

**DIFFERENTIAL RESPONSE OF SOME VARIETIES FROM
DIFFERENT TYPES OF SUGAR BEET TO PLANT
DENSITY AND HARVESTING DATES**

(Received:4.5.2006)

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ABSTRACT

Field experiments were carried out during the two successive growing seasons of 2002 / 2003 and 2003 / 2004, under Beni Sweeif Governorate conditions; to study the response of some different types of sugar beet varieties [type E (Pleno and Samba), type N (Kawemira and LP13) and type N, Z (Gloria and Athos poly)] to three harvest dates (180, 195 and 210 days after sowing) and three plant densities (56000, 42000 and 33600 plants/fed. resulted from hill spacing 15, 20 and 25 cm respectively). Athos poly and Gloria varieties had the best quality traits in terms of sucrose % , purity % and recoverable sugar percentages as well as the lowest juice impurities such as Na , K and amino-N contents. On the other hand Samba and Pleno varieties gave the highest root dimension (length and diameter) and weight as well as rood yield per fed. Harvest sugar beet after 210 days from sowing gave the highest root weight, root yield and the best quality (sucrose, purity, recoverable sugar percentages and sugar yield. On the other hand impurities in terms of N , K and amino - N decreased with delaying harvest date till 210 days after sowing.

Sucrose, purity and recoverable sugar percentages were linearly reduced with the reduction in plant density, while Na , K and amino -N contents decreased with increasing plant density . Root and sugar yields were maximized when beets were growing at 42000 plants / fed..

Variety x harvest date and variety x plant density interactions had a significant effect on root weight, root yield, sucrose % , recoverable sugar % and sugar yield in both seasons. Varieties Pleno and Samba (type E) gave the highest root and sugar yields when sown at 25cm and harvested after 210 days, the varieties Kawemira and Lp 13 (type N) gave the highest root and sugar yield / fed. when sown at 20 cm and harvested after 195 days. On the other hand the varieties Gloria and

Athos poly (type N, Z) gave the highest root and sugar yields when sown at 15 cm and harvested after 180 days.

Key words: *harvesting dates, plant density, types of sugar beet.*

1. INTRODUCTION

The yield of sugar from beet crop is determined by the yield of roots and sugar concentration either of which may change with genotype. Wide variability among genotypes in response to environmental factors, especially plant density and day of harvest is well established. Several studies have reported differences among sugar beet varieties in the yield and quality. Ramadan (1999) and Nassar (2001) found that variety Toro gave the highest root dimension (length and diameter) and weight. Toro and Lola varieties outyielded the other varieties in root number and root yield per fed. On the other hand Aries variety had the best quality traits in terms of sucrose % and purity % and the lowest juice impurities such as Na, K and amino-N contents.

Regarding the effect of harvest date, Barbieri (1982) found that the time of harvest had no significant effect on root and sugar yields. On the other hand Ramadan (1999) found that harvest of sugar beet after 210 days from sowing gave the best quality (sucrose, purity and recoverable sugar percentages) as well as the highest mean root weight, root and sugar yields in two seasons. Impurities in terms of Na, K and amino-N decreased with delaying harvest date (210 days after sowing).

Previous studies showed that plant density had remarkable effects on yield and quality of sugar beet (Sultan *et al.*, 1996; Ramadan 1999). Abo-El-wafa (2002) found that increasing plant spacing from 20 to 30 cm between hills increased root length, diameter and weight as well as root yield, weight of leaves per plant, sucrose percentage and juice purity.

The significant interaction between varieties and harvesting dates was reported by Mahmoud *et al.*, (1990). Ramadan (1999) found that variety x harvest date interaction had a significant effect on purity % (in the first season) as well as mean root weight and root yield (in both seasons.)

The differential response of sugar beet varieties to plant density has been reported by Kamel *et al.*, (1981) and Ramadan (1999) they found significant interaction between varieties and plant density on sucrose % and purity %.

