

Response of Sugar Beet to Planting Dates and Water Requirements in Middle Egypt 2-Yield and Yield Components

M.A. El-Shouny^{*}, E.M.Taha^{}, M.A. Sherif^{***} and M.M. Ewis^{***}**

^{}Soils and Water Use Dept.; NRC; ^{**} Agronomy Dept. Fac. of Agric., Minia Univ. and ^{***}Water Req. and Field Irrig. Dept., Agric. Res. Center, Cairo, Egypt.*

TWO FIELD experiments were carried out for two growing seasons of sugar beet 1995 / 1996 and 1996/1997 at Sids Agric. Res. Station Farm Beni-Suef Governorate, Egypt to study the relationship between planting dates (25 Sept., 10 Oct. and 25 Oct.) and irrigation treatments (irrigation at 40 , 60 and 80% depletion from available soil moisture added to recommend irrigation). Significant increases in root length, root diameter, fresh root weight , leaves number / plant, fresh weight / plant were obtained by early planting date at all ages in both seasons . At harvest the highest values of root length, root diameter and yield of roots, tops and sugar / fed were obtained by early planting (25 Sep.), while. the heaviest roots were obtained from middle planting date (10 Oct.). On the other hand , late planting gave the highest number of plants / fed. Total soluble solids (T.S.S.), sucrose percentage and purity were significantly increased by early planting date in both seasons.

Irrigation at 40 % depletion from available soil moisture resulted in the highest values of all growth characters except root length , yield and yield components and all quality characters under study.

Early planting date with irrigation at 40% depletion from available soil moisture gave the highest values of all characters under study.

Keywords: Sugar beet, Planting dates, Water requirements, Middle Egypt.

Planting dates and irrigation regimes play an important role on yield and quality of sugar beet. Taha *et al.* (1985) and Badawi (1985) found that sowing sugar beet early (10 Sep.) gave the largest number of leaves / plant, top yield, root weight, root yield / fed and T.S.S.%. Cucci *et al.* (1989) and Ghandorah (1994) stated that the period from 15 Oct. to 1 Nov. was the optimum data for planting sugar beet. Metwally (1998) found that the early planting date gave the best results of number of leaves / plant, root diameter, root weight at all studied ages. At harvest, significant increase in root yield / fed, T.S.S. %, juice purity and sucrose % was obtained.

Attia and Sultan (1987) found that irrigation every 12 days gave significantly higher root yield. Dimian *et al.* (1987) studied the effect of soil moisture stress (=25, 50 and 75 depletion of available water). They found that seasonal water use by sugar beet varied widely between 45.5 and 62.2 cm under the different treatments. Water consumption increased as soil moisture stress decreased.

Ibrahim *et al.* (1993) reported that water requirements of sugar beet varied between 59.56 and 46.67 cm / season; The values of water consumptive use were 58.06, 55.04 and 49.86 cm. for the 2, 3, 4, weeks irrigation intervals, respectively. The water use efficiency was 8.66 kg root / m³ of water consumed.

Rayan *et al.* (1997) showed that irrigation after 25-30% depletion of available soil moisture gave the maximum root yield, sucrose percentage and root weight. The values of water consumptive use were 2253, 2116 and 2071 m³ / fed for the treatments of irrigation after 25-30%, 45-50 % and 65-70% depletion of available soil moisture, respectively. Average crop coefficient was 0.72 and maximum water use efficiency was 14.6 kg root / m³ under the irrigation after 25 - 30 % depletion of available soil moisture.

Material and Methods

Two field experiments were conducted at Sids Agricultural Research Station (Middle Egypt) during the two successive growing seasons 1995 / 96 and 1996/97 to study the effect of planting dates and irrigation treatments on sugar beet (*Beta vulgaris* L.) cv. Ras Poly and its productivity.

A split-plot design with four replications was used, three planting dates *i.e.* 25 Sept. (A₁), 10 Oct. (A₂), 25 Oct. (A₃) were arranged randomly in the main plot. *Egypt. J. Soil Sci.* 43, No. 4 (2003)

plots, while four irrigation treatments, *i.e.* irrigation at a depletion of 40 % from available soil moisture (B₁), 60 % (B₂), 80% (B₃) and irrigation in normal production of sugar beet as a control (B₄) in the sub - plots. The sub-plot area was 42 m² (8.75 x 4.8 m). It consists of 8 ridges, 8.75 m long and 60 cm width.

