FERTIGATION REGIMES UNDER DRIP – IRRIGATION SYSTEM

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ABSTRACT

Two field experiments were conducted on sandy soil at El-Kassasien Research Station Ismaillia Governorate, under drip- irrigation system , during the two successive seasons of 2004/2005 and 2005 /2006 to study the influence of N fertilizer application methods (7 N fertigation treatments) on yield and quality of two sugar beet varieties (Atose poly and Loados). A split-plot design technique was used to carry out this trial. The 7 N fertigation treatments were :

Fr_1: Applying the N fertilizer through soil + 3 hrs irrigation.
Fr_2: $^3/_4$ hrs irrigation + $1^1/_2$ hrs fertigation + $^3/_4$ hrs irrigation.
Fr_3: $1^1/_2$ hrs irrigation + $^3/_4$ hrs fertigation + $^3/_4$ hrs irrigation.
Fr_4: $1^1/_2$ hrs fertigation + $1^1/_2$ hrs irrigation.
Fr_5: $2^1/_4$ hrs irrigation + $^3/_4$ hrs fertigation.
Fr_6: $2^1/_4$ hrs fertigation + $^3/_4$ hrs irrigation.
Fr_7: 3hrs fertigation.

The main plots were devoted to N fertigation treatments and the two sugar beet varieties were placed in the sub-plot units.

The important results could be summarized as follow:

1. All fertigation treatments were superior to the non fertigation treatment.
2. The highest values of root, top and sugar yields and root length were recorded when Fr_6 treatment was applied.
3. The highest value of TSS % were obtained when Fr_5 treatment was applied, while the highest value of root diameter was obtained with Fr_3.
4. Sucross % and purity % were not significantly affected by all fertigation treatments.
5. Lados variety surpassed Atose poly variety for top , root and sugar yields, TSS% , root length and diameter.

Keywords: N fertigation treatments , sugar beet varieties.

INTRODUCTION

In Egypt, the total sugar production is about 1.575 million ton) in 2006 season, about 68% of the amount from sugar cane and the other 32.% from sugar beet), while the consumption is about 2.485 million tons*. Sugar beet can successfully close this gap as for as it is adapted to a wide rang of climatic and soil conditions.

Regarding the effect of N fertilizers application and water supply methods (fertigation), Feigin et al. (1982) and Thompson and Doerge (1995) reported that three qualities are necessary for efficient fertilization through irrigation, they are: (1) irrigation water must contain the needed nutrients in forms available to plants or in forms readily converted to available, forms; (2) water must be uniformly distributed and (3) application of water must be done so that plants are not burned and irrigation lines, emitters or orifices are not plugged. Cortez *et al.* (2000) stated that this method (fertigation) produces good results, including higher overall agricultural yield. Ghali *et al.* (2004) studied five different fertigation treatments and found that all of them were superior to the non fertigation treatment. Ouda, sohier (2006) reported that all

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fertigation treatments were superior to the non-fertigation treatment. She added that wetting the soil by water only then applying NK fertilizers through trips (i.e. fertigation) helps in better distribution of the fertilizers and greater soil depth. This could be observed when Fr_3 (1 $^1/_2$ hrs irrigation $^3/_4$ hrs fertigation + $^3/_4$ hrs irrigation) and Fr_5 (2 $^1/_4$ hrs irrigation + $^3/_4$ hrs fertigation) treatments were superior to the other fertigation regimes in most of the characters studies.

Abd Alla *et al.* (1995) found that the sugar beet varieties significantly different in sucrose % and purity %. Ramadan (1999) reported that variety Eva had the best quality traits in terms of sucrose purity and recoverable sugar percentages, while Ras paoly variety gave the highest root yield compared with the other varieties . Also Abou – Salama and El-Syied (2000) observed that root and sugar yields and sugar quality varied significantly between cultivars. El-Hinnawy *et al.* (2003) stated that genotypes were significantly differed in total soluble solids (TSS%), sucrose % , purity % and root as well as extractable sugar yields.