2. MATERIALS AND METHODS

Two field experiments were conducted during successive growing seasons of 2002 / 2003 and 2003 / 2004 at Beni Sweeif Governorate. The physical as well as the chemical analysis of the soil as an average of two seasons revealed that soil texture was clay texture with pH of 7.3 , organic matter 2.0 % , Ca Co₃ 3.8 % , 8.7 ppm available P and 512 ppm available K. Fifty four treatments resulted from the combinations of six sugar beet varieties of three types (Table 1), three harvest dates (180, 195 and 210 days after sowing) and three plant densities; 56000 plants / fed. (50 x 15 cm), 42000 plants / fed. (50 x 20 cm) and 33600 plants / fed. (50 x 25 cm).

A split – split plot design with four replication was used in both seasons. Date of harvest occupied the main plots, plant densities and varieties occupied the sub plots and sub – sub plots, respectively. The sub – sub plot size was 12.5 m², 5 rows 50 cm apart and 5 meters long. Planting dates were the 9th and 11th of October in the first and second seasons respectively. At the four leaf stage, the plants were thinned to insure one plant / hill. Nitrogen was applied at the rate of 80 kg N / fed. in the form of urea (46.5 % N), splitted in two equal doses, the first dose was applied after thinning and the other dose was applied 30 days later. Moreover, 30 Kg of super phosphate (15 % P₂O₅) were added during land preparation and 24 Kg potassium sulphate (48 % K₂O) at seventy-five days after thinning. All other cultural practices were carried out as recommended for sugar beet. At harvest a sample of ten roots was taken to determine the following traits.

Table (1): Types of varieties and their origin country.

Types	No.	Variety	Country of origin
E	1	Pleno	Netherland
	2	Samba	Netherland
N	3	Kawemira	Germany
	4	Lp13(Ghania)	Netherland
N,Z	5	Gloria	Germany
	6	Athos poly	France

2.1. Root yield and its contributing traits

- Root length (cm)
- Root diameter (cm)
- Root weight (g)
- Number of roots at harvest.

-Root yield (ton / fed).

2. 2. Juice quality traits and sugar yield

Sucrose percentage was determined using Saccharometer on a lead acetate basic according to Carruthers and Oldfield (1960).

Juice purity percentage = sucrose % x 100 / T.S.S. according to Carruthers and Oldfield (1960).

Sodium, potassium and amino-N (millequivalents/100 gm beet) were determined according to A.O.A.C. (1984).

Recoverable sugar percentage (corrected sugar) = $pol\% - 0.343 (K + Na) + 0.094 \text{ amino-N} + 0.29$ according to Reinfield *et al.*, (1974), where pol = Sucrose %, K = Potassium, Na = Sodium in milliequivalent / 100 gm beet.

Recoverable sugar yield (ton/ fed.) = root yield (ton/ fed.) x recoverable sugar%.

Data collected from both seasons were statistically analyzed according to Snedecor and Cochran (1967). Treatment means were compared by using LSD at 5 % level of probability according to Waller and Duncan (1969).

3. RESULTS AND DISCUSSION

3.1. Variety performance

Data presented in Table (2) reveal that the varieties significantly differed in root length and diameter in both seasons. Samba variety exhibited the best root performance in terms of length and diameter which recorded 29.8 , 18.7 cm and 30.3 , 19.3 cm in the first and second seasons, respectively. These findings are in agreement with those obtained by Badawi and El-Moursy (1997) who showed that varieties differed in root length and diameter.

The data in Table (2) reveal significant differences among the varieties in root weight at harvest in both seasons. Samba and Pleno gave the highest root weight with an average of 919, 877 and 957, 895 grams in the first and second seasons, respectively, while the lowest root weights 601, 595 grams and 620, 622 grams resulted from varieties Gloria and Athos poly in the first and second season, respectively. The other varieties ranked in between. Such effect may be due to that Samba and Pleno varieties are characterized with the highest root dimension as mentioned before. At harvest, Gloria and Athos poly gave the highest no. of roots with an average of 41.3, 40.7 and 42.0, 41.8 thousand plants/fed., in the first and second seasons, respectively, while the lowest no. of roots at harvest was 39.1 and 39.6 thousand plants / fed.

Differential response of some different types.....

Table (2) : Mean yield and quality traits of sugar beet varieties during 2002 /2003 and 2003 /2004 seasons.

