EFFECT OF NITROGEN AND MAGNESIUM FERTILIZATION ON YELD AND QUALITY OF TWO SUGAR BEET VARIETIES.

GAMAL S. EL-SAYED

Sugar Crops Res. Inst., Agric. Res. Center, Giza, Egypt.

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Abstract

Two field trials were carried out at Tamia, Fayium Governorate in 2002/2003 and 2003/2004 growing seasons to evaluate two multigerm sugar beet varieties viz Toro and Gloria grown under three N levels (75, 100 and 125 kg N/fed) and three levels of magnesium sulfate (zero, 4 and 8 kg MgO). The two experiments were laid out in a split plot design with four replications. Sugar beet varieties were allocated in the main plots whereas the sub plots were assigned for the combinations between fertilizers levels. The results showed that variety Gloria surpassed variety Toro in root length, root fresh weight, top and root yields in the 1st season only. Nitrogen fertilization at 100 kg N/fed produced significantly higher values of root length, root fresh weight and total soluble solids percentage in the 1st season and 125 kg N/fed increased significantly sugar yield in the same season; while 125 kg N/fed increased significantly root diameter, root fresh weight, TSS % and top yield (tons/fed) in the 2nd season and root yield (tons/fed) in both seasons.

Magnesium sulfate fertilizer attained a significant difference in root length, TSS %, root yield in the 1st season and root fresh weight, sucrose %, purity % and sugar yield in both seasons. Increasing the magnesium sulfate level up to 8 kg MgO increased significantly root fresh weight, sucrose and purity percentages as well as sugar yield in both seasons. Meanwhlie, root length, TSS % and root yield were affected by $MgSO_4$ level in the 1st season. The highest value of root yield (38.1 tons/fed) resulted from the interaction between Gloria variety, fertilized with 125 kg N/fed and 8 kg MgO in the 2nd season, while the maximum sugar yield (6.78 tons/fed) resulted from Toro variety, fertilized with 125 kg N and 4 kg Mg O in the 2nd season.

INTRODUCTION

A strategic decision has been taken to increase the area planted with sugar beet in Fayium Governorate as an attempt to narrow the gap in sugar commodity. Tamia is a newly reclaimed farm in Fayium Governorate. Therefor, it was necessary to test the performance of some multigerm sugar beet varieties under different levels of

nitrogen (N) and magnesium sulfate ($MgSO_4$) fertilization to obtain the maximum yield and good quality.

Kruger and Nowakowski (1995) obtained an increase in yield of roots (ton/fed) and recoverable sugar with N dose up to 120 kg N/ha. Sugar content decreased with increasing N doses. El-Shafai (2000) showed that increasing N level up to 92 kg N/fed significantly increased root fresh weight (g/plant), root and sugar yields (ton/fed), while sucrose % was decreased. He noticed that purity % was not significantly affected by the applied N levels. Ismail (2002) found that nitrogen levels affected significantly root length (cm), diameter (cm) and root fresh weight (g/plant), root and sugar yields (ton/fed) in both seasons. Otherwise, sucrose and purity % were not affected by the used N levels.

El- Taweel (1999) in Egypt, found that sugar beet varieties Top, Kawemira and Pleno did not differ significantly in sugar yield (tons/fed), sucrose, TSS and purity %. The variety Pleno was the highest one in this respect followed by Kawemira and Top in a descending order. Saif (2000) tested four sugar beet varieties viz. Marcopoly, M 9680, M 9681 and Mito. She found significant differences among varieties in root fresh weight, sucrose, purity and root yield. Ismail (2002) found that sugar beet varieties did not differ significantly in root length and diameter cm as well as sucrose and purity % in both seasons, while they varied significantly in root fresh weight (g/plant), root and sugar yields (ton/fed) in the 1st season only. Osman *et al.* (2003) found that sugar beet variety Toro surpassed the other two varieties in root length and total soluble solids percentage.

