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AGRICULTURAL, CHEMICAL AND TECHNOLOGICAL STUDIES ON SUGAR BEET :
2- EFFECT OF NITROGEN APPLICATION ON YIELD, CHEMICAL CONSTITUENTS AND JUICE QUALITY CHARACTERISTICS OF SUGAR BEET.

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ABSTRACT

Two field experiments were carried out at second Belkas farm, Dakahlia governorate, Egypt in 1999 / 2000 and 2000 / 2001 seasons to study the effect of four Nitrogen rates i.e. 60,80,100 and 120 K_g N / fed. [as ammonium nitrate (33.5%N) on yield and juice quality of sugar beet variety Ras poly. The experiments were laid out in Randomized Complete Block Design. Applying Nitrogen fertilizer at the rate of 80 and 100K_g N /fed. gave the highest values of the chemical constituents of fresh sugar beet roots.Increasing Nitrogen up to 120 kg. N /fed. can be significantly increased root yield, top yield and sugar yield .On the other hand (sucrose %, juice purity %, Na%, K% white sugar extrable %and quality) decreased with increasing nitrogen fertilizer rate up to 120 Kg.N %fed. In the average of both seasons, while this rate of N increased ash %,αN%, fiber %, reducing sugars %and TSS%.

INTRODUCTION

Sugar beet (*Beta Vulgaris* L.) is the second producing sugar crop after sugar cane in Egypt. It produces annually about 40% of sugar production all over the world .The total cultivated areas with sugar beets in Egypt reached 135623 feddan in 2000 - 2001 seasons. It gave about 22890359 tons of roots with averages of 21.321 tons / fed. *[1]. The importance is not confined only to the sugar produced from it, but also to its by- products. It considered as an important source of feed for livestock and pectin production from the pulp of sugar beet.

Egypt began to cultivate sugar- beet as a source for sugar beside the main crop, (sugar cane,) which cultivated in Upper Egypt. It is spread through the new lands, which use the ground water for irrigation especially in the north part of Delta at Kafr El –Sheikh, Belkas and Nobaria

Nitrogen is the most limiting nutrient for sugar beet, which affected the yield and quality of sugar beet technological properties.

Abd El-Ghaffar *et al.* (1981) found that applying 30 and 45 kg. N/fed. Increased root yield significantly compared to the control.

Basha (1984) noticed that the increase in root yield and top yield consistently increased with applying nitrogen up to 90 kg. N/fed.

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[1] * Economic section/agriculture ministry 2000.

Zeidan *et al.* (1987), reported that increasing nitrogen fertilization up to 75 kg. N /fed. produced the highest root and top weights and gross sugar yields.

El –Attar et al. (1995), found a significant increase in top yield, root yield and gross sugar yield with increasing applied nitrogen up to 100 kg. N /fed. in the first season and 120 kg. N /fed. in the second season.

El –Hawary (1999), noticed that average root fresh weight and yields of top, root and sugar (ton /fed.) of sugar beet (significantly increased with increasing nitrogen fertilizer. Application of nitrogen at the rate of 90 kg. N /fed. Increased root yield (ton /fed.) by 66.96 and 48.4% and sugar yield (ton / fed.) 59.72 and 40.06 % as compared with the control (0 kg. N/ fed.) in both seasons.

Mahmoud *et al.* (1990), reported that increasing nitrogen rate up to 80 kg. N / fed. increased significantly root, top and sugar yields.

EL-Shafei (1991), pointed out that increasing nitrogen fertilizer level up to 75 Kg .N / fed. to significant and gradual increases in root and top fresh weights / plant, TSS % and roots top as well as sugar yields of sugar beet as compared with the control plants (unfertilized). Meanwhile root sucrose % and juice purity % negatively responded to the doses of nitrogen.

Kumer and zutshi (1991), fertilized sugar beet with 0,60,120 or 180 Kg. N /fed. they found that root sucrose content decreased, while impurity index increased with increasing N - rate.

Assey *et al.* (1992), reported that increasing nitrogen fertilizer level up to 40 kg. N/fed. resulted in a remarkable increase in all of yield components of sugar beet. While application of 30 kg. N / fed. resulted in higher sucrose %.

Sobh *et al.* (1992) and Sorour et al. (1992), found that increasing N – rates application, decreased TSS% and juice purity %.

Besheit *et al.* (1995), demonstrated that nitrogen fertilization significantly increased fresh yields of roots and tops, but it reduced sucrose and purity percentages of sugar beet. They also concluded that maximum root and extractable sugar yields were obtained at the rate of 69 kg .N /fed.

