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Response of Sugar Beet to Micronutrients Foliar Spray under Different Nitrogen Fertilizer Doses

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THE PRESENT investigation was carried out at the Experimental Farm of Sakha Agricultural Research Station, ARC, at Kafrelsheikh Governorate, Egypt during 2012/2013and 2013/2014 seasons. Two field experiments were conducted to study the effect of different foliar spraying treatments, *i.e.,* spraying with distilled water, spraying with micronutrients mixture once after 60 days from sowing and twice after, 60 and 75 days from sowing and four nitrogen rates, *i.e.,* 60, 75, 90 and 105 kg N/fad (as soil application) on yield, yield components and quality of sugar beet as well as to minimizing costs of mineral fertilization and environmental pollution. The experimental design was split plot design with three replications. The main results of this investigation clear that nitrogen fertilizer up to 105 kg N/fad and foliar twice with micronutrients mixture significantly increased root length and diameter, dry matter accumulation/plant, top and root yield/fad as well as sugar yield/fad in both seasons. The inverse was true in TSS, sucrose and juice purity percentages. Whereas, raising soil application of nitrogen from 60 to 105 kg N/fad and foliar spraying with micronutrients mixture caused a marked decrease in the previously mentioned traits.

Generally, it can be concluded that soil application of nitrogen fertilizer at the rate of 105 kg N/fad and foliar spraying sugar beet plants twicely with micronutrients mixture could be recommended for optimum root and sugar yield per unit area.

Keywords: Sugar beet, Micronutrients Foliar, Nitrogen .

Sugar beet *(Beta vulgaris L.)* is the second source for sugar production after sugar can. The Egyptian Government encourages sugar beet growers to increase the cultivated area with sugar beet for decreasing the gab between sugar production and consumption. Improvement of sugar beet production can be achivied through optimizing the cultural practices.

Nitrogen is an essential nutrient for sugar beet plants, decidedly the amount and method of nitrogen application required to produce the maximum root and sugar yields. Soil application of fertilizers is the oldest and most common method practiced throughout the world for all crops. It was based on the fact that primary function of the root is to plant nutrient from the soil.

Nitrogen application as soil fertilizer increased length and diameter of roots (EL- Zayat, 2000; Nemeat-Alla & El- Geddawy, 2001; Abo El –Wafa, 2002 and Badr, 2004) dry mater accumulation/plant (Hassanin & Elayan, 2000; Nemeat-Alla *et al*., 2002; Ouda, 2006; Aboushady *et al.*, 2007; EL- Fedaly *et al.*, 2011 and Essam *et al.*, 2012), root, top and sugar yields /fad (Ouda, 2000; Bader, 2004; Nemeat-Alla *et al.*, 2007a; Allam, 2008, and Essam *et al*., 2012), TSS, sucrose and juice purity percentages were decreased by increasing nitrogen rates (Azab *et al.*, 2000; Ouda, 2006; Allam, 2008; El- Fedaly *et al*., 2011 and Essam *et al.*, 2012).

Most of Egyptian soil suffered from micronutrients deficiency as a results of the intensive cropping, low organic mater content in soil and alkaline condition of soil which decreases the availability of many nutrients. Times of micronutrients application gave the maximum yield and quality for sugar beet crop. Therefore, fertilization rate for nitrogen and number of application for micronutrients is very important and become target to many investigators, Abd El- Hadi *et al.* (2002), Abd El- Gawad *et al.* (2004), Ismail & AboEl- Ghait (2005), Nemeat- Alla *et al.* (2007a) and Nemeat-Alla *et al.* (2009) reported that root dimensions significantly affected by application with micronutrients which gave maximum root dimensions. Concluded that maximum dry matter was obtained when sugar beet fertilized with micronutrients, the highest top, root and sugar yield by high rate of nitrogen and gave micronutrients produced maximum by Abd El- Hadi *et al.* (2002), Ramadan & Nassar (2004), Nemeat-Alla (2005) and Nemeat-Alla *et al.* (2009). On the other hand, the high levels of nitrogen or micronutrients gave the lowest values of quality characters such as sucrose total soluble solids and purity percentages as reported by Ramadan & Nassar (2004), Aboushady *et al.* (2007), Nemeat-Alla *et al*. (2009) and Salim *et al.* (2012).