In this respect, efforts have been directed towards two objectives; selecting and improving the promising cultivars and N fertilizer application methods (fertigation) in sandy soil under drip irrigation system for maximum production.

MATERIALS AND METHODS

Two field experiments were carried out in the Experimental Farm of El-Kassasien Agricultural Research Station during the two successive seasons of 2004/2005 and 2005/2006. A split-plot design with four replications was used, where the main plots were devoted for the following seven fertigation treatments:

1. Fr_1:Applying the N fertilizer through soil+3 hrs irrigation.
2. Fr_2: $^3/_4$ hrs irrigation + 1$^1/_2$ hrs fertigation + $^3/_4$ hrs irrigation.
3. Fr_3:1$^1/_2$ hrs irrigation + $^3/_4$ hrs fertigation + $^3/_4$ hrs irrigation.
4. Fr_4:1$^1/_2$ hrs fertigation + 1$^1/_2$ hrs irrigation.
5. Fr_5:2$^1/_4$ hrs irrigation + $^3/_4$ hrs fertigation.
6. Fr_6:2$^1/_4$ hrs fertigation + $^3/_4$ hrs irrigation.
7. Fr_7: 3hrs fertigation.

Nitrogen fertilizer was applied as ammonium sulfate (20.6%N) at a rate of 120 kg/fad was added at three equal doses, the first after thinning, the second was applied one month later. While, the third was applied after three weeks later. Two cultivars i.e., Atose poly (V_1) and Lados (V_2) were placed in the sub-plot units. Each sub-plot unit was 24m^2, 4 ridges each of 10 meters length and 60 cm width. Three irrigations per week were applied. Average discharge of each drripper was 10.13 L/hrs i.e. 91.17 L/week. As basal application, P and K fertilizers were applied at the rates of 30 kg P_2O_5 and 48 K_2O/fad during land preparation.

Soil samples were taken at random from the different sites of the experimental field at a depth of 0-30cm from soil surface before sowing. Chemical and physical properties of the experimental soil are presented in Table 1.

The experiment were plated at 21 and 16 October in the 1st and 2nd seasons, and harvested at 180 days after sowing in the two seasons respectively. Fertigation treatments were applied after thinning. Two guarded ridges for each sub-plot were harvested, topped and cleaned and the following parameters were recorded:

A. Root yield and its attributes:

1.Root length (cm).
2.Root diameter (cm).
3.Root yield (ton/fad).
4.Top yield (ton/fad).

B. Sugar yield and quality:

1.Sugar yield (ton/fad) was calculated according to the following equation: Theoretical sugar yield= root yield (ton/fad) X sucrose %
2.Sucrose percentage was determined by using saccharometer according to Le Docte (1927).
3. Total soluble solids percentage was determined by using hand refractometer.
4.Juice purity percentage was determined according the following equation as described by Carruthers *et al.* (1962). Purity % = sucrose % / TSS % .

Statistical analysis:

Analysis of variance and combined analysis for the two seasons were carried out on the data obtained using MSTAT-C computer program according to Gomez and Gomez (1984) . To compare treatment means, least significant difference (LSR) at 0.05 level of significance was used according to Duncan (1955).

Table 1. Chemical and physical properties of soil of the experimental site

Seasons	2004/2005	2005/2006
Particle size distribution		
Coarse sand %	77.62	77.72
Fine sand %	15.00	14.90
Silt %	2.34	2.39
Clay	5.04	4.99
Textture class	Sandy soil	
Organic mater %	0.16	0.21
Chemical analysis in extraction soil		
a) Cations (mg/l)		
Ca^{++}	0.10	0.21
Mg^{++}	0.05	0.16
Na^{+}	0.1	0.30
K^{+}	0.006	0.01
b) Anions (mg/l)		
Hco^{-}	0.13	0.12
Cl^{-}	0.11	0.27
So_4^{-}	0.36	0.32
pH	8.10	7.5

RESULTS AND DISCUSSION

A. Root yield and its attributes

Root length, root diameter, root yield (ton/fad) and top yield (ton/fad) are shown in Table 2.