The distance between hills was 20 cm. The previous crop was corn (*Zea maiz* L.) in both seasons. Agronomic practices and fertilization applied to the experiment were those recommended in the region.

Results of chemical, soil analysis according to Jackson (1967) and some of soil-water characteristics for the trial sites are shown in Tables 1 and 2, respectively.

Samples of five individual plants were taken randomly from each sub - plot at different periods, *i.e.* 45, 75 and 105 days from sowing to determine root length (cm), root diameter (cm), fresh root weight (gm), number of leaves / plant and fresh leaves weight / plant (gm). At harvest, number of plants / fed were counted and ten plants from each plot were taken to determine root length (cm), root diameter (cm), root weight (gm), root yield / fed. (ton / fed.) and top yield (ton / fed).

TABLE 1. Mechanical and chemical soil analysis of the experimental sites in 1995/96 and 1996 / 97 seasons.

Characteristics	1995 / 96	1996 / 97
Mechanical analysis		
Sand %	20.25	16.42
Silt %	34.80	31.38
Clay %	44.95	52.20
Soil texture	Clay	Clay
Chemical analysis		
O.M. %	2.2	2.04
PH	7.7	7.9
E.C. mmhos / cm (1 : 5)	0.55	0.57
Cations and anions meq / L.		
Ca ⁺⁺	2.6	2.8
Mg ⁺⁺	2.2	2.1
Na ⁺	0.70	0.78
K ⁺	0.05	0.04
CO ₃ ⁻	-	-
HCO ₃ ⁻	5.0	5.0
Cl ⁻	0.35	0.54
SO ₄ ⁻	0.22	0.18

TABLE 2. Some soil-water characteristics for the experimental sites at different depth in 1995 / 96 and 1996 / 97 seasons.

Sample depth (cm)	FC %	PWP %	ASM %	D _b (g / cm ³)
1995 / 96				
0 - 15	42.40	20.00	22.40	1.176
15 - 30	35.90	18.80	17.10	1.244
30 - 45	33.45	15.00	18.45	1.251
45 - 60	31.71	14.50	17.21	1.431
1996 / 97				
0 - 15	42.40	20.93	21.47	1.186
15 - 30	36.99	18.02	18.97	1.261
30 - 45	33.41	15.61	17.80	1.264
45 - 60	32.61	15.58	17.03	1.336

FC = Field capacity

ASM = Available soil moisture

PWP = Permanent wilting point

D_b = Soil bulk density

Quality characters, *i.e.* total soluble solids of root (TSS) was measured by hand refractometer at 60, 90, 120 days and at harvesting. Sucrose percentage was estimated polarimetrically as mentioned by Le-Docteur (1927).

Apparent purity percentage was calculated according to

$$\text{the following equation Purity \%} = \frac{\text{Sucrose \%}}{\text{TSS \%}} \times 100$$

All data were subjected to statistical analysis according to procedures outlined by Snedecor and Cochran (1967).

Results and Discussion

Growth characters

The effects of planting dates on root length, root diameter and root fresh weight were significant at all ages in the two seasons (Table 3, 4 and 5). The mid sowing date (10th of Oct.) gave the greatest root length, while early planting date (25 Sep.) produced the thickest and heaviest root at all ages in both seasons.

TABLE 3. Effects of planting dates, irrigation treatments and their interaction on root length (cm) at different ages in 1995 / 96 and 1996 / 97 seasons.