The objective of this study was increasing sugar beet productivity by determine the optimum nitrogen rate and micronutrients of sugar beet at Sakha, Kafrelshiek Governorate.

Materials and Methods

Two field experiments were carried out at the Experimental Farm of Sakha Agricultural Research Station, Agricultural Research Center, Egypt, during 2012/2013 and 2013/2014 seasons. The preceding crop was maize in the two seasons. The chemical analysis of the experimental soil is presented in Table 1. A split plot design with three replicates was used, the main plots were occupted by micronutrient spraying whereas, the nitrogen fertilizer rates were allocated in the sub-plots. The studied fertilizer treatments were as follows:

Spraying treatments

1. Spraying with, water.
2. Spraying with micronutrients mixture once after 60 days from sowing.
3. Spraying with micronutrients mixture twice after 60 and 75 days from sowing.

Nitrogen level

1. 60 kg N/fad.
2. 75 kg N/fad.
3. 90 kg N/fad.
4. 105 kg N/fad.

TABLE 1. Chemical analysis of the experimental soil (0-30 cm in depth) (2012/2013 and 2013/2014).

Season	PH 1.2-5	EC Mmhas/cm	Organic mater%	Fe	Zn	Mo	Mn	B	Cu
				Meq/l					
2010/2011	8.2	3.45	1.82	0.72	0.44	0.23	1.88	0.39	0.53
2011/2012	8.1	3.31	1.85	0.75	0.40	0.24	1.97	0.38	0.56

Solution of micronutrients mixture include iron sulphate, zinc sulphate, ammonium molybdate, manganes sulphate and boric acid (each at the rate of 1.0 g / 1) in addition to copper sulphate (at the rates of 0.5 g/l). Each sub-plot has five ridges 60 cm apart and 7m long. Sowing took place on 15th Nov. and 17th Nov. in both seasons, respectively.

Seed of multigerm cultivar "top" was sown in hill 20 cm apart. Plants were thinned to one plant per hill after 4 true leaves from sowing. Nitrogen was applied in the from of Urea (46% N) in two equal doses. The first one was applied after thinning and the 2nd dose 25 days later. The other cultural practices for growing sugar beet were conducted as recommended.

At maturing (205 days from sowing), a sample of 10 plants was taken at random to determine root dimensions and dry matter accumulation. TSS% was determine by using hand Refractometer, sucrose percentage was determine according to Le Docte (1927) and juice purity percentage was calculated according the following equation according to Silin & Silina (1977).

$$\text{Purity \%} = \text{Sucrose \%} / \text{TSS \%}.$$

Sugar yield per faddan was calculated according the following equation.

$$\text{Sugar yield (ton/fad)} = \text{Root yield (ton/fad)} \times \text{Sucrose \%}.$$

The analysis of variance was carried out according to Gomez & Gomez (1984). Treatment means were compared by Duncan's multiple Range test (Duncan, 1955). All statistical analysis were performed using analysis of variance technique by means of "MSTAT" computer software package.

Results and Discussion

Agronomical studies

Growth characters

Root dimensions (length and diameter) were significantly affected by spraying with micronutrients mixture in the two seasons (Table 2). Sugar beet plants, which sprayed with micronutrients mixture twice was superior in root length and diameter compared to other treatments. These results are in line with those reported by Nemeat-Alla & El-Geddawy (2001) and Nemeat-Alla & Mohamed (2005).

TABLE 2. Root length and root diameter (cm) as affected micronutrients foliar spray and nitrogen fertilizer (2012/2013 and 2013/2014 seasons).

Factor	Root length (cm)		Root diameter (cm)	
	2012/2013	2013/2014	2012/2013	2013/2014
Micronutrient	*	*	*	*
Water	28.43c	29.62c	10.89c	11.29c
MN-Once	28.94b	30.14b	11.18b	12.18a
MN-Twice	29.85a	31.17a	12.04a	12.41a
N. rate (kg N/fad)	**	**	**	**
60	26.15d	27.23d	9.51d	10.25d
75	28.32c	29.16c	10.9c	11.53c
90	29.77b	31.19b	11.8b	11.92b
105	31.56a	33.04a	13.27a	14.13a
Interaction	*	*	*	N.S

* and N.S indicated P<0.05 and not significant, respectively. Means within the same column for each factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test. MN (micronutrients).

