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EFFECT OF NITROGEN FERTILIZATION AND HARVEST DATE ON YIELD, YIELD COMPONENTS AND QUALITY OF SUGAR BEET

Ramadan, B. S. H.
Agron. Dept. Fac. of Agric. Cairo Univ., Giza, Egypt

ABSTRACT

Two field experiments were conducted at Cairo University, Agric, Experimental Station, during 2001/02 and 2002/03 seasons on clay loam soil. The objective was to describe yield and quality in response to different nitrogen fertilization rates (0, 30, 60, 90 and 120 kg N/fed) and harvesting dates 180, 195 and 210 days from sowing). Results revealed that increasing nitrogen level up to 120 kg N/fed increased root diameter, root length, root weight/plant and LAI, while reduced quality traits in terms, of sucrose, purity, recoverable sucrose and quality of beet % in both seasons. Impurities in terms of Na, K and amino-N increased with increasing nitrogen rate up to 120 kg N/fed. Sucrose loss to molasses increased significantly with the increase in nitrogen level. Addition of 120 kg N/fed gave the highest root and top yield, while 90 kg N/fed gave the highest recoverable sugar yield ton/fed. Delaying harvest date up to 210 days from sowing increased root diameter, root length and root weight, but decreased LAI.

Sucrose, purity, recoverable sucrose and quality percentages as well as impurities were increased with the delay in harvest. Delaying harvest date up to 210 days from sowing decreased sucrose loss to molasses from 2.10 and 2.25 % after 180 days to 1.87 and 2.01 % after 210 days in both seasons, respectively.

Delaying date of harvest up to 210 days after sowing caused a significant increase in root yield of 11.6% (from 21.6 to 24.1 ton/fed) on the average of both seasons. While top yield decreased with delay harvest date.

Recoverable sucrose yield increased from 2.34 and 2.49 ton / fed when harvest took place after 180 days to 3.19 and 3.30 ton/fed when harvest after 210 days from sowing.

Nitrogen levels x harvesting dates interactions exhibited significant effect on root diameter, root weight and LAI as well as sucrose, recoverable sucrose and quality percentages. The highest root yield 30.4 ton/fed resulted from adding 120 kg N/fed with harvest after 120 days from sowing in the second season, while the highest recoverable sugar yield (3.73 and 3.80 ton/fed) resulted from 90 kg N/fed and harvest toro variety at 210 days from sowing, in both seasons, respectively.

INTRODUCTION

Mineral elements have a great influence on root yield, quality and recoverable sugar production of sugar beet (*Beta vulgaris,* L.). Increasing nitrogen fertilization ordinarly increases root yield until a plateau is reached, however; sucrose and purity% decrease with increasing nitrogen even before root yield peaks (Carter, 1982). The optimum nitrogen level for sucrose and economic return is less than for root yield (Adams *et al.*, 1983). Oraby *et al.* (1987) reported that increasing rate of nitrogen up to 100 kg N/fed resulted in increasing root length, diameter and leaf area index. Excess nitrogen reduces sucrose % and increases Na, K and amino-N as well as sucrose loss to molasses (Carter and Traveller, 1981; Winter, 1990; Lauer, 1995; El-Hennawy *et al.*, 1998 and Ramadan *et al.*, 2003). Sorour *et al.* (1992) and Badawi (1996) reported that increasing nitrogen levels from 60 to 90 kg N/fed increased sugar yield, while sucrose and purity percentages were reduced. Nemeat Alla and El-Geddawy (2001) reported that increasing nitrogen rate up to 120 kg N/fed produced the highest values of root length and root diameter as well as top yield, while sucrose and purity percentages reduced.

Sowing beet usually takes place during a period that extends from September till November and harvest almost starts from mid February and extends up to the end of June. Due to this long growing season it is expected that harvest date may affect yields and quality of sugar production.