Wetting the soil then applying the nitrogen fertilizer through fertigation had significant favourable effect on top and root yields. The more time given to irrigation had adaptional effect. Wetting the soil for $2^1/_4$ hours and then $^3/_4$ hours fertigation (Fr_5) performed better than $1^1/_2$ hours wetting + $^3/_4$ hours fertigation + $^3/_4$ hours wetting (Fr_3). However, the differences between Fr_5 and Fr_3 did not reach the level of significant These two treatments i.e., Fr_3 and Fr_5 gave more top yield than other treatments in which fertigation was applied first then irrigation followed i.e. Fr_4 and Fr_6. Applying 120 kg nitrogen through fertigation for 3 hours (Fr_7) stood in the second rank. All fertigation treatments out yield the Fr_1 where the fertilizer was applied through soil followed by 3 hours drip – irrigation. Similar trends were observed on root length, root diameter and root yield. Similar results were recorded by Feigin *et al.* (1982), Thompson and Doerge, (1995), Zebarth *et al.* (1995), Thompson *et al.* (2000), Ghali *et al.* (2004) and Ouda,soheir (2006).

B.Sugar yield and quality:

Sugar yield, sucrose %, TSS% and purity % are presented in table 3.

Sugar yield as a function of both root yield and sucrose % followed the root yield in its variation where the different treatments had no significant effect on sucrose % . The same trend was observed with purity % but not found in total soluble solids (TSS%) Cortez *et al.* (2000) in Spanish reported that fertigation technique produces good results, including higher yield and quality. Also, Ghali *et al.* (2004) and Ouda, soheir (2006) reported that all fertigation treatments were superior to the non fertigation treatment.

C. Varietal variation:

The differences between the two cultivars are shown in Tables 2 and 3.

The superiority of Lados cultivar over Atose poly was clear and significant in most studied traits . Root length, root diameter, top yield and root yield of Lados were significantly higher than Atose poly. Both cultivars gave statistically similar sucrose %, but sugar yield was affected in favour of Lados since its root yield was also superior. Lados also gave higher % of TSS but its purity was inferior to that of Atose poly. The variation in gentical factors between cultivars make up these differences between them. El-Hawary and Mokadem (1999) found that the highest expected technological yield of sugar was found in Pamela and Top varieties as compared with other varieties. Nassar (2001) stated that Toro and Lola varieties out yield the other varieties in root yield/ fad. El-Hinnawy *et al.* (2003) showed that genotypes were significantly differed for root and extractable sugar yields.

D. The interactions:

Though most of the interactions were statistically significant, yet no new information were obtained other than the main effects of varieties and fertigation regimes. Therefore these data were excluded.

Table 2: Yield and its attributes as affect by N fertigation treatments and sugar beet varieties performance during 2004/2005 and 2005/2006 seasons (and combined)