El-Ramady (1997), showed that, sucrose concentration and juice purity percentage of sugar beet were decreased by increasing rates of nitrogen up to 120 Kg. N / fed. While, increasing the rate of nitrogen significantly increased sugar yield.

Morrsi (1997), found that, sucrose % and purity of juice % in roots of sugar beet plant were highly significant increased by increasing nitrogen fertilization up to 90 Kg .N /fed.

Sarhan (1998) stated that increasing nitrogen fertilizer up to 100 KgN/fed. Significantly increased root and sugar yields / fed. and total soluble solids % but it markedly decreased sucrose and purity percentages of sugar beet . He also recommended that the highest values of yield components resulted with the application of nitrogen at the rate of 100 kg. N/fed. while the lowest ones were produced from the addition of 40 Kg. N / fed.

Mahmoud *et al.* (1999b): reported that increasing nitrogen level up to 100 Kg.N/fed. substantially improved weight of roots, depressed sucrose content in the root, purity, increased impurities in terms of Na,K and ∝-N contents in sugar beet juice, markedly depressed sugar recovery % .They also added that application of 80 Kg. N / fed. significantly increased root yield and gross sugar yield, there after, application of N- had marked effects on gross sugar yield. N - levels, did not significantly affect recoverable sugar yield. Each nitrogen increment over 100 Kg. N / fed. was accompanied by a marked increased in top yield .

Fahami Mahasen (1999), reported that nitrogen fertilizer levels exerted significant effects on all estimated characters of sugar beet. Raising nitrogen levels from 50 to 70 and 90 Kg.N/fed. enhanced vegetative growth characteristics as well as yield and its components, while it resulted in marked reduction in yield quality (TSS, sucrose % and purity).

Neana Shahr-zad (1999): found that nitrogen levels significantly affected fresh weights of root and leaves, top and sugar yields / fed. of sugar beet . On the other hand, it had no significant effects on TSS % during the two seasons. She added that increasing nitrogen fertilizer levels reduced juice purity.

Aly (2000), found that increasing nitrogen fertilizer from (0, 30 50, 70 and 90 Kg N/fed.) gave significant increased in fresh weight ∝. N %, top yield, root yield and sugar yield /fed. of sugar beet in both seasons. On the other hand sucrose %, TSS and purity % significantly decreased with increasing nitrogen fertilizer up to 90 Kg. N/ fed. in both seasons.

The aim of this investigation is to study the effect of different rates of K fertilizers on yield and quality of sugar beet crop, sugar beet juice and its content.

MATERIALS AND METHODS

Field experiments were conducted at second Belkas farm, Dakahlia governorate, Egypt, during the two successive growing seasons, 1999/2000 and 2000/2001 to study the following:

Effect of different levels of potassium fertilizers on sugar beet yield and sugar juice quality.

Experimental design:

The previous crop was rise (Orisa sp.) in the two seasons. Seeds of (Ras poly) sugar beet variety was sown on November,8 and 11 in the first and second seasons respectively . Some chemical and physical characteristics of the soil were estimated according to the procedures outlined by Jackson (1967). The experimental sites for the two seasons are shown in Table (1).

A complete randomized block design was followed, each plot contained (6 rows 7m. long X 0.6m. wide) in the two seasons. Sowing was achieved by hand in hills (20 cm a part) with approximately 4-5 seed balls per hill. Plants were thinned to one plant per hill after 45 and 46 day from sowing for the first and second season, respectively.

The experiment include 4 levels in Nitrogen treatment (60-80-100 and 120 Kg. N / fed). as ammonium nitrate (33.5% N). N fertilizer was added in two equal portions one after thinning and the other before 2nd irrigation.

Table (1): Mechanical and chemical soil characteristics at the experimental sites during the two seasons (1999/2000 and 2000/2001).

variables	Seasons	
	1999/2000	2000/2001
Mechanical analysis		
Coarse sand %	2.66	2.32
Fine sand %	18.86	17.85
Silt and clay %	21.34	21.21
Clay	57.14	58.62
Texture class	Clay	Clay
Chemical analysis		
Available nitrogen p.p.m	41	39
Available phosphorus p.p.m	39	38
Available potassium p.p.m	465	466
pH	7.9	8.4

All the practical operation such as thinning, hoeing, irrigation and pesticides were performed at the optimum level for the highest yield and best quality. Harvest date was on June 1, 2000 in the first season and on June 4, 2001 in the second season.

