J. Agric. Sci. Mansoura Univ., 34 (9): 9557 - 9564, 2009

EFFECT OF TRANSPLANTING DATES ON PRODUCTIVITY OF SOME SUGAR BEET VARIETIES IN THE NEWLY RECLAIMED LANDS UNDER SINAI CONDITIONS

Yousef, M. S. H.
Argon. Dept., Fac. of Agric., Suez Canal Univ., Egypt.

ABSTRACT

Two field experiments were conducted in 2003\2004 and 2004\2005 seasons in Gelbana village, El-Kantra Shark, Sinai to study the effect of transplants dates, namely 15, 25 and 35 days from sowing nursery compared with direct seeding (control) on productivity of five sugar beet varieties, namely Top, Kawemira, Gloria, Pleno and Farida. Results showed that both direct seeding and transplant 25 days age produced the highest root yield without significant difference between them. Also, direct seeding did not differ significantly from transplants 15 or 25 days age concerning sugar yield. Slight but significant differences among the five studied varieties were found in root yield, and Farida cv. recorded the highest roots and sugar yields/fad.

INTRODUCTION

Yearly, Egypt imports about 30-35% of local consumption of sugar to face the shortage in local production. Therefore, expanding cultivation of sugar beet on the new reclaimed lands especially region of eastern and western Suez Canal should be hardly pushed to increase the sugar crop area, consequently increased local production of sugar. Most of these lands are sandy soil and some of them are salt affected. Such lands are very promising for growing sugar beet.

Sugar beet can be grown on different types of soils, because it is somehow salt tolerant crop, it may improve the chemical properties of the new lands.

Planting methods play important role in sugar beet productivity, particularly, root and sugar yields. Smith *et al.*, (1984) recorded that sugar beet transplanting technique has shown major advantage over the conventional direct sowing technique. Also, Burcky (1988) found that transplanting of sugar beet gave higher populations especially after late planting. Transplanted seedlings had a survival rate of 84.3 – 94.1 % compared with 74.5 % from direct sowing (Zhao *et al.*, 1995). Many investigators reported that transplanting sugar beet increased yield and sucrose content comparing with sowing seed directly (Valni, 1985; Eric *et al.*, 1986; Vigoureux, 1986; Yonts *et al.*, 1986; Qu and Wang, 1987; Lunnan *et al.*, 1991 and El-Geddawy *et al.*, 1997).

Sugar beet production fluctuated according to the cultivated variety because of the variation in yield components such as individual root length, root diameter, top and root weight per plant (Mokadem,1999; Ramadan, 1999 and Nassar, 2001). Whereas, Mahmoud *et al.* (1999), Mokadem (1999), Ramadan (1999) and Nassar (2001) reported that there were differences among sugar beet varieties in juice properties (T.S.S. %, sucrose

% and purity %). Meanwhile, Hassanein (1999), Mahmoud *et al.* (1999), Ramadan and Hassanein (1999) and Al-Naas (2004) demonstrated that sugar beet varieties differed in root, top and sugar yields. Therefore, selecting the promising cultivars (which have better growth, juice and yield characters), is among the important factors to produce maximum productivity from sugar beet.

This experiment was carried out eastern Suez Canal in Gelbana village, El-Kantra Shark, Sinai (represented sandy soil affected with salinity and irrigated from Al-Salam canal), aiming to find the proper seedling age can be used.

MATERIALS AND METHODS

Two field experiments were conducted in 2003\2004 and 2004\2005 seasons at Gelbana village, El-Kantra Shark, Sinai to study the effect of transplants ages, namely 15, 25 and 35 days compared with direct seeding (control) on productivity of five sugar beet varieties, namely Top, Kawemira, Gloria, Pleno and Farida.