Characters / Treatments	Root length (cm)			Root diameter (cm)			Root yield (t/fad)			Top yield (t/fad)		
	1st season	2nd season	Combined	1st season	2nd season	Combined	1st season	2nd season	Combined	1st season	2nd season	Combined
N fertigation treatments (fertig)* Fr:												
Fr_1	17.5c	20.0bc	18 7c	8 6b	9 4bc	9 0cd	15 781c	19.421c	17.601d	3.324d	4.723e	4.023f
Fr_2	19.6b	21.9ab	20.9ab	8.5b	9 3bc	8 9de	25 222ab	24.964bc	25.093 bc	4.228bc	5.919bc	5.073cd
Fr_3	22.1a	21.4abc	21.7ab	9.7a	10 4a	10 0a	27 516a	28.287ab	27.901ab	5.832a	6.306b	6.069b
Fr_4	20.6ab	21.0abc	20.8b	9.9a	10 0a	10.0ab	17.931bc	23.447bc	20.689bc	4.169bc	5.360cd	4.764de
Fr_5	21.8a	22.1a	22.0a	9 7a	9.2bc	9.5bc	27.582a	35.541a	31.561a	6.393a	9.214a	7 803a
Fr_6	21.8a	20.0c	20.9ab	8 6b	8.9c	8.8e	16 670c	23.417bc	20.043cd	3.644cd	4.994de	4,319ef
Fr_7	20.7ab	18.1d	19.4c	9.2ab	7 9d	8 6e	20 472ab	25.516bc	22.994bc	4 771b	6.240b	5.505c
F-test	*	*	*	*	*	*	*	*	*	*	*	*
Sugar beet varieties (V):												
Atose poly	18.6b	19.3b	18.9b	8.2b	8.5b	8.3b	13.103b	18.702b	15.902b	2.954b	4.236b	3 590b
Lodos	22.6a	22.0a	22 3a	10.2a	10 2a	10.2a	30.089a	32.896a	31 492a	6.292a	7.990a	7 141a
F-test	*	*	*	*	*	*	*	*	*	*	*	*
Interaction	*	*	*	*	*	*	*	*	*	*	*	*

*Treatments mvoive successive spells of irrigation (irrig.) and fertigation (fertig.) ; as follow: Fr_1: No fertig. (N soil application) Fr_2= $^3/_4$ hr irrig. + $1^1/_2$ hr fertig. + $^3/_4$ hr irrig. Fr_3 = $1^1/_2$ hr irrig + $^3/_4$ hr fertig + $^3/_4$ hr irrig. Fr_4 = $1\ ^1/_2$ hr fertig + $1\ ^1/_2$ hr irrig. Fr_5 = $2^1/_4$ hr irrig + 3/4 hr fertig. Fr_6 = $2^1/_4$ hr fertig + $^3/_4$ hr irrig. Fr_7=3hr fertig. Fertilizer application through drips is called "fertigation".

Table 3: Yield and its attributes as affect by N fertigation treatments and sugar beet varieties performance during 2004/2005 and 2005/2006 seasons (and combined)

Characters / Treatments	Sugar yield (t/fad)			Sucrose (%)			TSS (%)			Purity (%)		
	1st season	2nd season	Combined	1st season	2nd season	Combined	1st season	2nd season	Combined	1st season	2nd season	Combined
N fertigation treatments (fertig)* Fr:												
Fr_1	2.656c	3.333d	2991e	16 8	17 1	16.999	20 000d	20.000b	20.000d	84.165	85.830	84.995
Fr_2	4.392ab	4.368bc	4 380bc	17 4	17.5	17 458	20.750bcd	20 500b	20.625bc	83 932	85.365	84.644
Fr_3	4 815a	5.020b	4.917ab	17.5	17.7	17.625	21.500ab	20 500b	21.000b	81.395	86.585	83.928
Fr_4	3.093bc	4.064bcd	3.646cd	17.2	17.3	17.625	20 750bcd	20 250b	20.500bcd	85.185	85.595	85.975
Fr_5	4 849a	6 308a	5 575a	17 5	17 7	17 666	22 250a	21 750a	22 000a	79.024	81 609	80 300
Fr_6	2.833c	4.039cd	3.432de	17 0	17.2	17.125	20 083cd	20 250b	20.166cd	84.648	85.185	84.920
Fr_7	3.582abc	4.465bc	4.023cd	17.5	17.5	17.500	21 000bc	20 500b	20.750b	83.333	85.365	84.337
F-test	*	*	*	NS	NS	NS	*	*	*	NS	NS	NS
Sugar beet varieties (V):												
Atose poly	2 239b	3 259b	2 744b	17 0	17 4	17 261	20 238b	20 285b	20.261b	84.469	85.915	85.193a
Lodos	5.265a	5.756a	5.511a	17 5	17.5	17 500	21 571a	20.787a	21 178a	81 127	84 195	82.632b
F-test	*	*	*	N.S	N.S	N.S	*	*	*	*	NS	*
Interactions	*	*	*	*	*	*	*	*	*	*	NS	*