Increasing nitrogen level from 60 to 105 kg / N fad significantly increased root dimensions (length and diameter) at harvest in both seasons. The highest values of root length and diameter was recorded at the level of 105 kg N / fad This result is in agreement with Neameat-Alla & El-Geddawy (2001) which concluded that 115 kg N/fad caused significant effect on root diameter.

The interaction between micronutrients foliar spray and nitrogen rate had significant effect on root length in two seasons, while root diameter affected in the first season only (Tables 3 and 4). Beet plants sprayed two times with micronutrients mixture under 105 kg N / fad produced the highest root length and diameter. While beet plants of the control treatment and nitrogen rate 60 kg N/fad gave the lowest root length and diameter.

TABLE 3. Root length as affected by the interaction between micronutrients foliar spray fertilizer (2012/2013 and 2013/2014 seasons).

Micronutrients	N. rate (kg N/fad)			
	60	75	90	105
2012/2013 seasons				
Water	24.95h	27.84ef	30.00c	30.95b
MN-Once	24.87g	28.37de	30.08c	30.98b
MN-Twice	25.73f	28.75d	30.73c	32.75a
2013/2014 seasons				
Water	27.00h	28.71f	30.35de	32.42b
MN-Once	27.62g	29.15ef	31.15cd	32.63b
MN-Twice	28.88f	29.08c	32.08c	34.07a

Means designed by the same letter are not significantly at 5% level, using Duncan's multiple range test. MN (micronutrients).

TABLE 4. Root diameter (cm) as affected by the interaction between micronutrients foliar spray and nitrogen fertilizer (2012/2013 season).

Micronutrients	N. rate (kg N/fad)			
	60	75	90	105
Without spraying				
Water	8.93g	10.71ef	11.18cd	12.47b
MN-Once	9.28g	10.92ef	11.53c	13.00b
MN-Twice	10.32f	11.07de	12.68b	14.07a

Means designed by the same letter are not significantly at 5% level, using Duncan's multiple range test.

Dray matter accumulation (g/plant)

Foliar application of micronutrients mixture had a significant effect on dry matter accumulation in both seasons (Table 5). Plants sprayed with micronutrients mixture twice substantially recorded the greatest dry matter accumulation, while the lowest one was associated with control (spraying with water). Similar results were obtained by Nemeat-Alla & El-Geddawy (2001).

TABLE 5. Dray matter accumulation (g/plant) and root/top ratio% as affected by micronutrients foliar spray and nitrogen fertilizer in 2012/2013 and 2013/2014 seasons.

Factor	Dray matter (g/plant)		root/top ratio%	
	2012/2013	2013/2014	2012/2013	2013/2014
Micronutrients	**	**	**	**
Water	203.77c	206.05c	4.72c	4.41b
MN-Once	207.01b	209.97b	4.86b	4.55a
MN-Twice	209.11a	211.00a	5.05a	4.68a
N. rate (kg N/fad)	**	**	**	**
60	202.87c	203.43d	5.06a	4.68a
75	203.84bc	206.77c	4.88b	4.55b
90	205.29b	208.44b	4.87b	4.53b
105	214.22a	217.40	7.70c	4.43c
Interaction	**	*	N.S	N.S

* and N.S indicated P<0.05 and not significant, respectively. Means within the same column for each factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test. MN (micronutrients).

Nitrogen rate had a significant effect on dry matter accumulation (g / plant) in the both seasons (Table 5). Application of 105 kg N / fad produced the highest dry matter accumulation in the two seasons, while application of 60 kg N / fad produced the lowest dry matter accumulation per plant. Similar results were obtained by El-Zayat (2000), Badr (2004), Nemeata-Alla (2005), Nemeat-Alla *et al.* (2007), El-Fadaly *et al.* (2011) and Essam *et al.* (2012).

The interaction between micronutrients foliar spray and nitrogen rates had a significant effect on dry matter accumulation/plant in the two seasons (Table 6). Spraying micronutrients twice nitrogen rates in combination with 105 kg N / fad resulted in the highest dry matter accumulation at harvest in both seasons.

TABLE 6. Dry matter as affected by the interaction between micronutrients foliar spray and nitrogen fertilizer (2012/2013 and 2013/2014 seasons).