Varieties	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
	Root length (cm)		Root diameter (cm)		Root weight (g)		No. of roots at harvest (1000)		Root yield (tons/fed)		Sucrose %	
Pleno	28.2	28.9	16.0	16.7	877	895	39.3	39.9	33.2	35.7	15.7	16.0
Samba	29.8	30.3	18.7	19.3	919	957	39.1	39.7	34.4	38.0	15.5	15.9
Kawemira	26.0	27.0	14.2	14.7	752	763	39.3	39.8	28.9	30.4	16.7	17.2
LP 13	25.0	25.7	13.7	14.2	709	722	39.2	39.6	27.3	28.6	17.1	17.4
Gloria	21.0	21.8	10.4	11.2	601	620	41.3	42.0	24.2	26.0	18.7	19.3
Athos poly	20.3	21.9	10.0	10.8	595	622	40.7	41.8	23.6	26.0	19.6	19.9
LSD at level 0.05	0.2	0.3	0.6	0.4	0.22	0.27	N.S	N.S	2.1	2.3	0.1	0.2
Varieties	Purity %		Meq./100 gm Beet				Amino -N		Recoverable sugar %		Sugar yield (tons/fed)	
			Na	K								
Pleno	82.7	83.2	1.86	1.80	4.76	4.58	3.00	2.85	12.90	13.25	4.28	4.73
Samba	82.2	83.0	1.90	1.82	4.81	4.60	3.04	3.01	12.61	13.13	4.34	4.99
Kawemira	85.1	86.2	1.65	1.61	2.85	2.78	2.32	2.18	14.68	15.20	4.26	4.62
LP 13	86.3	87.5	1.55	1.53	2.80	2.53	2.12	2.00	15.10	15.53	4.13	4.44
Gloria	88.7	89.2	1.40	1.37	3.12	3.00	1.94	1.85	16.67	17.34	4.02	4.51
Athos poly	90.6	91.3	1.32	1.28	2.97	2.91	1.79	1.68	17.65	18.01	4.17	4.69
LSD at level 0.05	0.4	0.5	0.04	0.03	0.57	0.62	0.08	0.06	0.51	0.56	0.04	0.03

1st = first season

2nd = second season

Table (3) : Effect of harvesting date on the yield and quality of sugar beet during 2002 / 2003 (1st) and 2003 / 2004(2nd) seasons.

Harvesting date	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
	Root length (cm)		Root diameter (cm)		Root weight (g)		No. of roots at harvest (1000)		Root yield (tons/fed)		Sugar %	
180 days	23.1	24.1	12.4	12.8	686	715	39.7	40.6	26.5	28.9	16.7	17.0
195 days	25.2	26.3	14.0	14.3	746	772	39.8	41.2	28.8	31.5	17.3	17.8
210 days	26.4	27.2	15.1	15.3	792	810	39.9	41.5	30.5	33.3	17.6	18.2
LSD at level 0.05%	0.1	0.2	0.4	0.3	0.17	0.19	N.S	N.S	1.8	1.9	0.1	0.3
Harvesting date	Purity %		Meq./100 gm Beet				Amino -N		Recoverable sugar %		Sugar yield (tons/fed)	
			Na	K								
180 days	85	86.3	1.72	1.66	3.96	3.87	2.56	2.47	14.27	14.58	3.71	4.17
195 days	86.1	87.2	1.59	1.48	3.43	3.33	2.33	2.30	15.07	15.64	4.26	4.91
210 days	86	87.6	1.53	1.51	3.27	3.18	2.22	2.17	15.47	16.10	4.62	5.24
LSD at level 0.05%	0.3	0.2	0.04	0.02	0.05	0.03	0.16	0.13	0.27	0.25	0.19	0.21

resulted from Samba and Lp 13 in the first and second season, respectively. The other varieties ranked in between. Differences among sugar beet varieties in mean root weight and number of roots at harvest were reported by Nassar (1992) and Ramadan (1999).

Significant differences among varieties in root yield per feddan were reported in both seasons (Table 2). Samba variety recorded the highest root yield (34.4 and 38.0 tons/fed) in the first and second seasons, respectively, while Athos poly recorded the lowest root yield (23.6 and 26.0 tons/fed.) and the other varieties ranked in between. Such effect may be due to that Samba variety has the best root performance (root dimension and weight). Similar results were reported by Kamel *et al.*, (1981), Ramadan (1999) and Nassar (2001).

