EFFECT OF SOME CULTURAL PRACTICES ON SUGAR BEET SEEDLINGS

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Abstract

Density of sugar beet plants is a limiting factor for sugar beet production, The present work was carried out to study the effect of some agricultural practices on sugar beet seedlings(transplants) to avoid and reduce the injury of seedlings by farmers without paper pots and to increase the density to 10 plants /m^2 to give the highest number of plants per unit area (feddan). Two field trails were carried out at Experimental Farm of Sakha Agricultural Research Station at Kafr El-Sheikh Governorate during 2000/2001 and 2001/2002 seasons. Eeach trail included ten treatments: two treatments were soaking in GA_3 and another two soaking in propham at 50 and 100 ppm for every substance in addition two foliar application by GA_3 and two foliar with propham at 50 and 100 ppm with one foliar application and one treatments was transplant without any soaking or foliar application as farmers used compared with direct seed bed planting (control).

All treatments were arranged in randomized complete block design in three replications. The important results could be summarized as follow:

1. The traditional method (direct sowing) gave the highest values for all characteristics followed by soaking, Then by foliar application with GA_3 or propham, respectively.
2. Soaking sugar beet transplants in GA_3 at 50 ppm before transplanting for six hours affected on root yield, sugar yield and purity percentage compared with soaking in propham with 50 or 100 ppm.
3. Foliar application with GA_3 or propham with any concentration gave the lowest values compared to soaking at the same rate of concentration for GA_3 or propham.
4. Transplanting sugar beet transplants from nursery's soil as farmers used without paper pots attained the lowest values for all characteristics of sugar beet, except for sucrose percentage which recorded the highest values in both seasons.

Generally, it could be concluded that traditional method attained the highest root and sugar yields followed by soaking transplants before transplanting in GA_3 at 50 ppm for six hours, then foliar application by GA_3 or propham compared to transplanting transplants without any soaking or foliar by any substances which gave the lowest ones.

INTRODUCTION

Nowadays, sugar beet (*Beta vulgaris* L.) has is considered as the second sugar crop in Egypt after sugar cane. The main goal of the scientific research is to face the problems which appear during application processes. It is well know that plant density is the major factor for sugar beet production in Egypt. The earlier sowing for sugar beet will increase the chance for pests and diseases to attack sugar beet seedlings. So, this work was carried out to face and solve the density problem by improving transplanting methods of sugar beet to increase the number of plants per unite area to 10 plants /m^2 by some agricultural practices for example soaking or spraying seedlings with some growth regulators. Therefore, seedlings and growth regulators became target for many investigators, *Kinoshita (1983)* found that spraying beets with 50 and 200 ppm GA_3 were effective in improving the mutant characteristics. *Yants et al. (1986)* found that foliar application with Gibberellic acid increased root and sugar yields but decreased sucrose percentage. *Burckly, K (1988)* concluded that transplants surpassed direct sowing method in all sugar beet characters. *El-Kassaby et al (1988)* spraying beets with GA_3 at 100 ppm significantly increased sucrose %, root and sugar yields (ton/fad) compared with control. *Emara (1990)* showed that sugar beet spraying with GA_3 at 200 ppm resulted significantly increased root, sugar and top yields (ton/fad). *Lunnan et al (1991)* pointed out that transplants caused to increase sugar yield than direct sowing. *El-Geddawy et al (1997)* observed that sugar beet transplants by paper pots gave the highest root and sugar yields than direct sowing. The superiority due to was the highest density for transplants. *Zalat and Ebrahim (2002)* showed that transplants sugar beet by paper pots gave the highest values for sugar, root and top yields and other characters compared with direct sowing. On the other hand, *Kalaida and Savchuk (1985)* reported that when sugar beet plants sprayed with Gibberelline/yield increased to 38.0 t/ha compared with 32.9 t/ha when sprayed with water.