El- Taweel (1999) In Egypt, found that Mg application from 0 to 9 and 18 kg MgO/fed, significantly increased root length, root diameter cm, fresh weight of sugar beet root sucrose, purity %, root, top and sugar yields (tons/fed). Osman (2001) found that foliar spray sugar beet plants cv. Sultan with 50 and 250 ppm of Mg at 45, 75 and 105 days from sowing significantly improved top, root and sugar yield (tons/fed) and total soluble solids, sucrose and purity percentages of sugar beet plants.

This work was carried out to investigate the effect of nitrogen and magnesium fertilization on yield and quality of two sugar beet varieties.

MATERIALS AND METHODS

Two field trials were carried out at Tamia Research Station (Fayium Governorate) in 2002/2003 and 2003/2004 growing seasons to evaluate yield and quality response of two sugar beet varieties viz Toro and Gloria (multigerm) to three N

levels (75, 100 and 125 kg N/fed). and magnesium sulfate in three levels (zero, 4 and 8 kg MgO). Nitrogen fertilizer was applied in the form of Urea 46% N in two equal doses, the 1st one was added after thinning 45 days from planting and the 2nd dose was applied two weeks later. Phosphours fertilizer was applied in the form of calcium superphosphate 15.5 % P_2O_5 at the rate of 30 kg P_2O_5/fed, at seed bed preparation. Magnesium sulfate fertilizer was applied in the form of magnesium sulphate (20 % MgO) at the rate of zero, 4 and 8 kg MgO with the 1st N dose. Sowing took place during the 1st week of November while harvest was done 7 months later in both seasons. Treatments were distributed in a split plot design in four replications. Plot size was 21 m^2 (6 rows of 50 cm apart and 7 m in length). Distance between hills was 20 cm. The tested sugar beet varieties were allocated in the main plots and fertilizers levels were randomly distributed in the sub plots. The previous crop was maize in both seasons. Other agricultural practices were done as recommended by Sugar Crops Research Institute. The physical and chemical analysis of the upper 30 cm of soil of the experimental site showed that the soil was sand clay loam containing 74 ppm available N, 4 ppm available P, 0.28 meq/L of K^+ and 3 ppm available Mg.

Data recorded:

At harvest, a sample of ten guarded plants were taken at random to determine the following characters:

I. Root traits at harvest: A sample of 5 plants was taken at random to determine:

1. Root length (cm).
2. Root diameter (cm).
3. Root fresh weight (g/plant).

II. Juice quality:

4. Total soluble solids percentage (TSS %) was determined using hand refractometer.
5. Sucrose percentage which was determined according to Le Decote (1927).
6. Purity percentage which was calculated according to Carruthers *et al.* (1962).

Apparent purity % = Sucrose % x 100/TSS %.

III. Yield and yield components: At harvest plants of each plot for various treatments were uprooted and topped to estimate:

7. Top yield (tons/fed).
8. Root yield (tons/fed).
9. Sugar yield (tons/fed) was calculated according to the following equation:

Sugar yield (tons/fed) = Root yield x sucrose %.

The collected data were statistically analyzed according to Snedecor and Cochran (1981).

RESULTS AND DISCUSSION

I. Root traits at harvest:

1. Root length (cm)

Results in Table 1 show that Gloria variety gave taller root length (cm) compared with Toro with a significant differences in the 1st season.

Table 1. Effect of varieties, nitrogen and magnesium levels fertilizer on root length (cm) during the two successive seasons 2002/2003 and 2003/2004.

Treatment Varieties	Nitrogen (Kg N/fed)	Root length (cm) 2002/2003 Magnesium (Kg MgO/fed) zero	4	8	Mean	Root length (cm) 2003/2004 Magnesium (Kg MgO/fed) zero	4	8	Mean
Toro	75	24.10	24.43	25.23	24.59	26.20	28.28	26.53	27.01
	100	26.70	27.40	28.30	27.47	27.00	26.62	31.33	28.32
	125	26.43	27.63	28.67	27.58	27.67	30.20	28.50	28.79
Average		25.74	26.49	27.40	26.54	26.96	28.37	28.79	28.04
Gloria	75	35.12	35.70	35.65	35.49	32.43	31.63	31.67	31.91
	100	38.00	37.83	38.83	38.22	32.33	33.17	33.00	32.83
	125	36.53	36.87	37.33	36.91	32.33	32.39	34.67	33.13
Average		36.55	36.80	37.27	36.87	32.37	32.40	33.11	32.63
N x Mg	75	29.61	30.07	30.44	30.04	29.32	29.96	29.10	29.46
	100	32.35	32.62	33.57	32.84	29.67	29.89	32.17	30.58
	125	31.48	32.25	33.00	32.24	30.00	31.30	31.58	30.96
Total average		31.15	31.64	32.34	31.71	29.66	30.38	30.95	30.33