Pl. dates A	1995 / 96 season											
	45 days				75 days				105 days			
Ir. Treat B	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean
B ₁	21.00	21.63	19.75	21.46	29.75	28.75	27.38	28.63	33.63	37.25	34.13	35.00
B ₂	23.25	24.88	21.75	23.29	30.50	33.88	27.63	30.67	38.13	37.75	35.38	37.08
B ₃	23.75	26.55	22.00	24.00	31.75	36.50	29.13	32.46	39.50	38.75	37.13	38.46
B ₄	21.00	24.50	20.63	22.04	30.00	32.75	27.88	30.21	37.38	37.00	34.50	36.29
Mean	22.25	24.81	21.83	22.69	30.50	32.97	28.00	30.49	37.16	37.69	35.28	36.75
A	2.50				2.50				1.43			
LSD 5% B	2.15				1.68				2.04			
AB	3.72				2.91				2.53			
1996 / 97												
B ₁	18.15	18.28	13.45	16.63	27.00	26.58	21.28	24.95	28.83	29.35	29.43	29.20
B ₂	20.65	18.90	14.80	18.13	27.93	28.78	23.93	26.88	29.50	30.45	30.63	29.99
B ₃	20.85	21.78	15.00	19.21	28.85	30.28	28.50	29.21	30.75	33.03	38.40	31.73
B ₄	19.73	18.48	14.73	17.64	27.53	26.90	23.65	26.03	29.33	29.75	29.98	29.68
Mean	19.84	19.36	14.50	17.90	27.83	28.13	24.34	26.76	29.60	30.64	30.21	30.15
A	1.22				1.27				1.30			
LSD 5% B	0.75				1.31				1.51			
AB	1.31				2.27				2.63			

TABLE 4. Effects of planting dates, irrigation treatments and their interaction on root diameter (cm) at different ages in 1995 / 96 and 1996 / 97 seasons.

Pl. dates A	1995 / 96 season											
	45 days				75 days				105 days			
Ir. Treat B	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean
B ₁	2.90	2.68	1.48	2.35	5.90	6.35	5.60	5.95	8.88	8.00	6.65	7.84
B ₂	2.68	2.18	1.30	2.05	5.95	5.88	5.35	5.72	8.53	7.68	6.45	7.55
B ₃	2.13	1.95	1.00	1.69	5.55	4.68	5.15	5.13	8.20	6.98	5.88	7.02
B ₄	2.43	2.15	1.13	1.90	5.85	5.68	5.35	5.63	8.40	7.30	6.35	7.35
Mean	2.53	2.24	1.23	1.99	5.81	5.64	5.36	5.60	8.50	7.49	6.33	7.44
A	0.26				0.54				0.48			
LSD 5% B	0.22				0.38				0.31			
AB	0.38				0.65				0.56			
1996 / 97												
B ₁	3.03	2.75	1.48	2.42	6.53	5.63	6.15	6.10	8.76	7.90	6.63	7.76
B ₂	3.63	2.35	1.30	2.09	6.00	5.40	5.35	5.58	8.75	7.63	6.45	7.61
B ₃	2.20	2.05	1.00	1.75	4.63	4.90	5.00	4.87	8.30	7.00	5.95	7.11
B ₄	2.38	2.15	1.10	1.88	5.78	5.38	5.20	5.45	8.50	7.23	6.38	7.37
Mean	2.56	2.33	1.22	2.03	5.73	5.34	5.43	5.50	8.59	7.44	6.35	7.46
A	0.15				0.21				0.53			
LSD 5% B	0.30				0.42				0.42			
AB	0.34				0.73				0.73			

The increase in weight and diameter of the root in early planting date could be due to its longer vegetative growth period under such environmental conditions which seems to be more suitable for sugar beet growth. Such effect of root weight can be attributed to increasing of root diameter and roots are the tallest at the mid sowing date (10th of Oct.). Similar results were obtained by Taha (1985) and Badawi (1985).

TABLE 5 . Effects planting dates, irrigation treatments and their interaction on fresh root weighth (g/plant) at different ages in 1995 / 96 and 1996 / 97 seasons.