Micronutrints	N. rate (kg N/fad)			
	60	75	90	105
2012/2013 seasons				
Water	201.56g	202.52fg	203.90ef	207.12c
MN-Once	202.99fg	203.94ef	205.86cd	215.35b
MN-Twice	204.07ef	205.16de	207.00c	220.20a
2013/2014 seasons				
Water	201.84i	205.83fg	207.69de	208.85cd
MN_Once	203.69h	208.60ef	208.53cd	220.88b
MN-Twice	204.76gh	207.69de	209.09c	222.46a

Means designed by the same letter are not significantly at 5% level, using Duncan's multiple range test. MN (micronutrients).

Root/top ratio

Data given in Table 5 revealed the effect of foliar application of micronutrients mixture and nitrogen rate on root / top ratio (calculated on base of dry weight). Spraying micronutrients resulted in highly significant differences in root/top ratio in plants sprayed twice compared with those sprayed once.

Nitrogen rate exerted highly significant effect on root/top ratio in both seasons. Adding 105 kg N / fad produced the highest root/top ratio in the two seasons, while adding 60 kg N / fad produced the lowest value in the two seasons. In the connections Hassanin & El-Elayan (2000), Nemeat-Alla *et al.* (2002) and Nemeat-Alla (2005) showed that root/top ratio was increased with increasing N- fertilizer when soil N is limited.

The interaction between spraying micronutrients and nitrogen rate had significant effect on root/top ratio in both seasons (Table 6).

Top, root and sugar yield/fad

Top yield (ton/fad).

Data presented in Table 7 indicated that spraying of micronutrients mixture increased top yield in both seasons. Application of micronutrients mixture twice gave the highest top yield/fad. The obtained results are in agreement with those found by Nemeat-Alla & El-Geddawy (2001).

Nitrogen level of 105 kg N/fad significantly increased top yield to maximum values (11.58 and 12.04 ton/fad) in the first and second season, respectively. These observations are in agreement with those reports by Zalat & Ibrahim (2002), Mostafa *et.al.* (2005) and Moustafa (2006).

The interaction between spraying micronutrients mixture and nitrogen level had a significant effect on top yield in both seasons (Table 7). Table 8 shows that the maximum weight of top yield was produced with combination of applying 105 kg N/fed and foliar twice micronutrients.

TABLE 7. Top, root and sugar yield (ton/fad) as affected by spraying micronutrients and nitrogen fertilizer in 2012/2013 and 2013/2014 seasons.

Factor	Top yield (ton/fad)		Root yield (ton/fad)		Sugar yield (ton/fad)	
	2012/13	2013/14	2012/13	2013/14	2012/13	2013/14
Micronutrients	*	*	*	*	*	*
Water	8.53c	8.57c	26.27c	27.21c	3.75c	4.02c
MN-Once	9.46b	9.92b	27.08b	27.99b	3.82b	4.10b
MN-Twice	9.54a	10.62a	27.87a	28.78a	3.87a	4.19a
N. rate (kg N/fad)	*	**	*	**	*	*
60	7.32d	7.79d	24.43d	26.03d	3.61c	3.93c
75	8.85c	9.55c	27.08c	29.81c	3.82b	4.42b
90	9.61b	10.11b	27.98b	32.06b	3.24b	4.66a
105	11.58a	12.04a	28.81a	34.08a	3.96a	4.69a
Interaction	*	*	*	*	N.S	N.S

* and N.S indicated P<0.05 and not significant, respectively. Means within the same column for each factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test. MN (micronutrients).

TABLE 8. Top yield as affected by the interaction between spraying micronutrients and nitrogen fertilizer (2012/2013 and 2013/2014seasons).

Micronutrients	N. rate (kg N/fad)			
	60	75	90	105
2012/2013 seasons				
Water	6.30h	8.07d	9.07ed	10.67c
MN-Once	7.50g	8.98ed	9.62d	11.73b
MN-Twice	8.16f	9.50d	10.15cd	12.34a
2013/2014 seasons				
Water	6.83h	8.68de	9.62d	11.17c
MN-Once	7.86g	9.64d	10.08d	12.10b
MN-Twice	8.67f	10.33cd	10.62c	12.84a

Means designed by the same letter are not significantly at 5% level, using Duncan's multiple range test. MN (micronutrients).