Media of seedlings consisted of sand, fermuclide and beat moss in ratio 1:1:2 (in volume). The media was treated with fungicide and wetted to 50 % moisture content, then distributed to the germination trays (germination tray contained 210 hollows). Seeds of each beet cultivar were sown manually in 15 germination trays. Germination trays in greenhouse as well as the control treatment (direct seeding) in the field were sown at 21st September in both growing seasons. Germination trays were covered with polyethylene sheets for three days. After 15, 25 and 35 days from sowing, seedlings of each cultivar were transplanted to the experimental field.

The experiment was conducted under sprinkler irrigation system in four replicates using split plot design. The three transplants ages + control (direct seeding) were allocated in the main plots, while five varieties were arranged randomly in the sub plots. The experimental unit area was 18 m^2 (6 rows, 5 m in length and 60 cm in width).

Table (1) includes the chemical and mechanical analyses of the experimental soil and chemical analysis of irrigation water (El-Salam Canal). Organic matter (Compost) at rate of 20 m^3 /fad was applied to the soil during land preparing. Table (2) shows the chemical properties of the applied compost. Seedlings were transplanted at 20 cm apart.

Calcium super phosphate at a rate of 200 kg/fad (15.5% P_2O_5) and sulfur at a rate of 50 kg/fad were added after 21 and 51 days from sowing. Ammonium nitrate at a rate of 100 kg/fad (33.5%N) was applied in three equal doses at 21, 51 and 81 DAS. Potassium sulfate (48% K_2O) at a rate of 50 kg/fad was applied after 21 and 51 days from sowing. NPK fertilizers were added using drilling method.

At harvest (200 DAS), five plants were taken randomly from each plot to determine yield components (root length, root diameter, root fresh weight and top fresh weight/plant) as well as juice quality (T.S.S., sucrose and purity %). Root and top yields per feddan were estimated from the three inner rows of each experimental unit. Sucrose % was determined as described by Le

Docte (1927). Sugar yield was calculated by multiplying sucrose percentage × root yield per feddan. Purity % was calculated according to the following equation: purity %= sucrose % × 100 / T.S.S. %.

Data of each experiment were subjected to proper statistical analysis of variance for split plot design. Also, combined analysis was conducted between the data of the two seasons according to Snedecor and Cochran (1981).

Table (1): Chemical and physical analyses of the experimental soil site and irrigation water.

Proprieties	Soil	Irrigation water
pH (Soil extract 1: 5)	8.19	7.16
EC (dS m^{-1})	8.09	2.86
Cations (meq L^{-1})		
Ca^{++}	42.50	2.00
Mg^{++}	28.00	8.00
Na^{+}	76.90	16.55
K^{+}	2.50	0.49
Anions (meq L^{-1})		
Cl^{-}	115.0	18.15
HCO_3^{-}	4.0	6.80
CO_3^{--}	--	0.64
SO_4^{--}	30.0	1.45
Soil texture	sandy	

Table (2): The chemical properties of the used compost.

pH	Ec	OM %	C:N	N%	P%	K%	mg/kg			
							Fe	Mn	Cu	Zn
7.19	3.97	48.08	20.74	1.34	0.13	1.21	141.15	94.43	32.73	56.65

RESULTS AND DISCUSSION

A. Effect of transplants dates:

Combined analysis of the two seasons revealed that transplant seedlings 15 days or 25 days ages did not differ significantly than sowing seeds directly in the field concerning root characters (fresh weight, diameter and length) (Table 3). Transplanting seedlings 35 days age resulted the lowest root characters (weight, diameter and length), but recorded the highest top fresh weight/plant compared with the other transplants ages. Sugar beet plants resulted from direct seeding as well as from transplant seedlings 15 or 25 days age might enhance growth of plants and consequently sugar translocated from leaves to roots which in turn gave roots bigger and heavier. Similar results were obtained by Gibbons (1986); Wang *et al.* (1991) and El-Geddawy(1997).

Table (3): Effect of transplants age, sugar beet varieties and their interaction on some vegetative characters in 2003/2004 and 2004/2005 seasons.