Root, , sugar yields and quality increased as harvest was delayed up to 200 days from planting, while top yield decreased (Aly, 2000 and Basha and Ouda, 2000). Abou-Salama and El-Syiad (2000) studied the effect of different harvest dates (March 31th, April 15th and May 1st) on yield and quality of some sugar beet cultivars. Their results indicated that harvest date had a significant effect on root diameter, but it had insignificant effect on root length, sucrose %, impurities in terms of Na, K and amino-N, sugar loss to molasses, root yield and sugar yield. Late harvest had a negative effect on quality as it led to higher values for Na, K and sugar loss. Furthermore, late harvest was better in terms of sugar yield. The increase in sugar production accompanying the delay in harvest was attributed to increase in number of roots at harvest, root yield, sucrose and purity as well as recoverable sucrose percentage and the reduction in impurities., Gobarh, Mirvat (2001) reported that the highest root yield and recoverable sugar yield (ton/fed) were obtained from plants harvested at 210 days after sowing and she added that delaying harvest date 4 weeks significantly increased sucrose, purity and recoverable sucrose percentages but decreased impurities content in terms of Na, K and amino-N in roots.

Al-Jbawi, Entessar (2003) studied the effect of harvest dates (180 and 210 days from planting) on yield and quality of some sugar beet varieties. She found that leaf area index, dry weight/plant, sucrose loss to molasses, impurities (Na, K and amino-N) and top yield were significantly decreased by the delay in harvest throughout the growing seasons. While root diameter , root length, purity % , recoverable sucrose % and root yield as well as recoverable sugar yields were significantly increased as harvest was delayed. Several researchers found that the delay in harvest increased sugar and purity percentages as well as root and sugar yields, while decreased impurities in terms of Na, K and amino-N contents in beet root (Nassar, 1992; Lauer, 1997 and Ramadan, 1999).

The objective of this article was to study the effect of nitrogen rates and harvest date on yield and quality of sugar beet.

MATERIALS AND METHODS

Two field experiments were carried out at the Agriculture Experimental Station, Faculty of Agriculture, Cairo University, Giza, during 2001/02 and 2002/03 seasons, to study the effect of nitrogen rates, i.e. 0, 30, 60, 90 and 120 kg N/fed and harvest dates; 180, 195 and 210 days from planting on yield and quality of sugar beet. The soil of experimental site has a clay texture with 7.2 and 7.4 pH; 1.8 and 1.6 % organic matter;

0.11 and 0.10 % total nitrogen; 3.3 and 3.1% $CaCO_3$; and 9.5 and 9.9 ppm available P as well as 460 and 455 ppm available K in the first and seconed seasons, respectively.

A split-plot design with four replications was used where nitrogen rates were arranged in the main plots, and the three harvest dates were distributed in the sub-plots. Distance between hills was 20 cm, therefore plot area was $15m^2$ (5 ridges, 50 cm apart and 6 m long). A multigerm variety "Toro" imported from Germany was sown on Sep 10^{th} and Sep 12^{th} in the first and second seasons, respectively. At sowing 30 kg P_2O_5 and 48 kg K_2O/fed were added to the soil. Nitrogen fertilization was added in the form of urea (46.5 % N), splitted in two equal doses, the first was applied after thinning (at 4-6 leaf stage) to ensure one plant per hill (42 000 plants/fed.). The other dose was applied 4 weeks later. All other culture practices such as irrigation, weed control, insect control etc... were applied in the same manner as usually done in the ordinary sugar beet field to obtain maximum yield.

At harvest a sample of ten plants was taken at random from each sub-plot to determine root length, root diameter , root weight and leaf area index(LAI). LAI was determined by using area meter (Li-cor model LI-3100),USA. Total soluble solids (TSS) was determined by using digital refractometer model PR-1. ATAGO, Japan. Sucrose % (Pol%) was determined polarimetrically on lead acetate extract of fresh macerated roots according to Carruthers and Oldfield (1960). Purity % was calculated by dividing sucrose % by total soluble solids %. Juice impurities in terms of sodium (Na) and potassium (K) milliequivalent/ 100 g beet) were estimated according to A.O.A.C. (1984). Amino nitrogen milliequivalent/ 100 g beet according to Pergel (1945). Recoverable sucrose % (R.S %) was determined according to the following formula ;RS % = Pol – 0.29 – 0.343 (K + Na) – 0.0393 amino-N (Reinfield *et al.*, 1974).