At harvest time, ten guarded plants were taken at random from the middle rows of each plot in the two seasons and the following data were recorded:

All the plants from each plot were harvested to determine top yield (ton / fed), root yield (ton /fed) on fresh weight and sugar yield (ton / fed)

Sugar yield (ton /fed) estimated by multiplying root yield by sucrose percentage.

To determine quality characters of sugar beet, about 20 kg of root were taken from each plot and subjected to analysis in Belkas company for sugar at Belkas, Dakahlia Governorate. The analyzed parameter were as follows:

Sucrose percentage, white sugar extrable, concentration of K, Na and alpha amino (α-N) as meq / L and Quality %. The afore mentioned parameters were estimated according to such Le – Doctes as described by Mc Ginnus (1984).

T.S.S was determined in juice of fresh roots using Hand Refractometer.

Actual purity of sugar beet was determined as out lined by Kearney (1971) and calculated by the following equation: -

Purity = sucrose x 100 / Total soluble solids (T.S.S)

Quality can be calculated by the following equation:

$Qz = D/pol*100 = B/pol*100$

Where D=(K+Na) 0.343 + α N 0.094 +0.29

And B = pol – (0.29m-0.343*K+Na –α N 0.0939)

Preparation of samples:

Root samples were cleaned with running tap water, each sample was grated separately with grater. The part used directly (as fresh) for determination of k, Na, amino N sucrose content T.S.S, and quality, the rest was kept in deep freezer until used or was air dried at oven with air draft for 16 hrs at 50°c to avoid any changes in cell content as reported by Monuelyan (1979). Air-dried samples were powdered and kept in refrigerator at 4°c until used.

Methods of analysis:

Determination of ash, %, crude fiber %and reducing sugar were determined according to the method described by A .O .A .C. (1990).
Soluble sugar was extracted from air dried samples according to the method of Quemener and Mercier (1980).
Determination of K and Na was carried out by flamephotometer
Determination of alpha amino nitrogen was carried out by fluorimeter [In venema automation b. v.] Belkas.

Statistical analysis:

Statistical analysis of data was carried out using the standard method of Randomized Complete Block Design and level of significance degrees (L .S. D) at 5 % and 1 % as illustrated by Gomez and Gomezy (1984) Compution procedures were done using SAS software package (1992).

RESULTS AND DISCUSSION

1-Effect of Nitrogen levels on yield and yield attributes of sugar beet.

1-1 Root Yield (ton / fed)

The effect of N- fertilizer level on root yield (ton / fed.) during the first and second seasons is presented in Table (2) Concerning to the effect of Nitrogen levels on root yield, it is clear that increasing N- fertilizer from 60 up to 120 kg. N / fed. significantly increased root yield ton / fed. in both seasons and their combine .The increases amounted to 3.9, 12.49 and 24 .85 % by increasing N / levels from 60 to 80 and from 60 to 100 and 60 to 120 kg. N / fed. , respectively. The increases in root yield can be attributed to the role of nitrogen in building up metabolites, which translated from leaves to developing roots. More, nitrogen fertilization up to 120 Kg. N/ fed., markedly increased leave area (cm), root length (cm), root diameter (cm), and root fresh weight (g/plant). Consequently, increasing N-levels markedly increased root yield /fed. The present results are in line with those obtained by Abd -El – Ghaffar et al. (1981), Basha (1984), Kumar and Zutshi (1991), Assey et al. (1992), El- Attar et al. (1995) and El- Hawary (1999).

1-2 Top yield (Ton /fed.):

The effects of N -fertilizer levels on top yield (ton /fed.), during the first and second seasons are presented in Table (2)In the first season and combined analyzer, nitrogen levels had significant effect on top yield / fed.

Table (2) Effect of potassium fertilizer application on Root , Top and sugar yields (Ton /fed)of sugar beet

Treatment Of potassium	Ton /fed Sugar yield			Root tiled Ton /feld			Top Yield Ton /feld		
	1999-2000	2000-2001	combine	1999-2000	2000-2001	Combine	1999-2000	2000-2001	combine
Zero Kg.K_2o/fed	5 785	4.657	5.221	30.329	25.175	27.752	8.200	6.887	7.544
24Kg.K_2o/fed	5.948	4.884	5.416	30.542	25.175	27.859	8.295	7.600	7.947
48 Kg.K_2o/fed	5.826	5.214	5.520	30.542	26.125	28.334	8.6273	7.600	8.136
F. Test	N. S	N. S	N. S	N. S	N. S	N. S	N.S	N.S	N.S
LSD 5 %	-	-	-	-	-	-	–	-	-
LSD 1 %	-	-	-	-	-	-	–	-	-

N . S No significant

This increase in top yield due to nitrogen fertilization may be attributed to the role of nitrogen in increasing number and leave area which consequently improved top fresh weight / plant as mentioned before.