MATERIALS AND METHODS

Two field trails were conducted at Sakha Agric. Res. Station at Kafr El-Sheikh Governorate. Treatments were arranged in randomize complete block design with three replications: 1) Soaking treatments: sugar beet transplants after 8 weeks were

soaked in GA3 and propham at 50 and 100 ppm for six hours; 2) Foliar application treatments: beet transplant (8 weeks age) were spayed with GA_3 and propham at the same dose 50 and 100 ppm; 3) Transplants of sugar beet without any soaking or foliar and 4) Direct seed sown (control). Sugar beet seeds cultivar viz Raspoly were sown in four ridges 50 cm apart 7.0 m length and 20 cm between hills to gave density 10 plants / m^2, plot area was 14 m^2. The preceding crop in both seasons was maize. The recommended PK fertilizer doses (15 and 48 kg/fad., resp.) were applied. Sowing date was 20th October and 1st Nov. in both seasons, respectively. N fertilizer was applied in two equal doses after thinning and after one month later. Phosphorus and Potassium fertilizers were added during land preparation. Other cultural practices were carried out as used manner by sugar beet growers. At harvest after 210 days from sowing two middle ridges from every plot ten sugar beet plants were taken at random to determine yield and yield attributes and for chemical analysis to record the following data:

1. Sucrose percentage was determined by using *Saccharometer* according to *Le Docte (1927).*
2. Purity percentage was calculated according to the following equation:

$$Purity, \% = \frac{Sucrose\,\%}{T.S.S.\,\%} \times 100$$

3. Alkaline coefficient was calculated according to the following equation:

$$Alkaline\ coefficient\ (A.C) = \frac{K + Na}{\alpha - a\min oN}$$

according to *Wieninger and Kubadinow (1971).*

4. Theoretical sugar yield was calculated according to the following equation:

$$Sugar\ yield\ (Ton/fad) = Root\ yield\ (Ton/fad) \times sucrose,\%$$

Where: GA3 is Gibberelic acid and propham is N-phenyl carbamin soureiso-propylester): $C_{10}\ H_{13}\ No_2$ used to increase 0000000000

The data obtained were statistically analyzed according to the methods described by *Snedecor and Cochran (1967).*

Table 1. Chemical analysis of experimental soils (0-30 cm depth) at Farm of Sakha Research Station, Kafr El-Sheikh in 2000/2001 and 2001/2002 seasons.

Seasons	PH 1:2.5	Ec m mhos cm	Organic matter, %	Available			Anions meg/L			
				N Ppm	P ppm	K ppm	HCO^-_3	Cl^-	$So4^-$	Co_3^-
2000/2001	8.6	3.41	1.90	16.32	6.15	284.20	6.3	5.9	0.15	0.0
2001/2002	8.4	3.32	1.79	15.64	6.23	276.15	6.8	6.5	0.18	0.0

RESULTS AND DISCUSSION

1. Root and top yields:

Data presented in Table (2) showed that soaking sugar beet transplants before transplants in GA_3 solution at 50 and 100 ppm concentration gave significant increase in root and top yields compared with soaking in propham with same concentrations then without soaking in any substances (in water) which gave the lowest yields (15.00 and 16.430 ton/fed. root) and (4.00 and 5.44 ton/fad. top) in both seasons resp. On the other hand direct sowing gave the highest yields (24.63 and 26.370 ton/fad. root) and (8.8 and 10.38 ton/fad. top) in both seasons resp. Similar results were obtained by *Kalaida and Savchuk (1985); El-Kassaby et al (1988); Emara (1990).* They reported that spraying GA_3 sugar beet plants gave significant effect on yields of root and top of sugar beet. *El- Geddawy et al (1997)* concluded that direct seed bed progressive then transplants from soil.

Table 2. Effect of some agricultural practices on root and top yields during 2000/2001 and 2001/2002 seasons.

Treatments	Root yield, (ton/fad.)		Top yield, (ton/fad.)	
	2000/2001	2001/2002	2000/2001	2001/2002
Soaking in propham 50 ppm	18.250	20.150	5.700	7.650
Soaking in propham 100 ppm	18.022	18.850	5.200	7.130
Soaking in GA_3 50 ppm	19.934	20.900	6.400	8.040
Soaking in GA_3 100 ppm	19.250	20.680	6.000	7.860
Spraying with propham 50 ppm	18.410	18.320	5.620	6.940
Spraying with propham 100 ppm	18.375	19.000	5.320	6.560
Spraying with GA_3 50 ppm	19.625	20.110	5.220	6.380
Spraying with GA_3 100 ppm	19.732	19.240	5.160	6.650
Transplants without any treatments	15.000	16.430	4.000	5.440
Direct sowing	24.630	26.370	8.800	10.380
F. test	**	**	**	**
LSD at 0.05	00.700	00.950	0.360	00.800