Pl. dates A	1995 / 96 season											
	45 days				75 days				105 days			
	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean
Ir. Treat B	93.13	47.65	25.44	55.41	417.75	237.75	121.50	287.33	775.50	625.25	329.25	597.67
B ₁	91.08	43.29	20.69	51.68	383.00	235.75	119.50	246.08	690.75	597.75	355.00	547.83
B ₂	67.52	33.72	18.30	39.85	324.25	165.50	107.00	198.92	564.25	543.75	340.75	482.92
B ₃	69.12	63.80	18.64	41.52	333.25	200.00	115.25	216.17	639.50	568.75	370.50	526.25
Mean	80.21	40.36	20.77	47.11	364.56	210.00	115.81	230.12	667.50	283.88	364.63	238.67
A	13.59				58.90				31.13			
LSD 5% B	10.94				31.76				97.34			
AB	18.94				54.86				168.49			
	1996 / 97											
B ₁	35.45	30.65	9.93	25.34	298.90	240.90	85.80	208.53	482.50	378.90	342.00	401.00
B ₂	27.65	21.85	8.30	19.27	246.50	183.90	70.93	167.13	101.50	356.50	327.75	361.92
B ₃	18.78	20.83	5.85	15.15	144.95	173.83	58.75	125.84	325.50	331.00	298.25	318.25
B ₄	24.95	22.15	6.28	17.79	226.43	178.10	65.25	156.58	356.75	334.25	320.50	337.17
Mean	26.71	23.87	7.59	19.39	229.19	194.18	70.18	164.51	391.56	350.06	322.23	354.58
A	3.09				23.52				49.50			
LSD 5% B	3.47				27.95				45.99			
AB	6.01				48.47				76.97			

Regarding to effect of irrigation treatments on root length., root diameter and root weight (Tables, 3, 4 and 5), it was significant at all ages in both seasons. The tallest root resulted with the treatment of irrigation at a depletion of 80 % from available soil moisture B₃ in both seasons. The results show that roots grow deeper under water stress than under excessive water status. On the other hand, root diameter and root weight increased where B₁, irrigation at depletion of 40% from available soil water. Emara (1996) and Abd EL-Wahab *et al.* (1996) obtained similar results.

The interaction between A₁ and irrigation treatment B₁ gave the greatest values of root diameter and root weight, while with B₃ for root length only.

The influence of planting dates on number of leaves per plant and fresh leaves weight / plant was significant at all ages in both seasons (Tables 6 and 7).

Results showed that 25 Sept. as a planting date produced the greatest number of leaves / plant and heaviest fresh leaves weight / plant. This increase may be a reflection of accelerated crop phonology brought about the comparatively warmer temperature that prevail during their vegetative growth. Similar results were obtained by Badawi (1985).

Data presented in Tables 6 and 7 indicate that delaying the irrigation time from 40 to 80 % depletion caused a remarkable decrease in leaves number and leaves weight / plant at all ages in both seasons. The greatest value was obtained *Egypt. J. Soil Sci.* 43, No. 4 (2003)

TABLE 6 . Effects of planting dates, irrigation treatments and their interaction on number of leaves / plant at different ages in 1995 / 96 and 1996 / 97 seasons.

Pl. dates A	1995 / 96 season											
	45 days				75 days				105 days			
Ir. Treat B	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean
B ₁	14.25	12.00	10.25	12.17	19.50	16.50	13.00	16.33	24.25	22.25	20.00	22.17
B ₂	12.75	11.25	9.50	11.17	19.25	16.00	13.00	16.08	23.00	21.25	19.75	21.33
B ₃	12.25	10.75	8.50	10.50	18.75	13.75	12.00	14.83	21.00	20.25	18.00	19.75
B ₄	12.75	11.25	9.25	11.08	18.25	14.25	12.75	15.08	22.00	21.00	18.50	20.50
Mean	13.00	11.31	9.38	11.23	18.94	15.13	12.69	15.58	22.56	21.18	19.06	20.93
A	0.73				1.62				2.27			
LSD 5% B	0.82				1.02				1.69			
AB	0.42				1.77				2.92			
1996 / 97												
B ₁	9.75	10.00	8.75	9.50	19.25	16.50	12.50	16.08	21.50	20.25	19.00	20.25
B ₂	9.50	9.00	8.25	8.92	19.25	15.50	12.00	15.58	20.75	19.75	18.50	19.67
B ₃	9.06	8.25	7.25	8.17	16.25	14.50	11.00	13.92	20.25	19.00	16.50	18.58
B ₄	9.26	-9.25	8.00	8.83	18.50	15.25	11.50	15.08	20.75	19.25	18.25	19.12
Mean	9.38	9.13	8.06	8.86	18.31	15.44	11.75	15.17	20.81	19.56	18.06	19.48
A	0.69				1.42				1.74			
LSD 5% B	0.59				0.91				1.44			
AB	1.03				1.57				2.50			

TABLE 7 . Effects of planting dates, irrigation treatments and their interaction on fresh leaves weight / plant (g) at different ages in 1995 / 96 and 1996 / 97 seasons.