*Treatments mvoive successive spells of irrigation (irrig.) and fertigation (fertig.) ; as follow: Fr_1: No fertig. (N soil application) Fr_2= $^3/_4$ hr irrig. + $1^1/_2$ hr fertig. + $^3/_4$ hr irrig. Fr_3 = $1^1/_2$ hr irrig + $^3/_4$ hr fertig + $^3/_4$ hr irrig. Fr_4 = $1\ ^1/_2$ hr fertig + $1\ ^1/_2$ hr irrig. Fr_5 = $2^1/_4$ hr irrig + 3/4 hr fertig. Fr_6 = $2^1/_4$ hr fertig + $^3/_4$ hr irrig. Fr_7=3hr fertig. Fertilizer application through drips is called "fertigation".

E. Yield analysis:

a. Correlation study:

Table 4 show the simple correlation coefficients between sugar yield on one hand, and seven other characters including root and top yields. Simple correlation was positive and highly significantly when was made between sugar yield (t/fad) and each of root and top yields (t/fad) and root length and its diameter (cm). While there was positively and without significantly correlated with sucrose % and TSS %, but there was negatively correlated with purity % . Root yield (t/fad) was positive and highly significant correlated with top yield (t/fad) and rot length and its diameter (cm). Also, root yield was positively correlated with sucrose % and TSS% but the coefficient was not significant and negatively correlated with purity %.

Table 4: Simple correlation coefficient between sugar yield (ton /fad) and other traits of sugar beet (combined data)

Traits	1	2	3	4	5	6	7
Y-sugar yield (t/fad)	0.9633**	0.9748**	0.8404**	0.8555**	0.3611	0.5106	-0.2523
1-Root yield (t/fad)	-	0.9516**	0.8303**	0.7974**	0.2159	0.3825	-0.2350
2-Top yield (t/fad)		-	0.8513**	0.8356**	0.3594	0.4575	-0.2052
3-Root length (cm)			-	0.7740**	0.2722	0.5008	-0.3222
4-Root diameter (cm)				-	0.2566	0.5810*	-0.4073
5-Sucrose %					-	0.4085	-0.3578
6-TSS%						-	-0.7050**
7-Purity %							----

* and**significant at 0.05 and 0.01 levels of probability, respectively

Top yield on the hand was positive and highly significant correlated with root length and root diameter (cm) . Also top yield (t/fad) was positively correlated with sucrose and TSS percentages and negatively correlated with purity percentage. Similar results are agreed by Gewifele (1982) and Ouda.soheir (1986 , 2001 , 2002 and 2003).

For root length (cm) the results indicated that root length (cm) was positive and highly significant correlated with root diameter (cm), and did not significantly correlated with sucrose and TSS percentages and negative correlated with purity %.

Root diameter (cm) was positively and significantly correlated with TSS%, but the correlation did not reach the level significant with sucrose % and negative correlated with purity %. Sucrose % was positively correlated with TSS and purity percentages. TSS % was negatively and highly significantly correlated with purity % only.

b. Path analysis:

The method of path coefficient included the yield attributed i.e. root yield (t/fad), top yield (t/fad) and sucrose %. The effect of direct and indicate path coefficients of root yield, top yield and sucrose % on sugar yield as shown in Table 5. These effects were compated by partitioning the simple correlation coefficients into its components . Root yield / fad , demonstrated to have a high direct effect (0.4887%) on sugar yield, while the direct effect of top yield was less from the direct effect of root yield (4798) on sugar yield. The direct effect of sucrose % was very low (0.0832).