These results are in accordance with these obtained Besheit *et al.* (1995) , El – Hennawy *et al.* (1998) And Shahr – zad (1999).

1-1-3-Sugar yield (Ton / fed.)

The effects of N- fertilizer levels on sugar yield (ton / fed.) during the first and second seasons are presented in Table (2)

In both seasons and their combine, nitrogen fertilization had significant effect on sugar yield / fed. It is clear that each nitrogen increment markedly increased sugar yield. The increase amounted to 4.45, 10.08 and 15 .16 % by increasing N - levels from 60 to 80 and from 60 to 100 and from 60 to 120 kg. N / fed. respectively. The highest sugar yield (7.52 and 5.43 ton / fed. in the first and second seasons, respectively were obtained when beet plants fertilized with 120 kg. N / fed. The increase in sugar yield could attribute to the role of nitrogen in building up metabolites which translated from leaves to developing roots, N - application markedly increased root yield .It is worth to mention that the reduction in sucrose content accompanying N - application was compared by the increase in roots yield and finally increased sugar production per unit area. Similar results were concluded by Zeidan et al (1987) Mahmoud et al (1990 b) Kumar and zutshi (1991) El - Attar et al (1995) and El- Hawary (1999).

2- Effect of different levels of Nitrogen fertilizers on juice quality characteristics of sugar beet.

2-1- Alfa amino nitrogen %:

Data presented in Table (3) revealed that. Increasing N- level from (60 – 80- 100 – 120) kg .N / fed. increased significantly α-amino N % in both seasons and combine. The increase in α-amino N % due to increasing nitrogen fertilizer rates might be attributed to the role of excessive amount of nitrogen application which stimulate beet plants to transfer more photosynthesis to the top and reduce the sucrose concentration of storage roots as well as the increase of root α-amino N contents. Similar results were obtained by Mohamed *et al.* (1999) and Aly (2000).

Table (3): Effect of nitrogen fertilizer application on the chemical composition of sugar beet root (as fresh weight)

Treatment of Nitrogen	∝ Amino nitrogen %			(Na) sodium%			(K) potassium %			Sucrose %			T.S.S %		
	1999-2000	2000-2001	Combine	1999-2000	2000-2001	Combine	1999-2000	2000-2001	Combine	1999-2001	2000-2001	Combine	1999-2000	2000-2001	Comb.
60 Kg. N/ fed.	0.027	0.043	**0.035**	0.025	0.064	**0.044**	0.207	0.270	**0.239**	18.900	18.260	**18.580**	23.200	21.620	**22.410**
80 Kg.. N/ fed.	0.034	0.048	**0.041**	0.029	0.066	**0.048**	0.025	0.0278	**0.251**	19.000	18.760	**18.880**	23.300	21.920	**22.610**
100 Kg.. N/ fed	0.035	0.050	**0.043**	0.031	0.067	**0.049**	0.226	0.284	**0.255**	19.000	19.220	**19.110**	23.800	22.680	**23.240**
120 Kg. N/ fed	0.036	0.052	**0.044**	0.032	.068	**0.050**	0.227	0.285	**0.256**	18.900	18.580	**18.740**	23.900	22.760	**23.330**
F. test	**	**	**	**	**	**	**	**	**	N.S	**	**	**	*	**
LSD 5 %	0.004	0.002	**0.002**	0.001	0.001	**0.001**	0.001	0.001	**0.001**	-	0.259	**0.177**	0.187	0.165	**0.457**
LSD 1 %	0.005	0.003	**0.003**	0.002	0.002	**0.002**	0.002	0.002	**0.002**	-	0.363	**0.240**	0.262	-	**0.619**

(continued)