With respect to root quality, a significant difference among varieties in sucrose and purity percentages has been detected in both seasons (Table 2). Athos poly and Gloria varieties exhibited the highest sucrose percentages (19.6 and 18.7 %) in the first season and (19.9 and 19.3 %) in the second season and purity percentage (90.6 and 88.7 %) in the first season and (91.3 and 89.2 %) in the second season while Samba variety gave the lowest values of sucrose % (15.5 and 15.9 %) and purity % (82.2 and 83.0 %) in the 1st and 2nd seasons, respectively. The superiority of Athos poly and Gloria (type N, Z) in this respect may be due to its small sized roots. The small size of roots is assumed to have high sucrose % as reported by Nassar (1992), Lauer (1997) and Nassar (2001).

Data presented in Table (2) reveal that root juice impurities significantly differed among varieties. In both seasons the highest and lowest percentage of impurities in terms of Na, K and amino-N resulted from Samba and Athos poly varieties respectively. The superiority of Athos poly variety may be attributed to increased sucrose and purity percentages, as well as reduction of impurities. In this regard Lauer (1997) and Ramadan (1999) reported variety differences in impurity components.

Varieties exhibited significant differences in recoverable sugar percentage in the first and second seasons are shown in (Table 2). The highest recoverable sugar % was recorded by Athos poly and Gloria (17.65 and 16.67) in the first and (18.01 and 17.34) in the second season, respectively.

Significant differences among the varieties in recoverable sugar yield (tons / fed.) have been reported in both seasons (Table 2). Samba gave the highest recoverable sugar yield (4.34 and 4.99 tons / fed.) in the first and second seasons, respectively, while Gloria gave the lowest ones in the first season and Lp 13 in the second season. The superiority of Samba may be attributed to the increase in root yield at harvest as

mentioned before. Variations among sugar beet varieties in recoverable sugar yield were reported by Nassar (1992), Shalaby (1998), Ramadan (1999) and Nassar (2001).

3.2. Effect of harvesting dates

Number of roots at harvest was not significantly affected by harvesting time, while root length, root diameter and mean root weight were significantly increased when harvest was delayed up to 210 days after sowing (Table 3). The present results are in harmony with those obtained by Barbieri (1982), Nassar (1992), Lauer (1997), Al-Labbody (1998) and Ramadan (1999) who found that harvest date at 210 days after sowing gave the highest means of root length, diameter and root weight.

Delaying the date of harvest up to 210 days after sowing caused a significant increase in root yield / fed. . The increase in root yield could be attributed to the increase in mean root weight accompanying late harvest. Similar results were reported by Nassar (1992), Al - Labbody (1998) and Ramadan (1999).

Sucrose percentages significantly increased with delaying harvesting in both seasons, while purity % was significantly increased with later in the second seasons as well as the reduction of impurities in terms of Na, K and amino- N. These results are in harmony with those obtained by Mahmoud *et al.*, (1990), Nassar (1992), Lauer (1995) and Ramadan (1999).

Harvesting sugar beet after 210 days gave the highest recoverable sugar percentages (Table 3). Late harvest resulted in increased sucrose and purity %, as well as to reduction impurities in terms of Na, K and amino- N. These results are in harmony with those obtained by Nassar (1992) and Ramadan (1999).

Delaying the date of harvest up to 210 days after sowing significantly increased recoverable sugar yield. The increase amounted to 0.91 and 1.07 ton / fed. on the average of both seasons to harvest 180 and 210 days, respectively. The increase might have been due to the increase in root yield and recoverable sugar %. Similar results were reported by Mahmoud *et al.*, (1990), Nassar (1992), Lauer (1997), Al-Labbody (1998) and Ramadan (1999).

3.3. Effect of plant density

Plant density exhibited significant effects on root characters (length, diameter and weight) in both seasons (Table 4). Increasing plant density from 33600 to 56000 plants / fed. decreased root length, diameter and weight, while opposite trend was observed for the number of roots at harvest. The reduction in root weight accompanied higher

densities may be due to the high competition between plants for various growth elements.

Increasing plant density up to 42000 plants / fed. significantly produced the highest root yield / fed. (29.5 and 32.2) in the first and second seasons, respectively. Further increase in plant density was accompanied with a reduction in root yield / fed.