2. Sucrose percentage and sugar yield:

Effect of soaking and spraying with GA_3 and propham on sucrose percentage and sugar yield are presented in Table (3). The results indicated that sucrose percentage recorded the lowest values with direct sowing method (18.60 and 18.06 %) in both seasons resp. compared with transplants from soil without any treatments with growth regulators which gave the highest values (21.00 and 19.44) this suporiority due to small size of root. On the other direction sugar yield significantly increased with direct sowing (4.581 and 4.762 ton/fad) in both seasons respectively compared with any treatment with growth regulators either soaking or spring . These observations were fairly true with those elucidated by *Kinoshita (1983); Kalaida and Savchuk (1983); El-Kassaby et al (1988) and El-Geddawy et al (1997)* they reported that srpaying with growth regulator significantly increased sugar yield and direct sowing gave the highest sugar yield compared with other transplants methods from soil without paper pots.

Table 3. Effect of some agricultural practices on sucrose percentage and sugar beet yield during 2000/2001 and 2001/2002 seasons.

Treatments	Sucrose percentage		Sugar yield, (ton/fad.)	
	2000/2001	2001/2002	2000/2001	2001/2002
Soaking in propham at 50 ppm	20.45	18.26	3.732	3.679
Soaking in propham at 100 ppm	20.12	18.40	3.626	3.652
Soaking in GA_3 at 50 ppm	20.00	18.11	3.987	3.785
Soaking in GA_3 at 100 ppm	20.25	18.22	3.891	3.768
Spraying with propham at 50 ppm	20.20	19.00	3.719	3.481
Spraying with propham at 100 ppm	20.25	18.31	3.721	3.479
Spraying with GA_3 at 50 ppm	19.48	17.10	3.823	3.439
Spraying with GA_3 at 100 ppm	19.58	18.34	3.864	3.529
Transplants without any treatments	21.00	19.44	3.150	3.194
Direct sowing	18.60	18.06	4.581	4.762
F. test	**	**	*	**
LSD at 0.05	0.76	0.76	0.500	0.320

3. Top/root ratio

Table (4) pointed out that soaking or foliar application with GA_3 or propham at 50 and 100 ppm caused to balance between root and top weight by increasing root weight so, the ratio between top and root was low than the ratio of sugar beet gave not any Soaking or foliar applications as farmers used which gave the highest ratio this results sue to decrease of root weight and size than top weight. Top/root ratio is very important character for growers because we considered it the ideal guide for

maturity of sugar beet. Growth regulators prolongate the vegetative growth period than control or transplants without regulaters treatments. The same trend was found by *Emara (1990)* who reported that top/root ratio significantly increased by foliar GA3 at 200 ppm compared with control.

Table 4. Effect of some agricultural practices on top/root ratio during 2000/2001 and 2001/2002 seasons.

Treatments	Top / root ratio	
	2000/2001	2001/2002
Soaking in propham at 50 ppm	31.23	37.97
Soaking in propham at 100 ppm	28.85	35.92
Soaking in GA_3 at 50 ppm	32.11	38.47
Soaking in GA_3 at 100 ppm	31.17	38.01
Spraying with propham at 50 ppm	30.53	37.88
Spraying with propham at 100 ppm	28.95	34.53
Spraying with GA_3 at 50 ppm	26.60	31.73
Spraying with GA_3 at 100 ppm	20.27	28.27
Transplants without any treatments	34.40	41.56
Direct sowing (control)	35.73	39.36
F. test	**	**
LSD at 0.05	1.05	0.83

4. Purity percentage and Alkaline coefficient (AC).

Data illustrated in Table (5) show the effect of soaking or spraying with GA_3 or propham at 50 and 100 ppm concentration on purity and AC. It is worth mentioned from the results in table (5) that the highest quality or purity % was resulted from root which untreated (95.61 and 94.66 %) in both seasons this superiority due to the highest sucrose % as a results for small root for this treatment. On the other side growth regulators due to increase root size and decrease sucrose percentage which cause to decrease purity %.

For the AC coefficient it appear from table (5) that soaking roots in GA with 100 ppm concentration gave the highest (AC) (4.11 and 4.88) in both seasons. This mean that GA_3 due to decrease alfa amino nitrogen in roots and improve root quality. AC coefficient is considered the reflection mirror to the photosynthesis and the yield in final. For this reason, the growth regulators must be controlled to produce sugar beet crop with excellent quality.