Table 5: Partitioning of simple correlation coefficient between sugar yield (ton/ fad) and its components of sugar beet

Sources	Values
Root yield (t/fad)	
Direct effect	0.4887
Indirect effect	0.4567
Indirect effect via top yield (t/fad)	0.0179
Indirect effect via sucrose %	0.9633
Top yield (t/fad.)	
Direct effect	0.4798
Indirect effect	0.4652
Indirect effect via root yield (t/fad)	0.0298
Indirect effect via sucrose %	0.9748
Sucrose %	
Direct effect	0.0832
Indirect effect	0.1055
Indirect effect via root yield (t/fad)	0.1724
Indirect effect via top yield (t/fad)	0.3611

The indirect effects of root yield, top yield and sucrose % were (0.4567 and 0.0179), (0.4652 and 0.0298) and (0.1055 and 0.1724), respectively.

The contributions of the direct effects of root yield , top yield and sucrose % and their interactions on sugar yield as recorded in percentage of the variation are presented in Table 6 . Path analysis showed that the direct effects for root yield, top yield and sucrose % were 23.88%, 23.03% and 0.69%, respectively. The indirect path coefficient of three characters were about 44.63% , 1.75% and 2.87% of the sugar yield variation. Also, its clean from the results that root yield and top yield contributed much to sugar yield than from sucrose %. R^2 was 96.85%, of the total sugar yield variation.

Table 6: Direct and joint effects of yield components presented as percentage of sugar yield variation in sugar beet

Sources of variance	C. D	%
Root yield (t/fad)	0.23883	23.883
Top yield (t/fad)	0.23027	23.027
Sucrose %	0.00690	0.690
Roor yield (t/ fad) x top yield (t/fad)	0.44633	44.633
Root yield (t/fad) x sucrose %	0.01754	1.754
Top yield (t/fad) x sucrose %	0.02867	2.867
R^2	0.96854	96.854
Residual factors (R)	0.03146	3.146
Total	1.000	100.000

Conclusion:

According to the presented resulted from this investigation, it can be concluded that sowing Lados variety under the environmental conditions of Ismailia Governorate and then using the fertigation treatment of Fr_5 i.e. wetting the soil $2^1/_4$ hours and then $^3/_4$ hours fertigation could be recommended for maximizing sugar beet productivity.

REFERENCES

Abd Alla, A. F.; A. I. Allam; M.A. El-Hawary and H. M. El-Sayed (1995): Influence of plant densities on growth and yield of some sugar cultivars. Egypt. J. Appl. Sci. , 10 (9): 281-291.

Abou Salama, A. M. and S. I. El-Sayed (2000): Studies on some sugar beet cultivars under Middle Egypt conditions. 1. Response to planting and harvesting dates. Assiut J. Agric. Sci., 31 (1): 137-159.

Carruthers, A.; J. F. Olld Field and H. J. Teague (1962): Assessment of beet quality. Paper presented to the 15th. Ann. Tech. Conf. Br. Eng. Crop, P. 1-28.

Cortez, L.; W. J. Freire and F. Rosillo – Calle (2000): Biodigestion of vinasse in Brazil. International on Sugar Journal Cane 1998 , 100 : 1196 , 403-404-409-413 also pubil . in the Beet sugar Edition; 17 ref.

Duncan, D.B. (1955): Multiple range and multiple . F. test. Biometrics, 11 : 1-42.

El-Hawary, M. A. and Sh. A. Mokadem (1999): Tolerance of some sugar beet varieties to irrigations with saline water in sandy soils. Assiut J. Agric. Sci. , 30 (1): 1-10.

El-Hinnawy , H.H.; E. A. Ahmed; B. S. H. Ramadan; M. A. Farag; E. M. Al-Jabawi; M. R. Mahmoud; P. Baron and M. R. Bayoumi (2003): Variety x environmental interaction in sugar beet yield trials. Proc. Int. Conf. on Arab Region and Africa in the world sugar context. Aswan, Egypt 9-12 March.