The data presented in (Table 4) reveal that plant density had a significant effect on sucrose and purity percentages in both seasons. Such effect may be due to the fact that under the highest plant densities appreciable reduction in root weight was recorded which was reflected in the increase of root sucrose content. These results are in line with obtained by Lauer (1995), Ramadan (1999) and allam *et al.*, (2005).

Data presented in (Table 4) reveal that juice impurities, expressed as Na, K and amino- N were decreased with increasing of plant density. These results are in harmony with those obtained by Nassar (1992), Ramadan (1999) who found that decreasing plant density per fed. increased significantly and markedly all investigated impurity content.

Recoverable sugar percentages were significantly affected by plant density. The highest recoverable sucrose percentages resulted from 56000 plants/fed. Many different workers obtained similar results, however, Lauer (1995) stated that extractable sugar % decreased with the decrease of plant density.

The highest yield of recoverable sugar per fed. 4.35 and 4.97 tons in the first and second seasons, respectively resulted from 42000 plants / fed., while increasing plant density significantly decreased yield of recoverable sugar, due to the reduction in root yield / fed.. It is worth mentioning that the increase in recoverable sugar % accompanying higher plant density could not compensate for the reduction in root yield and final sugar yield / fed. These results are in harmony with those obtained by Kamel *et al.*, (1989), Mahmoud *et al.*, (1990), Assey *et al.*, (1992) , Ramadan (1999) and allam *et al.*, (2005).

3.4. Interaction effect

Varieties x harvest date interaction was significant for mean root weight, root yield, sucrose %, recoverable sugar % and sugar yield in both seasons. The highest means of root weight (1018 and 1112 g), root yield (38.2 and 41.3 tons / fed) and sugar yield (5.06 and 5.84 tons / fed) resulted from Samba variety harvested after 210 days from sowing. As well as the highest means sucrose % (19.7 and 20.1) and recoverable sugar % (17.81 and 18.16) resulted from Athos poly variety harvested after 180 days from sowing. Delaying the date of harvest insignificantly increased sucrose % and recoverable sugar % (Table 5).

Differential response of some different types.....

Table (4) : Effect of plant density on yield and quality of sugar beet during 2002/2003(1st) and 2003/2004 (2nd) seasons.

Plant density (fed.)	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
	Root length (cm)		Root diameter (cm)		Root weight (g)		No. of roots at harvest (1000)		Root yield (tons/fed)		Sugar %	
15 cm (56000)	23.6	24.1	12.6	12.9	579	602	46.8	48.2	27.1	29.0	17.5	17.8
20 cm (42000)	25.1	25.9	12.9	14.2	729	780	40.5	41.3	29.5	32.2	17.2	17.6
25 cm (33600)	26.5	27.2	14.9	15.1	917	951	32.1	32.8	29.3	31.2	16.9	17.1
LSD at level 0.05	0.1	0.2	0.4	0.3	017	022	2.4	2.7	1.8	1.5	0.1	0.2
Plant density (fed.)	Purity %		Na		K		Amino -N		Recoverable sugar %		Sugar yield (tons/fed)	
					Meq/100 gm Beet							
15 cm (56000)	86.7	87.3	1.56	1.48	3.29	3.18	2.28	2.17	15.37	15.71	4.11	4.56
20 cm (42000)	86.0	87.2	1.60	1.51	3.50	3.32	2.34	2.21	14.98	15.44	4.35	4.97
25 cm (33600)	85.1	85.7	1.68	1.61	3.85	3.63	2.48	2.33	14.45	14.79	4.44	4.61
LSD at level 0.05	0.3	0.2	0.04	0.03	0.05	0.04	0.16	0.18	0.27	0.23	0.19	0.16

Table (5): The interaction effect between varieties and harvest date on some traits during 2002/2003(1st) and 2003 / 2004 (2nd) seasons.