Root yield (ton/fad)

It is clear from Table 7 that spraying micronutrients mixture twice significantly increased root yield/fad to maximum values (27.87 and 28.78 ton/fad) in the first and second season, respectively. Similar results were obtained by Nemeat-Alla & El-Geddawy (2001).

Nitrogen rate exerted significant effect on root yield per faddan in the two seasons. Application at 105 kg N / fad produced the highest root yield in the two seasons. The lowest root yield per faddan was recorded at minimum nitrogen rate. Similar results were obtained by Nemeat-Alla & EL-Geddawy (2001) who found that increasing nitrogen level significantly increased root yield.

The effect of interaction between spraying micronutrients mixture and nitrogen rate was significant on root yield per faddan in both seasons, (Table 9). The highest root yields was obtained with spraying micronutrients mixture and soil application of 105 N / fad. While the lowest root yield were obtained with spraying micronutrients mixture and application of 60 kg N / fad

TABLE 9. Root yield as affected by the interaction between spraying micronutrients and nitrogen fertilizer (2012/2013and 2013/2014 seasons).

Micronutrients	**N. rate (kg N/fad)**			
	60	**75**	**90**	**105**
2012/2013 seasons				
Water	23.72f	26.27cd	27.12c	27.97b
MN-Once	24.47e	27.04c	28.08b	28.75b
MN-Twice	25.10d	27.92c	28.75b	29.70a
2013/2014 seasons				
Water	23.40h	25.10e	29.28cd	31.06b
MN-Once	24.09g	26.70de	29.70cd	23.02b
MN-Twice	24.75f	26.84e	30.44c	33.09a

Means designed by the same letter are not significantly at 5% level, using Duncan's multiple range test. MN (micronutrients).

Sugar yield (ton/fad)

Data presented in Table 7 indicated that sugar yield was significantly influenced by foliar application of micronutrients in the two seasons. Beet plants which were sprayed twice by micronutrients mixture exceeded those sprayed once in sugar yield in the two seasons. In both seasons, sugar yield per faddan was significantly affected by nitrogen rate. The highest sugar yield resulted from 105 kg N / fad in both seasons (Table 7). It worth mentioning that depressive effect of nitrogen on sugar % and juice purity % was compensated by higher root yield and finally increased sugar yield/fad. Similar results were obtained by Zalat & Ibrahim (2002), Ismail & AboEl-Ghait (2005), Moustafa (2006), Aboushady *et al.* (2007), El-Fadaly *et al.* (2011) and Salim *et al.* (2012). Interaction between foliar spray of micronutrient and soil applied nitrogen had no significant effect on this trait in both seasons.

Quality parameters

Total soluble solids percentage (TSS%)

From Table 10 it is clear that TSS% was significantly affected by foliar application of micronutrients in both seasons. TSS% was gradually decreased by increasing application of micronutrients mixture.

Increasing nitrogen level from 60 to 105 kg N / fad decreased TSS% at harvest in both seasons. TSS% was decreased from 21.58 and 21.46 to 19.92 and 20.61 % as N-level increased from 60 to 105 kg N / fad in the two seasons, respectively. Hassanin & El-Elayan (2000), Nemeat-Alla & El-Geddawy (2001) and Badr (2004) came to similar results and same conclusion.

The interaction effect between spraying micronutrients mixture and nitrogen rate was not significant on TSS% in the two seasons.

TABLE 10. Total soluble solids (TSS%), sucrose percentage and juice purity as affected by spraying micronutrients and nitrogen fertilizer in 2012/2013 and 2013/2014 seasons.

Factor	TSS%		Sucrose percentage%		Juice purity%	
	2012/13	**2013/14**	**2012/13**	**2013/14**	**2012/13**	**2013/14**
Micronutrients	*	**	*	*	*	*
Water	21.07a	21.43a	14.27a	14.77a	80.27a	73.24a
MN-Once	20.67b	21.10b	14.10b	14.65b	79.29b	71.43b
MN-Twice	20.53c	20.93c	13.90c	14.56c	79.39c	71.59b
N. rate (kg N/fad)	*	*	*	*	**	**
60	21.58a	21.46a	14.78a	15.11a	83.63a	72.54a
75	20.69b	21.32a	14.12b	14.83b	78.97b	71.54b
90	20.54c	21.21b	13.73c	14.52c	78.49c	70.39c
105	19.92d	20.61c	13.75c	13.77d	76.54c	68.71d
Interaction	N.S	N.S	N.S	N.S	N.S	N.S

* and N.S indicated $P<0.05$ and not significant, respectively. Means within the same column for each factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test. MN (micronutrients).