Pl. dates A	1995 / 96 season											
	45 days				75 days				105 days			
Ir. Treat B	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean
B ₁	242.42	210.84	92.32	181.86	946.50	614.00	338.25	629.27	1202.3	1077.0	617.50	965.60
B ₂	225.79	189.17	91.21	164.72	723.75	557.50	337.00	539.42	1159.8	1060.0	612.25	944.02
B ₃	211.57	170.98	84.01	155.52	645.50	535.25	316.75	499.17	833.50	847.75	603.00	761.42
B ₄	224.20	170.39	88.16	160.92	714.00	555.25	630.75	533.33	950.75	916.00	613.25	826.67
Mean	225.99	185.34	88.93	166.75	757.44	565.50	330.69	551.21	1036.6	975.19	611.50	814.53
A	39.24				143.66				178.97			
LSD 5% B	38.13				74.81				175.23			
AB	66.03				129.57				303.93			
1996 / 97												
B ₁	193.22	181.08	73.45	149.25	1144.5	860.75	312.25	772.50	1021.3	1063.8	896.00	993.67
B ₂	159.23	155.78	72.20	129.07	930.25	662.75	259.95	617.58	949.75	925.75	812.75	860.08
B ₃	117.43	134.13	46.28	99.28	517.25	548.00	154.75	406.67	882.50	837.50	618.75	779.58
B ₄	148.38	143.00	55.08	115.48	759.25	570.00	196.00	208.42	938.25	898.75	802.25	879.75
Mean	154.56	153.49	61.75	123.27	837.81	660.38	230.69	576.29	947.94	931.44	782.44	887.27
A	10.59				73.67				137.43			
LSD 5% B	12.59				81.70				128.87			
AB	21.80				150.77				223.21			

by irrigation at a depletion of 40 % followed by 60 % then normal irrigation as recommended B₄ . Similar trend was obtained by Emara (1996). Over the two seasons, the highest number and fresh weight of leaves / plant were obtained from early planting date with treatment B₁.

Yield and yield components

Results shown in Table 8 clarify that there was a significant increase in number of plant / fed at harvest in favour of late planting date over the early ones in both seasons. Such increase could be due to that the weather conditions associated with seed germination and early seedling growth in case of early planting appears to be comparatively proper for giving a good stand.

TABLE 8. Effect of planting dates, irrigation treatments and their interaction on number of plants / fed at harvest in 1995 / 96 and 1996 / 97 seasons.

Planting dates Irrig. Treat.	A B	1995 / 96				1996 / 97			
		A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean
B ₁		22065	20970	23992	22342	24330	23055	26000	24462
B ₂		22747	21435	22612	22264	24172	22642	26077	24297
B ₃		22650	19840	22575	21688	24412	23175	25597	24395
B ₄		23370	20070	23062	22167	26242	22852	26002	25032
Mean		22708	20578	23060	22117	24789	22931	25919	24546
	A	16.39				16.41			
LSD 5%	B	10.94				10.62			
	AB	NS				NS			

Concerning irrigation treatment effect, it is clear from Table 8 that number of plants / fed at harvest with significantly decreased increasing the depletion of available soil water.

Regarding to the effect of sowing dates on root length, root diameter, root weight, top yield and root yield / fed at harvest, it was significant in both seasons. Data presented in Tables 9 and 10 showed that early planting date (25Sept.) was associated with the greatest values of the yield and yield components in both seasons. This results due to more favourable environmental conditions such as temperature, light intensity and photo period which was reflected on root length, root diameter, root weight and top yield and subsequently root yield / fed. Similar results were obtained by Taha *et al.* (1985) and Metwally (1998).

Irrigation treatments had significant effect on yield and its components in both seasons) (Tables 9 and 10). The highest values for root length , root diameter, root weight and top yield / fed were obtained from the irrigation when 40 % of available soil water was depletion B₁, the mentioned traits decreased gradually and consistently as depletion level increased up to 80 %.