Quality % = recoverable sucrose %/Pol x100 according to the procedure of Delta Sugar Company. Percentage sucrose loss to molasses = 0.343 (Na+K) + 0.094 amino-N – 0.31 according to Reinfield *et al.* (1974). Number of roots at harvest, individual mean root weight/ plant (g) and root yield as well as top yield ton/fed were determined on a plot basis.

Sugar yield (ton/fed. = recoverable sucrose % x root yield (ton/fed).

Data collected from both seasons were statistically analyzed by using the computer package MSTATC. Means were compared using LSD according to Waller and Duncan (1969).

RESULTS AND DISCUSSION

A- Growth traits: Root characters (length, diameter and weight) and LAI.

The effect of N rates and harvest dates on root chracters are presented in Table 1. Increasing nitrogen rates from zero up to 90 kg markedly increased root size in terms of length and diameter, thereafter further increment of N was not associated with a significant increase in root size, except for root diameter in the 2^{nd} season, while root weight was significantly increased as N rate increased up to 120 kg/fed. This response is mainly due to the role of nitrogen in stimulating the meristematic growth activity which contribute to the increase in number of cells in addition to cell enlargement. This resulte is in agreement with those obtained by Oraby *et al.* (1987) and Nemeat Alla and El-Geddawy (2001)

Leaf area index was significantly affected by added N (Table 1). Increasing nitrogen rate up to 120 kg N/fed markedly increased LAI by 118.5 and 134.3 % in the first and second seasons, respectively. However, the difference between 90 and 120 kg N/fed was not significant in the 1st season. Similar results were obtained by Oraby *et al.* (1987).

The influence of harvest date on root diameter, root length and root weight was significant (Table 1). Delaying harvest up to 210 days increased root diameter by 8.3, 3.9 % and root length by 1.9, 4.6 % in both seasons, respectively. Gobarh, Mirvat (2001) and Al-Jbawi, Entessar (2003) found an increase in root diameter and root length with the delay in harvest date.

Harvest date exhibited significant effect on root weight in both seasons (Table 1). Later harvest date caused an increase of mean root weight/plant from 527 to 588 g in the first season and from 585 to 651 g in the second season. On the other hand, LAI was decreased with the delay in harvest date 11.5 and 10.0 % in the 1st and 2nd seasons, respectively. Such effect of late harvest might have been due to leaf senescence, which consequently increased the number of dead yellow leaves. Similar results were obtained by Besheet (1986) who reported that LAI significantly decreased as harvest date was delayed .

Table (1): Effect of nitrogen fertilization rates and harvest dates on root diameter, root length, root weight/plant and leaf area index (LAI) in the first and second seasons.

Characters / Treatments	Root diameter (cm)		Root length (cm)		Root weight/plant (g)		LAI	
	Seasons							
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
N rates(kg/fed)								
0	7.3	6.9	19.5	20.1	355	391	1.57	1.66
30	9.2	9.8	26.6	27.6	515	544	2.19	2.19
60	10.8	11.2	27.6	27.8	571	658	2.74	3.24
90	11.3	11.8	27.8	28.8	657	726	3.18	3.27
120	11.6	12.6	28.1	28.8	690	761	3.43	3.89
LSD at 0.05	0.7	0.2	0.7	0.7	33	35	0.40	0.58
Harvest dates								
180	9.6	10.3	25.7	25.9	527	585	2.78	2.98
195	10.1	10 4	25.9	26.8	558	612	2.63	2.90
210	10.4	10.7	26.2	27.1	588	651	2.46	2.68
LSD at 0.05	0.2	0.2	0.2	0.3	10	12	0.05	0.05

1st= first season, 2nd =second season.

Nitrogen rates x harvest dates interaction was significant for root diameter in the 2nd season and mean root weight in the first season. The highest root diameter (12.8 cm) and mean root weight (715 g), resulted from adding 120 kg N/fed and harvest sugar beet after 210 days from sowing (Table 2).

The interaction between nitrogen fertilization rates and harvest dates showed a significant effect on leaf area index in the second season (Table 2). The highest leaf area index (4.08) was obtained from adding 120 kg N/fed and early harvest which took place at 185 days from sowing. The difference between treatments (120 kg N/fed and harvest after 180 days) and (120 kg N/fed and harvest after 195 days from sowing) was not significant for LAI.

Table (2): Interaction effect of nitrogen fertilization rates and harvest dates on root diameter, root weight/plant and LAI .