Treatments	Root fresh wt/plant (kg)			Top fresh wt/plant (kg)			Root diameter (cm)			Root length (cm)		
	2003/2004	2004/2005	Combined	2003/2004	2004/2005	Combined	2003/2004	2004/2005	Combined	2003/2004	2004/2005	Combined
Transplants age:												
Direct seed	0.873 a	1.070 a	0.974 a	0.350 b	0.416 ab	0.383 ab	9.90 a	8.96 b	9.34 bc	17.53 a	19.33 a	18.43 a
15 Days	0.778 b	0.838 ab	0.786 ab	0.415 a	0.431 a	0.411 ab	9.16 bc	11.40 a	10.28 a	17.26 a	17.56 ab	17.41 b
25 Days	0.816 ab	0.960 ab	0.888 a	0.313 b	0.361 b	0.337 b	9.56 ab	10.36 ab	9.96 ab	17.56 a	19.23 a	18.39 a
35 Days	0.581 c	0.614 b	0.610 b	0.444 a	0.434 a	0.439 a	8.70 c	9.30 b	9.00 c	15.86 b	15.16 b	15.51 c
F- test	**	*	**	**	*	*	**	*	*	*	*	*
LSD at 5%	0.065	0.374	0.192	0.049	0.058	0.074	0.52	1.48	0.80	1.12	2.47	1.67
Varieties :												
Top	0.801 a	0.893 ab	0.847 ab	0.382 ab	0.420 ab	0.401 ab	9.75 a	10.45 a	10.14 a	17.37 a	17.62 a	17.5 a
Kawemira	0.735 a	0.752 b	0.743 b	0.352 b	0.347 c	0.349 b	9.29 ab	9.66 a	9.47 ab	16.83 a	17.00 a	16.91 a
Gloria	0.783 a	0.762 b	0.788 ab	0.418 a	0.415 ab	0.416 a	9.45 a	10.12 a	9.79 ab	17.04 a	18.62 a	17.83 a
Pleno	0.702 a	0.865 b	0.783 ab	0.362 b	0.402 bc	0.382 ab	8.83 b	9.58 a	9.20 b	17.04 a	18.45 a	17.75 a
Farida	0.789 a	1.080 a	0.907 a	0.387ab	0.470 a	0.414 a	9.33 ab	10.12 a	9.72 ab	17.12 a	17.41 a	17.27 a
F- test	NS	*	*	*	**	*	*	NS	*	NS	NS	NS
LSD at 5%	—	0.201	0.125	0.038	0.056	0.056	0.45	—	0.63	—	—	—
Interaction	NS	NS	NS	*	*	NS	NS	NS	NS	**	NS	NS

Table (4): Effect of transplants age, sugar beet varieties and their interaction on juice quality of beet in 2003/2004 and 2004/2005 seasons.

Treatments	T.S.S. (%)			Sucrose (%)			Purity (%)		
	2003/2004	2004/2005	Combined	2003/2004	2004/2005	Combined	2003/2004	2004/2005	Combined
Transplants age (Tr.)									
Direct seed	25.20 b	25.40 a	25.30 a	17.77 c	19.94 a	18.86 ab	74.53 b	78.52 a	76.53 b
15 Days	25.00 b	24.73 a	24.86 a	19.60 a	19.14 a	19.37 a	83.87 a	77.40 ab	80.64 a
25 Days	25.80 a	24.26 a	25.03 a	19.09 b	18.96 a	19.03 ab	78.54 ab	78.33 a	78.44 ab
35 Days	24.93 c	25.33 a	25.13 a	17.25 d	19.34 a	18.30 b	74.53 b	76.37 b	75.45 b
F- test	**	NS	NS	**	NS	*	*	*	*
LSD at 5%	0.30	—	—	0.41	—	0.92	6.85	1.84	2.93
Varieties (V.):									
Top	25.91 c	24.91 a	25.41 ab	18.07 cd	19.47 a	18.77 a	77.48 a	78.16 a	77.82 a
Kawemira	26.91 a	25.00 a	25.96 a	19.47 a	19.18 a	19.32 a	79.60 a	76.76 a	78.18 a
Gloria	25.66 c	25.25 a	24.46 ab	17.86 d	19.60 a	18.73 a	76.81 a	77.62 a	77.21 a
Pleno	26.41 b	24.66 a	25.53 ab	18.50 b	19.21 a	18.86 a	76.69 a	78.01 a	77.35 a
Farida	25.00 d	24.83 a	24.91 b	17.25 bc	19.27 a	18.26 a	80.84 a	77.73 a	79.29 a
F- test	**	NS	*	**	NS	NS	NS	NS	NS
LSD at 5%	0.45	—	0.85	0.35	—	—	—	—	—
Interaction	**	NS	NS	**	NS	NS	*	NS	NS