TABLE 9 . Effects of planting dates, irrigation treatments and their interaction on root length , root diameter and root weight at harvest in 1995 / 96 and 1996 / 97 seasons.

Pl. dates A	1995 / 96 season											
	Root length (cm)				Root diameter (cm)				Root weight (g 0			
Ir. Treat B	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean
B ₁	41.40	40.35	38.90	40.21	16.00	15.38	13.95	15.11	1387	1353	1142	1294
B ₂	43.55	43.15	39.50	42.07	15.05	15.08	13.40	14.53	1313	1308	1176	1266
B ₃	45.50	44.10	41.05	43.55	14.55	14.57	12.70	13.94	1187	1187	989	1121
B ₄	42.30	40.60	39.03	40.64	14.75	14.83	12.90	14.16	1178	1283	1076	1179
Mean	43.19	42.05	39.62	41.62	15.09	14.96	13.24	14.44	1266	1283	1096	1215
A	2.25				0.36				97			
LSD 5% B	1.34				6.53				100			
AB	NS				NS				NS			
1996 / 97												
B ₁	37.73	32.98	29.78	33.49	11.70	9.13	8.78	9.87	1317	1333	1063	1238
B ₂	38.58	34.55	31.78	34.97	10.20	8.88	8.55	9.21	1285	1270	1039	1198
B ₃	40.03	34.60	34.35	36.33	9.70	8.43	8.18	8.75	1183	1175	914	1091
B ₄	37.93	33.88	31.43	34.41	10.40	8.75	8.35	9.17	1161	1243	968	1124
Mean	38.57	34.00	31.84	34.80	10.50	8.79	8.45	9.25	1237	1255	996	1162
A	1.59				0.67				37			
LSD 5% B	1.23				0.55				93			
AB	NS				NS				NS			

TABLE 10. Effects of planting dates, irrigation treatments and their interaction on root yield, top yield and sugar yield in 1995 / 96 and 1996 / 97 seasons.

Pl. dates A	1995 / 96 season											
	Root yield (ton / fed)				Top yield (ton / fed)				Sugar yield (ton / fed)			
Ir. Treat B	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean
B ₁	30.41	28.34	27.06	28.61	14.64	13.80	12.72	13.72	4.60	4.28	4.19	4.36
B ₂	29.72	28.09	26.51	28.11	14.60	10.69	11.73	12.34	4.78	4.35	4.47	4.53
B ₃	26.91	23.50	22.36	24.26	12.38	9.73	9.17	10.43	4.06	3.80	3.91	3.95
B ₄	27.51	25.70	24.83	26.01	12.91	10.97	11.33	11.73	4.64	3.84	3.95	4.14
Mean	28.64	26.41	25.19	26.75	13.63	11.30	11.24	12.05	4.52	4.07	4.13	4.22
A	0.99				1.85				0.22			
LSD 5% B	2.18				1.48				0.36			
AB	2.51				NS				0.95			
1996 / 97												
B ₁	31.83	30.78	27.60	30.07	20.95	21.10	18.58	20.21	4.83	4.80	4.48	4.70
B ₂	30.93	28.78	27.03	28.91	20.25	16.75	18.33	18.44	4.83	4.55	4.45	4.61
B ₃	28.78	27.20	23.95	26.64	17.00	14.38	14.50	15.29	4.68	3.95	4.10	4.24
B ₄	30.40	28.35	24.83	27.86	18.10	15.35	16.50	16.71	4.58	4.60	4.95	4.71
Mean	30.48	28.78	25.85	28.37	19.08	16.94	16.98	17.66	4.73	4.48	4.50	4.58
A	0.69				N.S				0.19			
LSD 5% B	1.91				3.50				0.34			
AB	2.64				N.S				0.85			

Results of yield components may be attributed to healthy plants, tallest , thickness and heaviest roots which contributed to high root yield / fed, whereas treatment B₃ had the lowest values of the mentioned characters. Attia and Sultan (1987) Emara (1996) came to the same findings .

The highest values of studied characters of yield and yield components were obtained from plants planted in 25 Sept. A₁ and depletion of 40 % from available soil water B₁.