Varieties	Harvesting date	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
		Root weight (g)		Root yield (tons/fed)		Sucrose %		Recoverable sugar %		Sugar yield (ton/fed)	
Pleno	180	775	781	29.5	31.3	15.3	15.4	12.29	12.35	3.61	3.87
	195	870	891	32.8	34.9	15.7	15.9	12.85	12.98	4.19	4.53
	210	987	1012	37.3	40.9	16.2	16.7	13.56	14.42	5.03	5.90
Samba	180	815	828	30.9	34.7	15.0	15.2	11.94	12.25	3.68	4.25
	195	912	932	34.2	38.0	15.4	15.8	12.58	13.00	4.28	4.94
	210	1018	1112	38.2	41.3	16.0	16.7	13.30	14.14	5.06	5.84
Kawemira	180	689	692	26.5	27.8	16.1	16.8	13.65	14.58	3.62	4.05
	195	777	781	29.9	31.7	16.9	17.5	15.04	15.22	4.30	4.82
	210	790	815	30.3	31.9	17.2	17.6	15.35	15.80	4.65	5.04
Lp 13	180	657	672	25.2	26.4	16.4	16.9	14.11	14.87	3.55	3.93
	195	723	733	28.0	29.9	17.3	17.5	15.46	15.64	4.32	4.68
	210	748	759	28.7	30.1	17.5	17.8	15.72	16.08	4.51	4.84
Gloria	180	612	619	24.8	26.3	19.0	19.6	17.05	17.62	4.22	4.63
	195	600	630	24.2	26.1	18.7	19.3	16.70	17.41	4.04	4.54
	210	591	611	23.5	25.8	18.4	19.0	16.27	17.00	3.81	4.39
Athos poly	180	599	630	24.0	26.4	19.7	20.1	17.81	18.16	4.27	4.79
	195	595	623	23.7	26.0	19.7	20.0	17.80	18.00	4.22	4.68
	210	590	613	23.2	25.5	19.3	19.7	17.34	17.87	4.02	4.56
L.S.D at 0.05 %		033	037	0.7	0.6	06	07	0.56	0.61	0.26	0.28

Table (6) : The interaction between varieties and plant density on some traits during 2002/2003 (1st) and 2003/ 2004 (2nd) seasons.

Varieties	Harvesting date	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd
		Root weight (g)		Root yield (tons/fed)		Sucrose %		Recoverable sugar %		Sugar yield (ton/fed)	
Pleno	56000	642	655	29.7	30.8	16.1	16.4	13.46	13.67	4.00	4.21
	42000	829	839	33.2	34.7	15.7	16.2	12.86	12.97	4.29	4.50
	33600	1161	1190	36.6	41.6	15.4	16.0	12.38	13.11	4.56	5.45
Samba	56000	671	687	30.9	31.9	15.9	16.3	13.25	13.41	4.10	4.28
	42000	862	887	34.4	36.2	15.5	16.0	12.58	12.97	4.34	4.70
	33600	1210	1298	38.0	42.9	15.1	15.8	12.00	13.01	4.57	5.58
Kawemira	56000	607	621	28.0	30.2	17.1	17.4	15.10	15.50	4.24	4.68
	42000	784	793	31.7	33.5	16.9	17.1	14.91	15.36	4.73	5.15
	33600	864	875	27.1	27.5	16.2	16.6	14.03	14.70	3.81	4.04
Lp 13	56000	584	612	26.9	27.5	17.4	17.8	15.57	15.97	4.20	4.39
	42000	727	739	29.3	30.2	17.2	17.5	15.24	15.73	4.47	4.75
	33600	816	813	25.6	28.1	16.7	16.9	14.50	14.89	3.72	4.18
Gloria	56000	483	492	23.4	23.8	19.0	19.3	16.98	17.63	4.00	4.35
	42000	586	597	24.3	26.3	18.6	19.0	16.61	17.00	4.03	4.47
	33600	733	771	24.6	26.6	18.5	19.2	16.43	17.39	4.04	4.63
Athos poly	56000	484	511	23.2	25.5	19.8	20.1	17.86	18.56	4.14	4.73
	42000	584	599	23.8	26.7	19.6	19.8	17.70	17.92	4.21	4.78
	33600	717	756	23.9	26.9	19.2	19.5	17.39	17.55	4.15	4.72
L.S.D at 0.05 %		033	037	0.7	0.6	0.5	0.4	0.56	0.61	0.23	0.27

Table (7) : The interaction between varieties, harvest date and plant density on some traits during 2002 / 2003 and 2003 / 2004 seasons.