L S D at 5% level:		
Varieties (V)	3.11	N.S
Nitrogen (N)	1.32	N.S
Magnesium (Mg)	0.36	N.S
V x N	N.S	N.S
V x Mg	0.50	N.S
N x Mg	N.S	N.S
V x N x Mg	N.S	N.S

The increase in root length (cm) recorded by Gloria over Toro were 38.90 % in the 1st season and 16.37% in the 2nd season. This result is in line with those reported by Ismail (2002) and Osman *et al.* (2003).

The effect of nitrogen fertilizer levels, data revealed that root length (cm) was significantly increased in the 1st season. Adding 100 kg N/fed surpassed 75 and 125 kg N/fed by 2.80 and 0.60 cm., respectively. This result concide with those reported by Ismail (2002).

Regarding the effect of Mg fertilizer levels, results showed that applying 8 kg MgO/fed increased the root length in both seasons compared with check treatment and/or 4 kg MgO/fed by 1.19 and 0.70 cm in the 1st season and 1.29 and 0.57 cm in the 2nd season, respectively. This increment was significant in the 1st season only. This result concide with that reported by El-Taweel (1999).

The interaction effect in the 1st season appeared that the statistical maximum root length was 38.83 cm resulted from the interaction between variety Gloria and 8 kg MgO/fed under addition of 100 kg N/fed.

2. Root diameter (cm)

Results in Table 2 show that Gloria variety insignificant gave higher root diameter compared with Toro in the 1st season.

Table 2. Effect of varieties, nitrogen and magnesium levels fertilizer on root diameter (cm) during the two successive seasons 2002/2003 and 2003/2004.

Treatment Varieties	Nitrogen (Kg N/fed)	Root diameter (cm) 2002/2003 Magnesium (Kg MgO/fed) zero	4	8	Mean	Root diameter (cm) 2003/2004 Magnesium (Kg MgO/fed) zero	4	8	Mean
Toro	75	18.27	12.93	15.73	15.64	15.37	15.85	17.37	16.19
	100	16.20	15.57	16.53	16.10	16.83	18.82	17.83	17.83
	125	15.60	15.80	16.87	16.09	17.50	18.70	17.67	17.96
Average		16.69	14.77	16.38	15.94	16.57	17.79	17.62	17.33
Gloria	75	15.35	15.90	15.82	15.69	16.27	14.13	14.83	15.08
	100	18.16	18.07	18.73	18.32	16.83	16.00	17.17	16.67
	125	16.70	17.07	17.50	17.09	16.17	18.23	17.50	17.30
Average		16.74	17.01	17.35	17.03	16.42	16.12	16.50	16.35
N x Mg	75	16.81	14.42	15.78	15.67	15.82	14.99	16.10	15.64
	100	17.18	16.82	17.63	17.21	16.83	17.41	17.50	17.25
	125	16.15	16.43	17.18	16.59	16.83	18.46	17.58	17.63
Total average		16.71	15.89	16.86	16.49	16.49	16.95	17.06	16.84
L S D at 5% level:									
Varieties (V)					N.S				N.S
Nitrogen (N)					N.S				1.30
Magnesium (Mg)					N.S				N.S
V x N					N.S				N.S
V x Mg					N.S				N.S
N x Mg					N.S				N.S
V x N x Mg					N.S				N.S

Toro variety gave higher root diameter compared with Gloria in the 2nd season. This result is in line with that reported by Ismail (2002).

The effect of nitrogen fertilizer level on root diameter was significant in the 2nd season, adding 125 kg N/fed surpassed the other treatments by 1.99 and 0.38 cm., respectively. This result concide with those reported by Ismail (2002).