Treatment Of Nitrogen	Purity %			Quality %			Ash %			Reducing sugars %			Fiber %			White sugar ext.		
	1999-2000	2000-2001	Comb.	1999-2000	2000-2001	Comb.	1999-2000	2000-2001	Comb.	1999-2001	2000-2001	Comb.	1999-2000	2000-2001	Comb.	1999-2000	2000-2001	Comb.
60 Kg . N/ fed.	81.800	84.388	**83.094**	86.000	78.380	**82.190**	1.532	1.126	**1.329**	0.129	0.280	**0.204**	5.200	4.770	**4.985**	16.25	14.27	**16.263**
80 Kg.. N/ fed.	81.500	84.644	**83.072**	85.000	78.220	**81.610**	1.404	1.594	**1.499**	0.113	0.200	**0.157**	5.300	5.110	**5.205**	16.15	14.73	**15.440**
100 Kg.. N/ fed .	79.820	85.052	**82.436**	84.000	78.590	**81.295**	1.542	0.926	**1.234**	0.201	0.116	**0.159**	5.350	5.188	**5.268**	15.96	15.092	**15.526**
120 Kg. N/ fed .	79.070	84.476	**81.773**	84.000	78.320	**81.160**	1.543	1.160	**1.352**	0.219	0.219	**0.219**	5.400	5.208	**5.304**	15.88	14.552	**15.216**
F. test	**	N. S	**	N.S	**	N.S	**	**	**	**	**	**	**	**	**	N.S	**	N.S
LSD 5 %	0.443	-	**0.358**	-	0.176	-	0.001	0.134	0.063	0.009	0.009	**0.005**	0.022	0.078	**0.038**	-	0.405	-
LSD 1 %	0.443	-	**0.358**	-	0.247	-	0.002	0.188	**0.086**	0.013	0.010	**0.007**	0.032	0.109	**0.052**	-	0.568	-

N.S Not significant * significant ** High significant

2-2- Sodium % (Na)

Data presented in Table (3) revealed that increasing N- level from (60-80-100-120) kg. N/ fed. increased significantly sodium (Na) % in both seasons and its combine. This increase is due to the react of Na. with acids, which formed from the role of nitrogen. Similar results were obtained by Sobh *et al.* (1992) and El – Attar *et al.* (1995).

2-3 –Potassium % (k)

Data in Table (3) were significant increased in K % with increasing N-rate from (60- 80- 100 and 120) kg N / fed. This increase is due to the react of K. With acids, which formed from the role of nitrogen. Similar results were obtained by Sobh *et al.* (1992) and El –Attar *et al.* (1995).

2-4-T. S.S%

Data in Table (3) indicated that T S S % significantly increased with increasing N – rate from (60-80-100- and 120) Kg. N / fed. in the first seasons and combine . But this increase was not significant due to the increasing sucrose % with increasing nitrogen from (60 to 80 and 100) in the second season because of the less fertility of soil.(need more nitrogen). *Similar* results were obtained by El - Shafei (1991) and Sarhan (1998).

2-5- Sucrose percentage %

Data presented in Table (3) revealed that sucrose percentage of sugar beet juice was significantly affected by different nitrogen treatments. It is obvious that sucrose % was significantly decreased with increasing N – level from 100 Kg N/ fed. to 120 kg .N / fed. The decrease in sucrose percentage accompanied to the increase in N-levels can be ascribed to the role of nitrogen in increasing non – sucrose substances such as proteins and amino acids, and hence, decrease sucrose percentage Similar results indicate that excessive nitrogen fertilizer reduced sucrose % Kumer and Zutshi (1991). El – Ramady(1997).

2-6-Purity %

Data in Table (3) show that increasing N- rate from (60.80.100. and 120) Kg. N / fed.revealed a significantly decrease in purity by different nitrogen treatments in the first season and combine. This decrease in purity is due to the increase in TSS (total soluble solids) with increasing nitrogen treatments while in the second season purity was insignificant increase by increasing N level from 60-100kg N / fed.. (Similar results were obtained by Sobh et al (1992), Mahasen (1999) and Shar-Zad (1999).

2-7- Quality %

Regarding to nitrogen effects on juice quality of sugar beet. , data given in Table (3) and indicate that increasing N. level decreased juice quality . This decrease was not significant with increasing N rate from (60-80-100-120) Kg. N / fed. Similar results were obtained by Halvorson and Hartman (1988).