The three transplants ages namely, 15, 25 and 35 days did not differ significantly from direct seeding in total soluble solids %. Transplants 15 days age gave the highest sucrose content and did not differ significantly from transplants 25 days age or direct seeding concerning this trait, while transplants 35 days produced the lowest sucrose percentage.

Regarding root yield, statistical analysis over the two seasons revealed that the direct seeding of sugar beet followed by transplants 25 days age resulted the highest root yield/fed (26.74 t and 25.89 t) without significant differences between them. Moreover, transplants 35 days age resulted the lowest root yield (17.93 t, 17.52 t and 17.72 t /fed in the first and second seasons and over them, respectively). These results are in good line with those obtained by Valnli (1985); Gibbons (1986); Vigoureux (1986); Burcky (1988); Wang *et al.* (1991), El-Geddawy *et al.* (1997) and El -Debaby *et al.* (2003).

Growing sugar beet with transplants 35 days age gave the highest top yield followed by transplants 15 days age, while the lowest top yield/fed was obtained from transplants aged 25 days as well as from direct sowing.

Combined data in Table (5) showed that direct seeding of sugar beet did not differ significantly than growing it with transplants 15 or 25 days age in the resulted sugar yield (4.84, 5.16 and 4.62 t/fed, respectively). The lowest sugar yield (3.17 t/fed) was obtained with applying transplants 35 days age. Plants resulted from direct seeding as well as from transplants 15 or 25 days age might encouraged growth, which interpret their superiority in root and sugar yields compared to plants resulted from transplants 35 days age.

B. Effect of Varieties:

Slight but significant differences among the studied varieties were recorded for root fresh weight/plant, top fresh weight/plant and root diameter, while insignificant differences were detected for root length (Table 3). Similar results were obtained by Mokadem (1999); Ramadan (1999) and Nassar (2001).

Regarding juice quality, Kawemira cv. exceeded the other cvs. in TSS % and sucrose % (25.96% and 19.32%). That held true in the first season and combined data. The five studied varieties did not deviate from each other concerning purity % (Table 4). Some investigators reported that there were differences among sugar beet varieties in juice properties (Mahmoud *et al.*, 1999; Mokadem, 1999; Ramadan, 1999 and Nassar, 2001)

Table (5) indicates slight but significant differences among the five studied varieties in root yield per feddan. Combined data revealed that Farida cv produced the highest root yield (25.91 t /fed) without significant differences with the other varieties, except kawemira cv. Also, Farida resulted the best sugar yield (4.98 t/fed), but it also, deviated significantly with Kawemira and Gloria cvs. Furthermore, Farida cv. produced the highest top yields/fed (12.56 t/fed), while the lowest value for top yield was obtained by Kawemira cv. (10.14 t/fed). Hassanein (1999), Mahmoud *et al.* (1999), Ramadan and Hassanein (1999) and Al-Naas (2004) demonstrated that sugar beet varieties differed in root, top and sugar yields.

Table (5): Effect of transplants age, sugar beet varieties and their interaction on root, top and sugar yields in 2003/2004 and 2004/2005 seasons.