Application of 8 kg MgO/fed produced thicker root diameter, compared with zero application and 4 kg MgO/fed in both seasons. The insignificant increase in root diameter was 0.15, 0.97 cm in the 1st season and 0.57, 0.11 cm in the 2nd season., respectively. This result concide with that reported by El-Taweel (1999).

All interactions among the studied factors did not significant affectly root diameter in both seasons.

3. Root fresh weight (g/plant)

Results in Table 3 indicate that Gloria variety gave heavier root fresh weight compared with Toro with a significant difference in the 1st season. The increase in root fresh weight recorded by Gloria over Toro were 14.83 % in the 1st season. This result is in line with those reported by Saif (2000) and Ismail (2002).

Table 3. Effect of varieties, nitrogen and magnesium levels fertilizer on root fresh weight (g/plant) during the two successive seasons 2002/2003 and 2003/2004

Treatment Varieties	Nitrogen (Kg N/fed)	Root fresh weight (g/plant) 2002/2003 Magnesium (Kg MgO/fed) zero	4	8	Mean	Root fresh weight (g/plant) 2003/2004 Magnesium (Kg MgO/fed) zero	4	8	Mean
Toro	75	945.0	970.0	1030.0	981.7	1152.5	1188.8	1202.5	1181.3
	100	1115.0	1167.0	1240.0	1174.2	1262.5	1311.3	1337.5	1303.8
	125	1095.0	1185.0	1265.0	1181.7	1312.5	1352.5	1325.0	1330.0
Average		1051.7	1107.5	1178.3	1112.5	1242.5	1284.2	1288.3	1271.7
Gloria	75	1151.0	1192.0	1186.0	1176.8	1045.0	1060.0	1112.5	1072.5
	100	1362.0	1355.0	1405.0	1374.1	1137.5	1200.0	1237.5	1191.7
	125	1252.0	1280.0	1312.0	1281.6	1212.5	1267.0	1312.5	1264.0
Average		1255.3	1275.8	1301.3	1277.5	1131.7	1175.7	1220.8	1176.1
N x Mg	75	1048.3	1081.3	1108.3	1079.3	1098.8	1124.4	1157.5	1126.9
	100	1238.6	1261.3	1322.5	1274.1	1200.0	1255.6	1287.5	1247.7
	125	1173.6	1232.5	1288.8	1231.6	1262.5	1309.8	1318.8	1297.0
Total average		1153.5	1191.7	1239.8	1195.0	1187.1	1230.0	1254.6	1223.9

L S D at 5% level:		
Varieties (V)	136.77	N.S
Nitrogen (N)	88.23	53.24
Magnesium (Mg)	26.11	22.16
V x N	N.S	N.S
V x Mg	36.93	N.S
N x Mg	N.S	N.S
V x N x Mg	N.S	N.S

Oncemore, the results obtained in Table 3 show that in the root fresh weight was significant affected by nitrogen fertilizer in both seasons. Application of 100 kg N/fed gave the highest value of root fresh weight 1274.1 g in the 1st season, but application of 125 kg N/fed gave the highest value of root fresh weight (1297 g) in the 2nd season. This result concide with those reported by El Shafai (2000) and Ismail (2002).

With regard to the influence of Mg fertilizer treatments on root fresh weight, the data show that root fresh weight was significant by affected by Mg fertilizer in both seasons. Application of 8 kg MgO/fed produced the highest values of root fresh weight (1239.8 g) in the 1st season and (1254.6 g) in the 2nd season. This result concide with that reported by El-Taweel (1999).

Also, variety x magnesium interaction significantly affected root fresh weight in the 1st season. The results showed that the highest root fresh weight 1405 g was recorded by Gloria and 8 kg MgO/fed under addition of 100 kg N/fed in the 1st season.

II. Juice quality:

1. Total soluble solids percentage (TSS %)

The results indicated that there were insignificant effect on TSS % due to the varieties combination between the study factors. This result is in line with those reported by El-Taweel (1999) and Osman *et al.* (2003).