N rates (kg/fed)	Root diameter (cm) 2nd season			Root weight(g)/plant 1st season			LAI 2nd season		
	H1	H2	H3	H1	H2	H3	H1	H2	H3
0	7.2	7.2	6.9	334	358	372	1.73	1.68	1.58
30	9.4	9.6	10.5	463	530	549	2.28	2.18	2.13
60	10.9	11.1	11.5	535	569	610	3.38	3.30	3.05
90	11.3	11 7	12.0	639	640	692	3.45	3.32	3.03
120	12.5	12.5	12.8	665	690	715	4.08	4.00	3.60
LSD at 0.05	0.4			22			0.12		

H1,H2 and H3 = harvest after 180 days,195 days and 210 days, respectively

B - Quality traits:

Juice quality of beet roots, i.e. sucrose, purity, recoverable sucrose and quality of beet percentages were significantly affected by added nitrogen (Table 3). As the rate of added nitrogen increased, sucrose% juice purity and recoverable sucrose as well as quality percentages gradualy decreased. Similar results were obtained by Carter and Traveller (1981), Sorour *et al.* (1992) Badawi (1996) and Mahmoud *et al.*(1999).

Table (3): Effect of nitrogen fertilization rates and harvest dates on sucrose, purity, recoverable sucrose and quality percentages in the first and second seasons.

Characters / Treatments	Sucrose %		Purity %		%Recoverable sucrose		Quality %	
	seasons							
	1s	2nd	1st	2nd	1st	2nd	1st	2nd
N rates kg/fed								
0	17.5	17.7	91.6	89.4	14.0	13.9	80.2	78.6
30	17.1	16.9	89.6	86.2	13.5	13.2	78.7	77.5
60	16.7	16.2	88.9	83.5	12.9	12.3	77.2	75.6
90	16.5	16.0	87.9	83.8	12.5	11.9	75.8	74.2
120	15.5	15.6	83.2	82.0	11.2	11.1	72.3	71.0
LSD at 0.05	0.3	0.4	1.8	2.7	0.4	0.4	1.1	1.8
Harvest dates								
180	15.6	15.6	84.3	81.6	11.6	11.3	74.1	72.6
195	16.7	16.6	88.6	85.7	12.9	12.7	77.1	76.1)
210	17.6	17.2	91.8	87.6	14.0	13.3	79.4	77.4
LSD at 0.05	0.2	0.3	1.2	1.8	0.2	0.2	0.5	0.7

Differences among harvest dates in sucrose, purity as well as recoverable sucrose and quality percentages were significant in both seasons (Table 3). Delay in harvest date from 180 to 210 days consistently increased sucrose % from 15.6 to 17.6% and from 15.6 to 17.2% and purity from 84.3, to 91.8, and from 81.6 to 87.6% in the first and second seasons, respectively as well as recoverable sucrose% from 11.6 to 14.0 and from 11.3 to 13.3% and quality of beet roots from 74.1 to 79.4 % and from 72.6 to 77.4 % in the first and second seasons, respectively. Such effect might have been due to the increase in sucrose accumulation as well as reduction of impurities in terms of Na, K and amino-N accompanying late harvest date (See table 5). Similar findings were reported by Nassar (1992) and El jbawi, Entssar (2003).

Nitrogen fertilization rates x harvest dates interaction had a significant effect on sucrose percentage in 1st and 2nd seasons (Table 4). The highest sucrose content (18.3 and 18.0 %) in the first and second seasons respectively resulted from zero kg N/fed and harvest sugar beet after 210 days from sowing.

Table (4): Sucrose, recoverable sucrose and quality percentages as affected by the interaction between nitrogen fertilization rates and harvest dates in both seasons.