Variety	Plant density H. date	Root yield (ton/fed.) 2002-2003			Root yield (ton/fed.) 2003-2004			Sugar yield (ton/fed.) 2002-2003			Sugar yield (ton/fed.) 2003-2004		
		56000	42.000	33600	56000	42.000	33600	56000	42.000	33600	56000	42.000	33600
Pleno	180	27.6	29.3	31.3	29.8	31.5	33.4	3.59	3.39	3.67	3.94	3.93	4.04
	195	28.8	32.7	36.9	30.8	34.9	39.5	3.85	4.17	4.35	4.25	4.63	5.05
	210	32.4	37.7	41.7	34.7	40.3	44.6	4.35	5.11	5.45	5.05	5.65	5.99
Samba	180	29.2	30.5	33.1	32.3	33.9	36.7	3.68	3.63	3.72	4.23	4.14	4.26
	195	30.6	34.0	37.9	33.8	37.7	41.9	4.03	4.25	4.56	4.63	4.86	5.24
	210	33.0	38.8	42.9	36.4	43.0	45.2	4.59	5.13	5.45	5.27	5.85	6.07
Kawemira	180	25.6	28.8	25.2	27.1	30.5	26.8	3.61	4.02	3.23	3.90	4.34	3.47
	195	29.0	33.1	27.8	30.7	35.1	29.4	4.47	5.02	4.02	4.82	5.42	4.26
	210	29.6	33.2	28.2	31.3	35.3	29.9	4.64	5.16	4.17	5.01	5.47	4.48
Lp 13	180	23.7	27.2	24.7	24.3	27.9	25.2	3.48	3.90	3.27	3.74	4.19	3.50
	195	28.1	30.2	25.6	28.7	30.9	26.7	4.46	4.68	3.84	4.76	5.03	4.11
	210	29.0	30.6	26.6	29.2	31.2	27.1	4.67	4.85	4.04	5.00	5.19	4.33
Gloria	180	24.1	25.0	25.5	25.3	25.9	26.3	4.10	4.23	4.20	4.37	4.45	4.43
	195	23.8	24.4	24.6	24.5	25.1	25.4	4.04	4.05	4.03	4.32	4.33	4.31
	210	23.1	23.5	23.8	23.8	24.0	24.4	3.98	3.81	4.01	4.28	4.22	4.25
Athos poly	180	23.7	24.1	24.3	23.9	24.2	24.6	4.23	4.29	4.30	4.23	4.36	4.39
	195	23.4	23.9	24.0	23.8	23.9	24.2	4.21	4.25	4.20	4.22	4.30	4.26
	210	22.7	23.6	23.4	23.4	23.7	23.4	4.03	4.10	4.16	4.07	4.22	4.01
L.S.D at 0.05 %		0.6			0.8			0.22			0.24		

The interaction between varieties and plant density showed a significant effect on root weight, root yield, sucrose %, recoverable sugar % and sugar yield in both seasons. The highest means of root weight (1210 and 1298 g), root yield (38.0 and 42.9 tons / fed.) and sugar yield (4.57 and 5.58 tons / fed.), resulted from Samba variety when sown at 25 cm (33600 plants / fed.) as well as the highest means sucrose % (19.8 and 20.1) and recoverable sugar % (17.86 and 18.56) resulted from Athos poly variety and sown at 15 cm (56000 plants / fed.) (Table 6).

The interaction between varieties, harvesting date and plant density showed a significant effect on root yield and sugar yield in both seasons .The highest means of root yield was obtained from varieties Samba (42.9 and 45.2 ton/fed) and Pleno (41.7 and 44.6 ton/fed) when sown at 25 cm (33600 plants / fed.) and harvested after 210 days, in the first and second seasons, respectively, while the highest mean of sugar yield was obtained from varieties Athos poly (4.23 and 4.23 ton/fed) and Gloria (4.10 and 4.37 ton/fed) when sown at 15 cm (56000 plants/fed.) and harvested after 180 days in the first and second season, respectively. (Table 7).

Generally, the variety Pleno and Samba (type E) gave the highest root yield and sugar yield when sown at 25 cm (33600 plants / fed.) and harvested after 210 days, the variety Kawemira and Lp13 (type N) gave the highest root and sugar yield / fed. when sown at 20 cm (42000 plants / fed.) and harvested after 195 days. On the other hand the variety Gloria and Athos poly (types N,Z) gave the highest root and sugar yield when sown at 15 cm (56000 plants / fed.) and harvested after 180 days.