Table 4. Effect of varieties, nitrogen and magnesium levels fertilizer on total soluble solids (TSS %) during the two successive seasons 2002/2003 and 2003/2004.

Treatment Varieties	Nitrogen (Kg N/fed)	Total soluble solids % 2002/2003 Magnesium (Kg MgO/fed) zero	4	8	Mean	Total soluble solids % 2003/2004 Magnesium (Kg MgO /fed) zero	4	8	Mean
Toro	75	17.96	18.20	18.74	18.30	19.93	19.88	20.72	20.18
	100	19.76	20.24	20.86	20.29	21.27	21.04	21.63	21.31
	125	19.58	20.40	21.12	20.36	21.50	21.77	21.98	21.75
Average		19.10	19.61	20.24	19.65	20.90	20.90	21.44	21.08
Gloria	75	19.33	19.74	19.70	19.59	19.86	18.00	18.48	18.78
	100	21.32	21.21	21.90	21.47	18.71	19.29	19.63	19.21
	125	20.31	20.54	20.86	20.57	19.40	19.90	20.32	19.87
Average		20.32	20.50	20.80	20.55	19.32	19.06	19.48	19.29
N x Mg	75	18.65	18.97	19.22	18.95	19.89	18.94	19.60	19.48
	100	20.54	20.72	21.38	20.88	19.99	20.16	20.63	20.26
	125	19.94	20.47	20.99	20.47	20.45	20.84	21.15	20.81
Total average		19.71	20.05	20.53	20.10	20.11	19.98	20.46	20.18
L S D at 5% level:									
Varieties (V)					N.S				N.S
Nitrogen (N)					0.91				0.86
Magnesium (Mg)					0.25				N.S
V x N					N.S				N.S
V x Mg					0.35				N.S
N x Mg					N.S				N.S
V x N x Mg					N.S				N.S

Concerning, the effect of nitrogen fertilizer, the results in Table 4 indicate that 100 kg N/fed significantly increased TSS % compared with 75 and 125 kg N/fed in the 1st season, but 125 kg N/fed significant increased TSS % compared with 75 and 100 kg N/fed in the 2nd season. This result held good through out the two growing seasons. The results indicate that 100 kg N/fed increased TSS % by 1.93 and 0.41 % in the 1st season, but 125 kg N/fed increases of TSS % were 1.33 and 0.55 % in the 2nd season, respectively. This result concide with those reported by Kruger and Nowakowski (1995).

Regarding the effect of Mg fertilizer, the results showed that applying 8 kg MgO/fed increased TSS % in both seasons, compared with check treatment and/or 4 kg MgO/fed. This increment was significant in the 1st season only. This result concide with those reported by El- Taweel (1999) and Osman (2001).

Moreover, variety and magnesiun interaction insignificant affected TSS % in the 1st season. The highest value of TSS % 20.80 was recorded by Gloria variety and 8 kg MgO/fed.

2. Sucrose %

The results indicated that there were insignificant effect on sucrose% due to the varieties combination between the study factors. This result is in line with those reported by El-Taweel (1999), Saif (2000) and Ismail (2002).

Table 5. Effect of varieties, nitrogen and magnesium levels fertilizer on sucrose percentage during the two successive seasons 2002/2003 and 2003/2004.

Treatment Varieties	Nitrogen (Kg N/fed)	Sucrose % 2002/2003 Magnesium (Kg MgO/fed) zero	4	8	Mean	Sucrose % 2003/2004 Magnesium (Kg MgO/fed) zero	4	8	Mean
Toro	75	13.88	15.11	15.33	14.77	14.85	14.80	15.97	15.21
	100	14.34	15.16	16.11	15.20	14.86	15.62	16.88	15.79
	125	14.83	15.32	17.03	15.73	15.75	16.69	16.56	16.33
Average		14.35	15.19	16.16	15.23	15.15	15.70	16.47	15.78
Gloria	75	14.92	15.32	16.29	15.51	14.11	14.25	15.73	14.70
	100	15.57	16.13	16.48	16.06	13.63	14.20	15.55	14.46
	125	16.22	16.46	16.78	16.49	12.65	15.15	14.24	14.01
Average		15.57	15.97	16.51	16.02	13.46	14.53	15.17	14.39
N x Mg	75	14.40	15.22	15.81	15.14	14.48	14.52	15.85	14.95
	100	14.96	15.64	16.30	15.63	14.24	14.91	16.21	15.12
	125	15.53	15.89	16.91	16.11	14.20	15.92	15.40	15.17
Total average		14.96	15.58	16.34	15.63	14.31	15.12	15.82	15.08
L S D at 5% level:									
Varieties (V)					N.S				N.S
Nitrogen (N)					N.S				N.S
Magnesium (Mg)					0.46				0.36
V x N					N.S				N.S
V x Mg					N.S				N.S
N x Mg					N.S				0.63
V x N x Mg					N.S				N.S