Feigin, A.; J. Letey and W. M. Jarrell (1982) : Celery response to type , amount and method of N- fertilizer application under drip irrigation. Agron. J., 74: 971-977.

Geweifel, H. G. M. (1982): Effect of sowing date and time of harvesting on sugar beet yield and quality. M. Sc. Thesis, Fac. Agric. , Zagazig Univ.

Ghali, M.; A.Abd EL-Fattah and Ouda, Sohier M.M. (2004): Assessing fertigation regimes on sorghum productivity in a sandy loam Soil. Egypt. J. Appl. Sci., 19 (4): 239-255.

Gomez, K. A. and A.A. Gomez (1984): Statistical procedures for Agricultural Research. John Willey and Sons . Inc. New York.

Le Docte, A. (1927): Commercial determination of sugar in beet root using the sacks le Docte. Int. Sugar J., (29): 488-492.

Nassar, A.M.A. (2001): Effect of plant density on the productivity of some sugar beet varieties. J. Agric. Sci. Mansoura Univ., 26 (12): 7533-7546.

Ouda, Sohier M. M. (1986): Effect of levels and time of nitrogen fertilization on growth and yield of sugar beet. M. Sc. Thesis, Fac. Agric. Zagazig Univ.

Ouda, Sohier M. M. (2001): Response of sugar beet to N and K fertilizers levels under sandy soil conditions . Zagazig J. Agric. Res., 28 (2): 275-297.

Ouda, Sohier M. M. (2002): Effect of nitrogen and sulpher fertilizers levels on sugar beet in newly cultivated sandy soil. Zagazig J. Agric. Res., 29 (1): 33-50.

Ouda, Sohier M. M. (2003): Yield and quality of sugar beet as affected by irrigation intervals and hoeing frequency under two irrigation systems. J. Agric. Sci. Mansoura Univ., 28 (3): 1685-1699.

Ouda, Sohier M. M. (2006): Effect of some fertigation treatments on productivity of two sweet sorghum cultivars (sorhum Bioclorl ., Moench) under drip irrigation . Egypt. J. of Appl. Sci., 21 (8B) : 460-471 .

Ramadan , B. S. H. and M. A. Hassanin (1999): Effect of sowing date on yield and quality of some sugar beet (Beta vulgaris L.) varieties . J. Agric. Sci. Mansoura Univ., 24 (7): 3227- 3237.

Thompson, T. L. and T. A. Doerge (1995): Nitrogen and water rates for subsurface trickle irrigated collard, mustard, and spinach . Hort. Sci., (30): 1382-1387 [Abstract Free Full Text].

Thompson , T. L.; T. A. Doerge and R. E. Godin, (2000): Nitrogen and water interaction in subsurface drip irrigated cauliflower I. Plant response Am. J. Soil. Sci. Soci., 64 : 406-411 .

Zebarth, B.J.; P. A. Bowen and M.A. P. Toivonen (1995): Influence of nitrogen fertilization on broccoli yield , nitrogen accumulation and apparent fertilizer nitrogen recovery . Can. J. Plant Sci., 75 : 717-725.

تأثر حاصل وجودة صنفين من بنجر السكر بنظم الرى التسميدى للنيتروجين تحت نظام الرى بالتنقيط

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أقيمت تجربتان حقليتان بمحطة بحوث القصاصين بمحافظة الأسماعيلية خلال موسمى الزراعة ٢٠٠٤/٢٠٠٥ – ٢٠٠٥/٢٠٠٦ لدراسة تأثير سبعة نظم رى تسميدى للنيتروجين بالجرعة الموصى بيا فى الأرض الرملية (١٢٠كجم نيتروجين /فدان) على أنتاجية وجودة صنفين من بنجر السكر (Lados, Atose poly) فى الأراضى الرملية تحت نظام الرى بالتنقيط٠

وكانت نظم الرى التسميدى كالتالى :