Table 5. Effect of some agricultural practices on purity percentage and AC coefficient during 2000/2001 and 2001/2002 seasons.

treatments	Purity percentage		AC coefficient	
	2000/2001	2001/2002	2000/2001	2001/2002
Soaking in propham at 50 ppm	95.27	93.94	3.27	3.60
Soaking in propham at 100 ppm	95.07	94.02	3.08	3.75
Soaking in GA_3 at 50 ppm	95.00	93.85	3.80	4.52
Soaking in GA_3 at 100 ppm	95.15	93.91	4.11	4.88
Spraying with prepham at 50 ppm	95.12	94.39	3.43	3.36
Spraying with propham at 100 ppm	95.15	93.97	3.69	3.08
Spraying with GA_3 at 50 ppm	94.68	93.23	3.72	3.92
Spraying with GA_3 at 100 ppm	94.74	94.04	3.74	3.64
Transplants without any treatments	95.61	94.66	3.52	3.25
Direct sowing	94.15	93.82	3.77	4.62
F. test	*	**	*	**
LSD at 0.05	1.43	0.85	0.46	0.58

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تأثير بعض العمليات الزراعية على بادرات بنجر السكر المشتولة

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أقيمت تجربتان حقليتان في المزرعة البحثية لمحطة سخا للبحوث الزراعية بكفر الشيخ في الموسمين الزراعيين ٢٠٠٠/٢٠٠١ ، ٢٠٠١/٢٠٠٢م بغرض دراسة تأثير معاملة بادرات بنجر السكر المشتول بدون أصص ورقية المعامل ببعض منظمات النمو لتقليل الآثار الضارة من الشتل بهذه الطريقة. حيث تم الشتل لزيادة الكثافة النباتية. وأجرى هذا البحث بغرض تقويم عملية الشتل وتقليل أضرارها وقد أستخدم تصميم القطاعات الكاملة العشوائية في ثلاث مكررات تم توزيع المعاملات فيها كما يلي:-

١. نقع جذور بادرات البنجر قبل الشتل فى الجيريلين (٥٠ جزء فى المليون)
٢. نقع جذور بادرات البنجر قبل الشتل فى الجيريلين (١٠٠ جزء فى المليون)
٣. نقع جذور بادرات البنجر قبل الشتل فى البروفام (٥٠ جزء فى المليون)
٤. نقع جذور بادرات البنجر قبل الشتل فى البروفام (١٠٠ جزء فى المليون)
٥-٨ رش نباتات بنجر السكر بنفس التركيزات والمواد السابقة
٩. شتل بادرات بنجر السكر فى الارض المستديمة بدون رش أو نقع فى أى مادة .
١٠. زراعة عادية بالبذرة دون الشتل او النقل .

تمت الزراعة بالصنف راس بولي في ٢٠ أكتوبر ، أول نوفمبر فى كلا الموسمين على التوالي وتشير النتائج إلى أن طريقة الزراعة بالبذرة أعطت أفضل النتائج للصفات تحت الدراسة مثل محصول الجذور - السكر - العرش - نسبة العرش الى الجذر ولكن تحت ظروف الشتل سجلت طريقة معاملة البادرات قبل شتلها بالنقع فى الجيريلين بتركيز ٥٠ جزء في المليون وكذلك الرش به أفضل النتائج للبنجر المشتول إذا ما قورن بالنقع في البروفام أو الرش به تحت التركيزات المختلفة ٥٠ ، ١٠٠ جزء فى المليون ، بينما سجلت طريقة المزارع وهى الشتل للبادرات بدون معاملة باى منظمات نمو اقل قيم لجميع الصفات التى تمت دراستها ماعدا نسبة السكروز والنقاوة التى سجلت بهذه الطريقة اكبر قيم لها وهذا راجع الى انخفاض متوسط وزن الجذور الذى اثر بالتالى على محصول الجذور ومحصول السكروز سلبا. وتوضح الدراسة أهمية الزراعة بالبذرة اذا ما قورنت بطريقة الشتل التي يتبعها المزارعون في حقولهم ، حتى يمكن زيادة الكثافة النباتية فى وحدة المساحة المزروعة بمحصول بنجر السكر .