Quality characters

Data in Tables 10 and 11 show that the influence of planting date on quality characters of sugar beet was significant on total soluble solids (TSS) sucrose percentage, purity and sugar yield / fed in both seasons . Early planting date (25 Sept.) was associated with the highest values. The increase in this treats in early sowing date could be due to the minimum accumulated night temperature in the period during production of T.S.S. and sucrose and to a longer growing season between planting date and harvest comparing with other planting dates. Similar results had been observed by Metwally (1998).

TABLE 11. Effects of planting dates, irrigation treatments and their interaction on sucrose % and purity % at harvest in 1995 / 96 and 1996 / 97 seasons.

Pl. dates A	1995 / 96 season							
	Sucrose %				Purity %			
Ir. Treat \ B	A ₁	A ₂	A ₃	Mean	A ₁	A ₂	A ₃	Mean
B ₁	17.38	16.58	16.18	16.71	79.54	78.50	77.60	78.54
B ₂	16.87	15.53	16.10	16.15	77.47	73.44	75.38	75.43
B ₃	15.60	15.08	14.70	15.12	73.39	75.35	70.00	72.91
B ₄	15.97	14.95	15.15	15.34	78.12	71.30	74.70	74.71
Mean	16.46	15.54	15.53	15.83	77.13	74.65	74.42	75.39
A	0.59				4.68			
LSD 5% B	0.63				3.42			
AB	1.09				5.92			
	1996 / 97							
B ₁	17.15	15.50	16.25	16.30	82.05	75.23	77.28	78.18
B ₂	16.50	16.85	15.50	16.28	76.36	80.31	76.40	77.69
B ₃	15.20	15.15	15.10	15.15	76.57	74.36	77.42	76.11
B ₄	16.95	14.75	15.15	15.61	80.91	76.70	75.01	77.54
Mean	16.45	15.56	15.50	15.83	78.97	76.65	76.52	77.35
A	0.74				1.73			
LSD 5% B	0.78				4.45			
AB	1.34				8.01			

Concerning the effect of irrigation treatments on quality characters of sugar beet, (Tables 10 and 11), it was significant in both seasons. All characters in B₁ treatment was significantly higher than other treatments. In general early planting date with irrigation at 40 % depletion B₁ gave the highest values.

On conclusion, early planting is better. A certain delay of irrigation (B_1 -40% depletion) may lead to higher beet and sugar yields. This means, irrigation water can be saved and the yield will increase.

References

- Abd El - Wahab, S.A., Amer.A. A., El - Shahawy,M.L. and Sobh, M.M.** (1996) Effect of different irrigation amounts and Potassium fertilizer rates on yield and quality of sugar beet and water efficiencies.*J. Agric. Sci., Mansoura Univ.* **21**(2), 4687.
- Attia, A.N. and Sultan. M.S.** (1987) Response of some sugar beet (*Beta vulgaris, L.*) varieties to irrigation intervals and harvesting dates.*Conf. of Agric. Sci. on Food Efficiency over Comming Through Autonomous Efforts in Egypt*, Vol. 5, 22 -29, June 1987, Fac. of Agric., Mansoura Univ.
- Badawi, M.A.** (1985) Studies on sugar beet (*Beta vulgaris L.*). *Ph.D. Thesis*, Fac. of Agric. Mansoura Univ., Egypt.
- Cucci, G., Caliandro. A., Catalano, M. and Mastro, M.A.** (1989) Productivity response of autumn sugar beet to different irrigation regimes and sowing dates under southern conditions. *Informatore Agrario*, **45**(22), 67-70 (*C.F. Field Crop Abst.*, **42**, 7224, 1989).
- Dimian, W.N., Miseha. W.T. and Faltas, R.L.** (1987) Water use sugar beet crop under methods of irrigation. *Bull. Fac. of Agric., Univ. of Cairo*, **38** (1), 185.
- Emara, T.K.** (1996) Studies on the effect of some cultural practices on water parameters of sugar beet in North Delta Region. *Ph.D. Thesis*, Fac. of Agric., Mansoura Univ., Egypt.
- Ghandorah, M.O.** (1994) Effects of sowing date and cultivar on sugar beet (*Beta vulgaris L.*) production in the Central region of Saudi Arabia. *Arab Gulf J. Scientific Res.*, **12** (3) 465.
- Ibrahim, M.A.M., Sherif. M.A. and Ainer, N.G.** (1993) Response of sugar beet in North Delta to irrigation (Determination of Optimum Irrigation Intervals) *J. Agric. Sci., Mansoura Univ.*, **18** (5),1288.
- Jackson, M.L.** (1967) *Soil Chemical Analysis*. Constable and Co., Ltd., London.