١– وضع السماد النيتروجيني أرضى تكبيش بجوار النباتات ثم الرى لمدة ٣ ساعات (Fr_1)٠

٢– الرى بماء فقط لمدة $^3/_4$ ساعة ثم الرى بالماء مذاب فيه السماد لمدة 1 $^1/_2$ ساعة ثم الرى بماء فقط لمدة $^3/_4$ ساعة (Fr_2) ٠

٣– الرى بماء فقط لمدة 1 $^1/_2$ ساعة ثم الرى بالماء مذاب فية السماد لمدة $^3/_4$ ساعة ثم الرى بماء فقط لمدة $^3/_4$ ساعة (Fr_3) ٠

٤– الرى بالماء مذاب فيه السماد لمدة 1 $^1/_2$ ساعة ثم يعقبيا الرى بالماء فقط لمدة 1 $^1/_2$ ساعة (Fr_4)٠

٥– الرى بماء فقط لمدة 2 $^1/_4$ ساعة ثم الرى بالماء مذاب فية السماد لمدة $^3/_4$ ساعة (Fr_5)٠

٦– الرى بالماء مذاب فية السماد لمدة 2 $^1/_4$ ساعة ثم الرى بماء فقط لمدة $^3/_4$ ساعة (Fr_6)٠

٧– الرى بالماء مذاب فية السماد لمدة ٣ ساعات (Fr_7) ٠

وقد طبقت معاملات الرى التسميدى الستة (Fr_2, Fr_3, Fr_4, Fr_5, Fr_6, Fr_7) عن طريق السمادة المقامة على راس الحقل ، و تم اضافة السماد النيتروجينى على ثلاث دفعات متساوية الأولى بعد الخف ، والثانية بعد شهر من الأولى ، والثالثة بعد ثلاث أسابيع من الثانية٠

وفيما يلى أهم النتائج المتحصل عليها :

١- أظهرت كل معاملات الرى التسميدى تفوقا بالمقارنة بالمعاملة الأولى (Fr_1) والتى يضاف فيها السماد أرضى تكبيش بجوار النباتات ثم الرى .

٢- أظهرت النتائج أن أعلى حاصل للجذور والعرش والسكر طن /فدان كان عند تطبيق المعاملة الخامسة (Fr_5) . حيث يتم رى التربة بماء فقط لمدة $2\ ^1/_4$ ساعة ثم إدخال السماد مذابا فى الماء والرى لمدة قصيرة وهى $^3/_4$ ساعة .

٣- أظهرت النتائج أن أعلى قيمة للنسبة المئوية للمواد الصلبة الذائبة الكلية (TSS%) كانت عند تطبيق المعاملة (Fr_5) ، بينما النسبة المئوية للسكروز والنسبة المئوية للنقاوة لم تتأثرا معنويا بكل المعاملات تحت الدراسة .

٤- تفوق قطر الجذر/ سم وأعطى أعلى قيمة عند تطبيق المعاملة (Fr_3) حيث يتم رى التربة بالماء فقط لمدة $1\ ^1/_2$ ساعة ثم إدخال السماد مذابا فى الماء والرى لمدة $^3/_4$ ساعة ثم الرى بالماء فقط لمدة $^3/_4$ ساعة بينما كان أطول جذر عند تطبيق المعاملة (Fr_5) .

٥- أظهر الصنف Lados تفوقا فى صفات حاصل الجذور و العرش و السكر طن / فدان وكذلك % للمواد الصلبة الذائبة الكلية (TSS%) وطول الجذر ، وقطر الجذر / سم .

الخلاصة:

توصى الدراسة بزراعة الصنف Lados تحت ظروف محافظة الإسماعيلية فى الأراضى الرملية وتحت نظام الرى بالتنقيط مع استخدام نظام الرى التسميدى Fr_5 حيث يتم رى التربة بالماء فقط لمدة $2\ ^1/_4$ ساعة ثم إذابة السماد فى السمادة والرى لمدة $^3/_4$ ساعة للوصول إلى أعلى إنتاجية من نبات بنجر السكر .