N rates kg /fed	Harvest dates	Sucrose %		Recoverable sucrose %		Quality %	
		Seasons					
		1st	2nd	1st	2nd	1st	2nd
0	180	16.8	17.1	13.3	13.1	78.9	76.8
	195	17.3	17.9	13.8	14.3	80.1	79.6
	210	18.3	18.0	14.9	14.4	81.8	79.7
30	180	16.1	15.9	12.3	11.9	76.0	74.9
	195	17.1	17.3	13.5	13.5	78.7	78.2
	210	18.0	17.7	14.7	14.1	81.3	79.3
60	180	15.7	15.5	11.7	11.3	74.6	73.0
	195	16.9	16.1	13.1	12.1	77.4	75.2
	210	17.5	17.1	13.9	13.4	79.6	78.6
90	180	15.3	15.0	11.2	10.8	73.3	71.9
	195	16.6	16.2	12.6	12.2	75.8	75.2
	210	17.4	16.9	13.6	12.8	78.2	75.5
120	180	14.2	14.3	9.6	9.5	67.8	66.4
	195	15.7	16.0	11.5	11.5	73.3	72.2
	210	16.6	16.3	12.6	12.2	75.9	74.5
LSD at $_{0.05}$		0.4	0.6	0.4	0.5	1.1	1.5

C-Impurities:

Impurities in terms of Na, K and amino-N as influenced by nitrogen rates are given in Table 5. The increase in nitrogen rate up to 120 kg/fed. increased sodium by 21.53 and 37.06 %, potassium by 18.54 and 8.27 % and amino-N by 37.07 and 28.46% in the first and second seasons, respectively. The increase in impurities accompanying higher nitrogen rate may explain the reduction in quality of beet roots as mentioned before. Similar findings were obtained by Carter and Traveller (1981) and lauer (1995).

Delaying date of harvest up to 210 days after sowing caused a significant decrease in impurities i.e. Na, K and amino-N contents in both seasons (Table 5), reflecting the increase in sucrose, purity and recoverable sucrose which increased with the delay in harvest. Some investigators reported that the delay in harvest increased Na, K and amino-N in beet root (Abou-Salama and El-Syiad, 2000 and Al-Jbawi, Entessar 2003).

Table (5): Effect of nitrogen fertilization rates and harvest dates on sodium, potassium, amino-N and sucrose loss to molasses in the first and second seasons.

Characters / Treatments	Na Meq/100 g beet		K Meq/100 g beet		Amino-N Meq/100 g beet		Sucrose loss to molasses%	
	Seasons							
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
N rates kg/fed								
0	1.44	1.43	4.37	4.96	1.16	1.30	1.79	2.01
30	1.53	1.55	4.58	4.72	1.23	1.37	1.90	1.97
60	1.66	1.72	4.61	4.80	1.35	1.42	1.97	2.06
90	1.76	1.82	4.82	5.08	1.43	1.47	2.08	2.19
120	1.75	1.96	5.18	5.37	1.59	1.67	2.22	2.36
LSD at 0.05	0.28	0.23	0.10	0.37	0.16	Ns	0.11	0.16
Harvest dates								
180	1.70	1.81	4.93	5.24	1.45	1.53	2.10	2.25
195	1.65	1.70	4.73	4.93	1.35	1.41	2.10	2.09
210	1.55	1.59	4.48	4.79	1.26	1.40	1.87	2.01
LSD at 0.05	0.06	0.06	0.12	0.27	0.05	0.08	0.05	0.10

D- Sucrose loss to molasses % :

Sucrose loss to molasses percentage increased significantly with the increase in nitrogen rates (Table 5). Increasing nitrogen rates from 0 to 120 kg N/fed increased sucrose loss to molasses by 24.02 and 17.41 % in both seasons, respectively. Such effect of high nitrogen rates may be attributed to increased Na, K and amino-N as well as the reduction in quality traits in terms of sucrose, purity and quality percentages. These results are in line with those stated by Winter (1990) and El- Hennawy *et al.* (1998)

The effect of harvest dates on sucrose loss to molasses was significant (Table 5). Delaying harvest date up to 210 days decreased sucrose loss to molasses from 2.10 and 2.25 % after 180 days to 1.87 and 2.01 % after 210 days in in the first and second seasons, respectively. Results indicated in general that sucrose loss to molasses decreased with delaying harvest date, reflecting the reduction in impurities in terms of Na,K and amino-N. Similar results were reported by Lauer (1997) and Abou-Salama and El-Syiad (2000).