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اختلاف استجابة بعض أصناف بنجر السكر من الطرز المختلفة
للكثافة النباتية وميعاد الحصاد

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أجريت تجربتان حقليتان خلال موسمي ٢٠٠٢ / ٢٠٠٣ و ٢٠٠٣ / ٢٠٠٤ في تربة طينية بمنطقة ناصر محافظة بنى سويف لدراسة مدى استجابة ستة أصناف من بنجر السكر مختلفة الطرز. الصنفان Samba و Pleno يتبعان الطراز E والصنفان Kawemira و Lp13 يتبعان الطراز N بينما الصنفان Gloria و Athos poly يتبعان الطراز N . Z . ثلاث مواعيد حصاد هي ١٨٠ - ١٩٥ - ٢١٠ يوما من الزراعة وثلاثة مسافات بين الجور هي ١٥ ، ٢٠ ، ٢٥ سم والتي نتج عنها كثافة نباتية قدرها ٥٦٠٠٠ ، ٤٢٠٠٠ ، ٣٣٦٠٠ نبات / فدان .

أظهرت النتائج أن الصنفان Gioria , Athos poly كانا أكثر الأصناف جودة حيث سجلا أعلى نسبة مئوية للسكرز والنقاوة والسكر المستخلص. كما أظهرت النتائج أن هذان الصنفان كانا أقل الأصناف في المواد غير السكرية المتمثلة في الصوديوم والبوتاسيوم والامينو نيتروجين وفي حين أعطى الصنفان Samba Pleno أعلى قيم لطول وقطر ووزن الجذر وكذلك محصول الفدان من الجذور بالطن .

أعطى حصاد نبات بنجر السكر بعد ٢١٠ يوما من الزراعة أعلى وزن للجذر الواحد وكذلك متوسط محصول الفدان من الجذور وأعلى جودة للجذور المتمثلة في النسبة المئوية لكل من السكرز والنقاوة والسكر المستخلص وكذلك أعلى محصول

من السكر للفدان. وعلى الجانب الآخر أعطى الحصاد عند هذا العمر اقل قيمة من المكونات غير السكرية المتمثلة في الصوديوم والبوتاسيوم والالفا امينو نيتروجين. تزداد النسبة المئوية لكل من السكر والبقاوة والسكر المستخلص بانخفاض الكثافة بينما تنخفض المكونات غير السكرية المتمثلة في الصوديوم والبوتاسيوم والالفا امينو نيتروجين تنخفض بزيادة الكثافة النباتية. يلاحظ أن أعلى وزن للجذور والسكر المستخلص بالطن / فدان تكون في حالة الكثافة ٤٢٠٠٠ نبات / فدان. كان التفاعل بين الأصناف من جهة وميعاد الحصاد والكثافة النباتية من جهة أخرى معنويا في كل من صفات وزن الجذر ووزن الجذور للفدان والنسبة المئوية لكل من السكر والسكر المستخلص وكذلك في وزن المحصول من السكر للفدان. كان التفاعل بين الأصناف وميعاد الحصاد والكثافة النباتية معنويا في صفتي وزن المحصول من الجذور والسكر المستخلص بالطن للفدان وعموما كانا الصنفان Pleno , Samba (طراز E) أعلى محصولا للجذور والسكر المستخلص للفدان عند الزراعة في جور على مسافة ٢٥ سم والحصاد بعد ٢١٠ يوما من الزراعة بينما أعطى الصنفان Kawemira , Lp 13 (طراز N) أعلى محصول من الفدان للجذور والسكر المستخلص عند الزراعة على مسافة ٢٠ سم بين الجور والحصاد بعد ١٩٥ يوما من الزراعة وفي حين أعطى الصنفان Athos polv . Gloria (طراز N , Z) أعلى محصول من الفدان للجذور والسكر المستخلص عند الزراعة على مسافة ١٥ سم بين الجور والحصاد على عمر ١٨٠ يوما من الزراعة. المجلة العلمية لكلية الزراعة - جامعة القاهرة - المجلد (٥٧) العدد الرابع (لعام ٢٠٠٦) : ٦٢٠-٦٠٧.