- Le-Docte, A.** (1927) Commercial determination of sugar beet root using the Sachr Le Docta process. *Sugar L.* 29: 488-492. (*C.F. Sugar Beet Nutrition*, April 1972. Applied Science Publishers LTD. London A.P. Dray Cott).
- Metwaly, A.M.** (1998) Effect of some agricultural practices on sugar beet (*Beta vulgaris* L.) *Ph.D. Thesis*, Fac. of Agric., Minia Univ., Egypt.
- Rayan, A.A., Mohamed, K.A., Ainer, N.G. and Soliman, S.A.** (1997) Water needs for sugar beet in Upper Egypt. *Egypt. J. Appl. Sci.*, 12 (12), 993.
- Snedecor, W.G. and Cochran, G.W.** (1967) *Statistical Methods*. 6th ed. The Iowa State Univ. Press. USA.
- Taha, E.M., El -Ashmoony, M.S. and El-Sherbeny, A.A.** (1985) The influence of sowing dates and varieties on yield of sugar beet *Minia J. Agric. Res. and Dev.*, 7(2), 737.

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استجابة بنجر السكر لمواعيد الزراعة والاحتياجات المائية في مصر الوسطى. ٢- المحصول ومكوناته

محمد على الشونى* ، ايمان محمد طه** ، محمد عبد القادر
شريف*** ومحمد محمود عويس***

* قسم الأراضي واستغلال المياه-المركز القومي للبحوث، ** قسم
المحاصيل- كلية الزراعة-جامعة المنيا، *** وقسم المقتنيات المائية
والرى الحقل-مركز البحوث الزراعية-القاهرة-مصر.

أقيمت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بسدس
- محافظة بنى سويف خلال موسمي ١٩٩٥ / ١٩٩٦، ١٩٩٦ / ١٩٩٧
وذلك لدراسة العلاقة بين مواعيد الزراعة (٢٥ سبتمبر، ١٠
أكتوبر، ٢٥ أكتوبر) ومعاملات الري (الرى عند استنفاد ٤٠، ٦٠، ٨٠
٪ من رطوبة التربة بالإضافة لمعاملة الري العادى كمعاملة
الكنترول) وتأثير ذلك على انتاجية بنجر السكر صنف راس
بولى Ras Poly وكانت أهم النتائج :

- ١- كانت هناك زيادة معنوية في صفات النمو :
طول الجذر ، سمك الجذر ، الوزن الطازج للجذر والأوراق وعدد
الأوراق للنبات عند الزراعة المبكرة (٢٥ سبتمبر) في جميع
الأعمار المدروسة لموسمي التجربة
- ٢- عند الحصاد أعطى ميعاد الزراعة المبكر أفضل النتائج
لصفات سمك الجذر وقطر الجذر ومحصول الجذور والأوراق
والسكر بينما أعطى ميعاد الزراعة الأوسط (١٠ أكتوبر) أكبر قيمة
لوزن الجذر . كما أعطت الزراعة المتأخرة أكبر عدد من النباتات
للقدان في موسمي التجربة .
- ٣- المواد الصلبة الكلية ، النسبة المئوية للسكروز ، النقاوة
زادت معنويا عند الزراعة المبكرة (٢٥ سبتمبر) في موسمي
التجربة .
- ٤- أعطت معاملة الري عند استنفاد ٤٠ ٪ من الرطوبة الأرضية
أعلى القيم لجميع الصفات المدروسة (صفات النمو - المحصول
ومكوناته - صفات الجودة) وذلك في موسمي التجربة .
- ٥- أعطى تفاعل معاملة الزراعة المبكرة (٢٥ سبتمبر) مع معاملة
الرى عند استنفاد ٤٠ ٪ من الرطوبة الأرضية أعلى القيم لجميع
الصفات تحت الدراسة في موسمي التجربة .