Treatments	Root yield (t/fed)			Top yield (t/fed)			Sugar yield (t/fed)		
	2003/2004	2004/2005	Combined	2003/2004	2004/2005	Combined	2003/2004	2004/2005	Combined
Transplants age (Tr.):									
Direct seed	26.49 a	26.98 a	26.74 a	10.63 c	11.42 a	11.03 ab	4.70 ab	4.98 ab	4.84 a
15 Days	22.73 c	22.97 b	22.86 bc	12.22 b	11.89 a	12.06 ab	4.46 b	5.86 a	5.16 a
25 Days	25.47 b	26.31 ab	25.89 ab	9.73 c	10.01 b	9.88 b	4.86 a	4.39 b	4.62 a
35 Days	17.93 d	17.52 c	17.72 c	13.75 a	11.98 a	12.87 a	3.09 c	3.26 b	3.17 b
F- test	**	*	*	**	*	*	**	*	*
LSD at 5%	0.90	3.36	5.142	1.17	1.51	2.56	1.31	2.02	0.99
Varieties (V.):									
Top	23.47 b	24.49 ab	23.99 ab	11.36 b	11.55 ab	11.46 ab	4.24 a	4.78 ab	4.51 ab
Kawemira	22.33 bc	20.61 b	21.47 b	10.65 b	9.64 c	10.14 b	4.35 a	3.98 b	4.16 b
Gloria	23.42 b	21.73 b	22.57 ab	12.50 a	11.44 ab	11.98 a	4.18 a	4.14 b	4.16 b
Pleno	21.66 c	23.72 ab	22.69 ab	11.19 b	11.07 bc	11.13 ab	4.00 a	4.54 b	4.27 ab
Farida	24.89 a	26.93 a	25.91 a	12.21 a	12.92 a	12.56 a	4.29 a	5.68 a	4.98 a
F- test	*	*	*	**	**	*	NS	*	*
LSD at 5%	1.31	5.21	3.61	0.84	1.53	1.69	---	1.20	0.71
Interaction	*	*	NS	*	*	NS	NS	*	NS

C. Effect of the interaction:

The statistical analysis of variance over the two seasons revealed that the interaction between transplants ages and sugar beet varieties did not affect significantly the studied traits; which means that the individual factors act independently.

REFERENCES

Al-Naas, M.K.M. (2004): Enveronmental interactions in Sinai and relations with yield production of sugar beet; quality and quantity. M. Sc. Thesis, Fac. Agric., Suez Canal Univ., Ismailia.

A. **O. A. C. (1980):** Association of Official Agricultural Chemists". Official methods of analysis, 13th Eddition A. O. A. C., Washington D.C.

Burcky, K. (1988). Improving early development of sugar beet by transplanting and growing under plastic mulch. Crop sci., 161:3, 157-165.

El-Debaby, A.S.; ELS.H.M., Hefni; M.MA., EL-Kholi and R.T., Behairy (2003). Effect of planting methods on the productivity of sugar beet. Proc. 10th Conf. Agron., Suez Canal Univ., Fac. Environ. Agric. Sci., EL-Arish, Egypt.

El-Geddawy, I.H.; S. Zalat and Laila M. Saif (1997). Transplanting sugar beet seedling with relation to yield and quality of sugar beet. J. Agric. Sci., Mansoura Univ., 22 (2): 361-368.

Eric, D.K.; T.G. Robb; J.A. Smith; R.G. Wilson and C.D. Yonts (1986). Treansplanting sugar beets, focus of IANR research, Quarterly, No.1, 8-12.

Gibbons, J.G.(1986). Transplanting of sugar beet. Proc. of 6th Inter. Conf. on mechanization of field experiments. Dublin, Ireland, July 8-13, 128-134.

Hassanin, M. A. (1999): Effect of harvesting dates and nitrogen fertilization on yield and quality of some sugar beet varieties. Bull. Fac. of Agric., Cairo Univ., Vol. 11: 356-363.

Le-Docte, A. (1927). Commercial determination of sugar in the beet root using the So.Chs. Le-Docte Process. Intern. Sugar J., 29:488-492.