Sucrose percentage

Data in Table 10 show that sucrose percentage was significantly affected by foliar application of micronutrients in the two seasons. The lowest sucrose percentage was obtained from application of beet plants sprayed with micronutrients mixture twice compared with those sprayed once.

Increasing nitrogen fertilization significantly decreased sucrose concentration in beet root in both seasons. The lowest percentage of sucrose was recorded by 105 kg N/fad in the two seasons. Similar results were obtained by Abo EL-Wafa (2002), Moustafa (2006), Ouda (2007), El-Fedaly *et al.* (2011) and Essam *et al*. (2012). The interacrion effect between spraying micronutrients mixture and nitrogen rate was not significant on sucrose percentage in the two seasons .

Juice purity percentage

The results in the Table 10 showed that repeating foliar spray with micronutrients mixture decreased juice purity percentage in sugar beet root in both seasons. Similar results were obtained by Nemeat-Alla & El-Geddawy (2001).

Juice purity was decreased significantly by increasing nitrogen rate up to 105 kg N/fad. This results is similar to that of El-Geddawy *et.al.* (2007), Abo El-Wafa (2002), Ismail (2002), Nemeat-Alla (2005), Nemeata-Alla *et al.* (2009) and Essam *et al.* (2012).

None of interaction had significant effect on juice purity percentage in both seasons.

Generally, it can be concluded that the high rate of nitrogen (105 kg/fad) in combination with spraying beet plants twicely with mixture of micronutrients can achieve maximum yield and quality.

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استجابة بنجر السكر للرش بالعناصر الصغرى تحت معدلات السماد النيتروجيني

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تم دراسة مدى استجابة محصول وجوده بنجر السكر للرش بمخلوط من بعض العناصر الصغرى مع مستويات مختلفة من السماد النيتروجيني من خلال تجربتين زراعيتين في الموسمين الزراعيين٢٠١٣/٢٠١٢ ، ٢٠١٤/٢٠١٣ أقيما في المزرعة البحثية لمحطة سخا للبحوث الزراعية في محافظة كفر الشيخ. وقد استخدم التصميم الإحصائي قطع منشقة مرة واحده في ثلاثة مكررات وقد تم وضع رش العناصر الصغرى (سلفات نحاس – سلفات الحديد – سلفات الزنك – سلفات المنجنيز- موليبدات الامونيوم – حمض البوريك) في القطع الرئيسية (بدون رش (مياه فقط)، رشة واحده ، رشتين). بينما وضع في القطع المنشقة معدلات التسميد النيتروجيني الأربعة (٦٠ ، ٧٥ ، ٩٠ ، ١٠٥ كجم ن /ف). وقد أجريت كل العمليات الزراعية اللازمة للمحصول حسب توصيات المحصول والمتبعة فى مناطق زراعة البنجر.

وقد أوضحت النتائج المتحصل عليها في هذه الدراسة انه بزيادة معدلات التسميد النيتروجيني من ٦٠ إلى ١٠٥ كجم ن / ف والرش بالعناصر الصغرى مرتين خلال الموسم قد أدى إلي زيادة معنوية في كل من قطر الجذر – طول الجذر والمادة الجافة / نبات وكذلك محصول كلا من العروش والجذور ومحصول السكر بالطن / ف وعلى الجانب الأخر المختلف أدت هذه المعاملات إلى نقص فى قيم كلا من النسبة المئوية للمواد الصلبة الذائبة الكلية في العصير ونسبة السكروز المئوية وكذلك نقاوة العصير .

عموما يمكن القول انه بزيادة معدل التسميد النيتروجيني إلى ١٠٥ كجم / ف مع الرش مرتين بمخلوط من العناصر الصغرى قد أدى إلى زيادة محصول بنجر السكر كماً ونوعا تحت ظروف البحث في محافظة كفر الشيخ.