E- Yields of roots, tops and recoverable sucrose (ton/fed.) :

Nitrogen rates had insignificant effect on number of roots at harvest, while root and top yields were significantly increased when nitrogen rate increased up to 120 kg N/fed (Table 6). The increase amounted to 13.4 and

14.6 tons of roots and 6.1 and 6.0 tons of tops in the first and second seasons, respectively. This increases might have been due to the increase in root size and weight as well as the increases in LAI accompanying higher N rates. The present results are in harmony with those obtained by Ramadan *et a l. (*2003).

Results revealed highly significant differences in recoverable sucrose yield (ton/fed) owing to the application of different levels of nitrogen (Table 6). Increasing nitrogen level up to 90 kg N/fed increased recoverable sucrose yield by 1.30 and 1.25 ton/fed in both seasons, respectively. Further application of nitrogen a reduction in sugar yield in both seasons, reflecting the increase in impurities and reduction in recoverable sucrose, and purity percentages. Similar results were obtained by Lauer (1995), El-Hennawy *et al.*(1998).

Delaying date of harvest up to 210 days caused a significant increase of 12.1 and 11.6 % in root yield and 36.3 and 32.5 % in recoverable sucrose yield in the firest and second seasons, respectively. while top yield decreased as harvest was delayed. The increase in root yield ton/fed could be attributed to the increase in root length, diameter and root weight/plant (g) accompanying late harvest. Some investigators reported that the delay in harvest increased root yield (Lauer, 1997; Aly, 2000; Basha and Ouda, 2000 and Abou-Salama and El-Syiad, 2000).

Table (6): Effect of nitrogen fertilization rates and harvest date on number of roots at harvest, yield of root, top and recoverable sucrose in the first and second seasons.

Characters / Treatments	No. of roots at harvest 10^{-3}		Root yield (ton/fed)		Top yield (ton/fed)		Recoverable sucrose yield (ton/fed)	
	Seasons							
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
N rates kg/fed								
0	38.72	37.86	13.8	14.8	6.2	6.4	1.93	2.07
30	39.13	38.14	20.1	20.8	9.1	9.1	2.72	2.75
60	39.24	38.64	22.4	25.4	11.2	10.8	2.91	3.13
90	39.23	38.40	25.8	27.9	11.4	10.9	3.23	3.32
120	39.33	38.63	27.2	29.4	12.3	12.4	3.06	3.26
LSD at 0.05	Ns	Ns	1.2	1.0	1.4	1.1	0.17	0.14
Harvest dates								
180	39.06	38.36	20.6	22.5	11.4	10.9	2.34	2.49
195	39.10	38.21	21.8	23.4	10.1	9.7	2.78	2.91
210	39.24	38.44	23.1	25.1	8.7	9.3	3.19	3.30
LSD at 0.05	Ns	Ns	0.4	0.4	0.4	0.3	0.05	0.07

Nitrogen rates x harvest dates interaction was significant for root yield in the second season (Table 7). The highest root yield (30.4 ton/fed) resulted from 120 kg N/fed and harvest sugar beet after 210 days from sowing. The difference between 90 and 120 kg N /fed and harvest after 210 days from swing was not significant in root yield.

The interaction between nitrogen rates and harvest dates showed a significant effect on top yield (ton/fed) in both seasons (Table 7). The highest top yield (13.7 and 13.8 ton/fed) resulted from 120 kg N/fed and early harvest at 180 days from sowing, while the lowest top yield resulted from zero N and harvest sugar beet after 210 days from sowing.

Table (7): Root, top and recoverable sugar yields as affected by the interaction between nitrogen fertilization rates and harvest dates in both seasons.

N rates kg /fed	Harvest dates	Root yield	Top yield		Recoverable sucrose yield	
		(ton/fed.)				
		Seasons				
		2nd	1st	2nd	1st	2nd
0	180	14.4	7.3	6.5	1.71	1.89
	195	14.9	5.9	6.5	1.92	2.13
	210	15.5	5.4	6.2	2.15	2.19
30	180	19.5	10.3	10.0	2.24	2.32
	195	19.8	9.0	9.0	2.77	2.68
	210	23.0	8.0	8.24	3.16	3.24
60	180	24.0	13.0	11.8	2.47	2.13
	195	25.4	11.7	10.5	2.92	3.06
	210	26.8	8.8	10.3	3.35	3.59
90	180	25.9	12.5	12.3	2.78	2.79
	195	27.9	11.5	10.3	3.18	3.38
	210	29.8	10.3	10.3	3.73	3.80
120	180	28.7	13.7	13.8	2.51	2.73
	195	29.0	12.3	12.3	3.12	3.35
	210	30.4	11.0	11.3	3.56	3.70
LSD at $_{0.05}$		0.9	0.9	0.7	0.12	0.13

Finally, we may conclude that fertilization of sugar beet with 90 kg N/fed and harvest after 210 days (7 months) could maximize recoverable sugar yield per fed.