2-8-Reducing sugars (%)

Data presented in Table (3) revealed that reducing sugars % of sugar beet juice was significantly affected by different nitrogen treatments. It is obvious that reducing sugars decreased with increasing N level to 80 Kg N / fed while it increased again with increasing N/levels up to 120 Kg N/ fed. At the first season and combine

The increasing in reducing sugars due to the role of nitrogen is explain by increasing non – sucrose substances such as amino acids, which affect on pH and hence decrease sucrose percentage and increase invert it to reducing sugars. From this data it was found that the best level was 80 Kg N / fed. Similar ranges were obtained by Moussa (1990), Badawy (1992), and Abou Shadi (1994)

2-9- ASH %

Data presented in Table (3) revealed that ash % of sugar beet root was significantly affected by different nitrogen treatments. It is obvious that ash % increased with increasing N - level up to 80 Kg. N / fed., while it decreased at level 100 Kg. N/ fed (at the second season and combine). This decreased is due to the increase in sucrose %. then ash increased with the increasing N to 120 Kg N / fed . Similar range was obtained from Moussa (1990) and Abou Shadi (1994). From this data it could be concluded that the best level is 100 Kg. N / fed.

2-10- Fiber %

Data in Table (3) show that, in both seasons increasing N - rate up to 120 Kg .N / fed. revealed significantly increase in fiber% by different nitrogen treatment. This increase is due to increasing cells which consists from the role of nitrogen and accumulate glucose to cellulose. *Similar range were obtained* from Abou Shadi (1994)(No more available data was found in the literature on the effect of nitrogen treatments). on ash %, fiber % and reducing sugars of sugar beet root .)

2-11 - White sugar extrable %

Data presented in Table (3) revealed that increasing N- level from (60-80-100) kg. N / fed. increased significantly white sugar extrable % in second season while it decreased at 120 kg. N/fed. This may be due to the increasing in reducing sugars. Similar results were obtained by Beshet *et al.* (1995)) and Mahmoud *et al.* (1999).

In conclusion,nitrogen treatments of sugar beet plants affected the technological characteristics of sugar which can be extracted from the beets as summarized in Table (4).

Table (4)The technological characters of sugar , which can be extracted from sugar beet as affected by nitrogen treatments

Treatments	Sucrose %	Sugar yield ton / fed.	White sugar ext. %	Reducing sugars gm. / 100 ml.	Purity %	Quality %
60 kg. N/ Fed.	18.580	5.079	15.263	0.204	83.094	82.190
80 kg. N/ Fed.	18.880	5.337	15.440	0.157	83.072	81.612
100 kg. N/ Fed.	19.110	5.849	15.526	0.159	82.436	81.295
120 kg. N/ Fed.	18.740	5.434	15.216	0.219	81.773	81.160

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((دراسات زراعية وكيمائية وتكنولوجية على بنجر السكر))
٢-تأثير إضافة النيتروجين على كمية المحصول - التركيب الكيماوى وصفات الجودة لعصير بنجر السكر الناتج

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أجريت هذه الدراسة بهدف الوصول إلى أفضل نسبة من التسميد النيتروجيني اللازم لبنجر السكر للحصول على أعلى محصول من جذور بنجر السكر وفي نفس الوقت على أحسن صفات جودة لعصير بنجرا لسكر الناتج ولقد تمت هذه الدراسة في المزرعة بناحية بلقاس ثاني مركز بلقاس محافظة الدقهلية خلال موسمين متتالين (١٩٩٩ -٢٠٠٠)، (٢٠٠٠ -٢٠٠١م) وقد تم إضافة مستويات مختلفة من التسميد النيتروجيني من(٦٠ -٨٠ -١٠٠ -١٢٠)كجم نيتروجين / فدان وقد أضيف السماد النيتروجيني على صورة نترات الأمونيوم (٣٣،٥نيتروجين) تم زراعة صنف بنجر السكر (راس بولي) في الموسمين في موعد ١٩٩٩/١١/٨ في العام الأول وفى موعد ٢٠٠٠/١١/١١ في العام الثاني وجميع المعاملات الزراعية أجريت تبعا للتوصيات الفنية المتبعة فى مصر . وقد خلصت الدراسة إلى النتائج التالية :-

إن زيادة إضافة النيتروجين من (٦٠-٨٠-١٠٠-١٢٠)كجم نيتروجين / فدان تعمل على زيادة محصول الجذور والورق ومحصول السكر المنتج من الفدان (بالطن) و- الفا امينو نيتروجين %و الصوديوم %والبوتاسيوم%وتزيد نسبة المواد الصلبة الذائبة الكلية وتزيد أيضا السكريات المختزلة بالعصير كما تزيد نسبة الألياف.بينما يقل نسبة السكروز والسكر الأبيض المستخلص بزيادة معدل التسميد حتى١٢٠ كجم نيتروجين وبالتالي تقل النقاوة والجودة.

أفضل معدل تسميد نيتروجينى من (٨٠-١٠٠) كجم /فدان٠