Lunnan, T.A.; A. Skutlaberg and H. C. Svads (1991). Time of planting, fertilization, plant spacing and transplanting of sugar beet. Norwegian J. Agric. Sci., 5:3., 283- 288. ISSN 0801-5341.

Mahmoud, E.A.: El-M. A. El-Metwally and M.E.M. Gobarh (1999). Yield and quality of some multigerm sugar beet as affected by plant densities and nitrogen levels. J. Agric. Sci., Mansoura Univ., 24 (9): 4499-4516.

Mokadem, Sh- A.(1999). Effect of varying sowing and harvesting dates on yield and quality of some sugar beet cultivars under Minia condition. Zagazig J. Agric. Res., 26(2): 253-266.

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

Qu, W.C. and J.K. Wang (1987). Study of the growth regularity of high yielding sugar beet from paper cylinder grown seedlings. Scientia Agricultra Sinica, 20:1, 53-58. (CF. CAB Abst., No. 17, 1990-1991).

Ramadan, B.S.H.(1999). Differential response of some sugar beet varieties to plant density and harvesting dates. J. Agric. Sci, Mansoura Univ., 24(2)413-423.

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

Snedecor, G.W. and W.G. Cochran (1981). Statistical methods 6th Ed, Iowa State Univ., Press, Amer. Iowa, USA.

Smith, J.A.; C.D. yonts; R.G. Wilson and E.D. Kerr ((1984). Paper pot system for mechanized sugar beet transplanting paper. Am. Soci. Agric. Eng., No.84-15516, 10. beet Seker, 18:117, 8-18. (CF CAB Abst. No.139, 1987-1989).

Valnli, N. (1985). The paper pot transplanting method of growing sugar beet. Seker 18:117, 8-18. (CF CAB Abst. 139, 1987-1989).

Vigoureux, A. (1986). Influence of some technological factors on growth and yield of transplanted sugar beet. 49th winter Cong. Intern. Instit. for Sugar beet Res., 165-179. (CF CAB Abst. No. 126,1987-1989).

Wang, D. F.; C.W. Liu; J.G. Zou and Z.M. Han (1991). The use of nutrients beds for growing and planting out sugar beet seedlings. Modernizing Agriculture, No. 329-31. (CF CAB Abst. No. 6, 1995).

Yonts , C.D.; J.A. Smith, R.G. Wilson and E.D Kerr (1986): Transplanted sugar beet response to irrigation at transplanting.

Zhao, j.D.; B.X. Zhan and F.Q.Liu (1995). Study on measures for promoting establishment of sugar beet pants on alkaline soils. China sugar beet No.1, 24-27.

تأثير عمر الشتلات على انتاجية بعض اصناف بنجر السكر تحت ظروف سيناء

محمد صبرى حمادة على يوسف
قسم المحاصيل – كلية الزراعة – جامعة قناة السويس

اجريت تجربتان حقليتان فى موسم ٢٠٠٣/٢٠٠٤ وموسم ٢٠٠٤/٢٠٠٥ فى قرية جلبانة – القنطرة شرق –سيناء لدراسة تاثير عمر الشتلات (١٥ ، ٢٥ ، ٣٥ يوم) مقارنة مع الزراعة بالبذور مباشرة على انتاجية خمسة اصناف من بنجر السكر (توب ، كاوميرا ، جلوريا ، بلينو ، فريدا).

اظهرت النتائج ان زراعة بنجر السكر بالبذور مباشرة او بشتلات عمر ٢٥ يوم اعطت اعلى محصول من الجذور للفدان بدون اختلافات معنوية بينهما. ايضا لم تختلف الزراعة بالبذور مباشرة معنويا عن الزراعة بشتلات عمر ١٥ أو ٢٥ يوم فى محصول السكر. ولقد كانت الاختلافات بين الاصناف المنزرعة فى محصول الجذور بسيطة ولكنها معنوية ، وسجل الصنف فريدا اعلى محصول من الجذور والسكر للفدا ن.