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تأثير التسميد النيتروجينى وميعاد الحصاد على المحصول ومكوناته وجودة بنجر السكر

بدوى سيد حسانين رمضان
قسم المحاصيل-كلية الزراعة-جامعة القاهرة-الجيزة- مصر

أجريت تجربتان حقليتان خلال موسمى ٢٠٠١/ ٢٠٠٢و ٢٠٠٢/٢٠٠٣ فى محطة التجارب الزراعية بكلية الزراعة جامعة القاهرة فى تربة طينية طميية لدراسة تاثير معدلات التسميد النيتروجينى (صفر، ٣٠، ٦٠، ٩٠ و ١٢٠ كجم نيتروجين/فدان) وميعاد الحصاد بعد (١٨٠، ١٩٥ و ٢١٠ يوم من الزراعة)على المحصول ومكوناته وجودة بنجر السكر.

أظهرت النتائج ان زيادة معدل التسميد الأزوتي حتى ١٢٠ كجم نيتروجين/فدان أدى الى زيادة قطر وطول ووزن الجذر الواحد ودليل مساحة الأوراق. بينما انخفضت نسب كل من السكروز والنقاوة والسكر المستخلص وكذلك مقياس الجودة. بينما أدى زيادة التسميد الأزوتي الى زيادة المواد الغير نقية والممثلة فى محتوى الجذور من الصوديوم والبوتاسيوم والنيتروجين الامينى. كما أدى زيادة التسميد الأزوتي إلى زيادة السكروز المفقود فى المولاس فى كلا الموسمين.

أدى التسميد بمعدل ١٢٠ كجم نيتروجين/فدان لزيادة محصول الجذور والعرش بينما أعطى معدل التسميد ٩٠ كجم نيتروجين للفدان أعلى محصول من السكر المستخلص طن/فدان.

أدى حصاد بنجر السكر بعد ٢١٠ يوم من الزراعة الى الحصول على أعلى طول وقطر ومتوسط وزن الجذر بينما انخفضت دليل مساحة الأوراق. وكذلك أدي تأخير الحصاد حتى ٢١٠ يوم إلى زيادة مقاييس الجودة ونقص السكروز المفقود فى المولاس.

نتج أعلى محصول من الجذور والسكر المستخلص بتأخير الحصاد حتى ٢١٠ يوم بينما انخفض محصول العرش بتأخير الحصاد حتى ٢١٠ يوم من الزراعة.

وكان التفاعل معنويا بين النيتروجين وميعاد الحصاد فى الصفات التالية قطر وطول الجذر ومتوسط وزن الجذر الواحد وكذلك دليل مساحة الأوراق وأيضا السكر المصحح ومقياس الجودة العامة للجذور. ونتج أعلى محصول للجذور طن/فدان من التسميد بمعدل ١٢٠ كجم نيتروجين/فدان والحصاد بعد ٢١٠ يوم من الزراعة وذلك فى الموسم الثانى فقط ولم يكن هناك فرق معنوى بين المعاملة السابقة و اضافة التسميد بمعدل ٩٠ كجم/فدان والحصاد بعد ٢١٠يوم من الزراعة. بينما ادى التسميد بمعدل ٩٠ كجم نيتروجين للفدان والحصاد بعد ٢١٠ يوم من الزراعة الحصول على اعلى محصول سكر مستخلص (٣,٨، ٣,٧٣ طن/فدان) فى كلا الموسمين على التوالى

ويمكن التوصية عند زراعة الصنف تورو بالتسميد بمعدل ٩٠كجم نيتروجين للفدان والحصاد بعد ٢١٠يوم من الزراعة للحصول على اعلى محصول من السكر المستخلص.