Regarding the influence of nitrogen fertilizer treatments on sucrose %, the data show that sucrose % was insignificant affected by N fertilizer in both seasons. Application of 125 kg N/fed gave the highest values of sucrose % (16.11 and 15.17 in both seasons, respectively). This result concide with those reported by Kruger and Nowakowski (1995), El-Shafai (2000) and Ismail (2002).

Concerning, the effect of Mg fertilizer levels, data revealed that sucrose % was significant affected by the applied doses of Mg in both seasons. Application of 8 kg MgO/fed resulted the highest values of sucrose % (16.34 and 15.82 in both seasons, respectively).This result concide with those reported by El-Taweel (1999) and Osman (2001).

Moreover, N x Mg interaction significantly affected sucrose % in the 2nd season. The highest value (16.21) of sucrose % was recorded by 100 kg N/fed and 8 kg MgO/fed.

3. Purity %

The presented data in Table 6 show that the difference between the examined varieties was insignificant Gloria variety gave higher purity % in both seasons. This result concide with those reported by Saif (2000) and Ismail (2002).

Table 6. Effect of varieties, nitrogen and magnesium levels fertilizer on purity percentage during the two successive seasons 2002/2003 and 2003/2004.

Treatment Varieties	Nitrogen (Kg N/fed)	Purity % 2002/2003 Magnesium (Kg MgO/fed) zero	4	8	Mean	Purity % 2003/2004 Magnesium (Kg MgO/fed) zero	4	8	Mean
Toro	75	77.33	83.12	81.68	80.71	74.71	74.36	77.15	75.41
	100	72.71	75.09	77.15	74.98	69.79	74.26	78.12	74.06
	125	75.67	75.20	81.47	77.45	73.71	76.86	75.67	75.41
Average		75.24	77.80	80.10	77.71	72.74	75.16	76.98	74.96
Gloria	75	77.32	77.80	83.12	79.41	71.59	79.74	85.63	78.98
	100	73.58	76.82	75.55	75.31	73.45	73.97	79.56	65.66
	125	80.34	80.12	80.80	80.42	65.33	76.31	70.05	70.56
Average		77.08	78.25	79.82	78.38	70.12	76.67	78.41	75.07
N x Mg	75	77.33	80.46	82.40	80.06	73.15	77.05	81.39	77.20
	100	73.15	75.95	76.35	75.15	71.62	74.11	78.84	74.86
	125	78.01	77.66	81.13	78.93	69.52	76.58	72.86	72.99
Total average		76.16	78.02	79.96	78.05	71.43	75.92	77.70	75.01
L S D at 5% level:									
Varieties (V)					N.S				N.S
Nitrogen (N)					N.S				N.S
Magnesium (Mg)					2.82				2.75
V x N					N.S				N.S
V x Mg					N.S				N.S
N x Mg					N.S				N.S
V x N x Mg					N.S				N.S

The results indicated that there were insignificant effect of purity % due to nitrogen fertilizer between the studied factors. This result is in line with those reported by El-Shafai (2000) and Ismail (2002).

Results in Table 6 show that 8 kg MgO/fed produced higher purity % compared with zero application and 4 kg MgO/fed in both seasons. The increase in purity % were 3.80 and 1.94 in the 1st season and 6.27 and 1.78 in the 2nd season, respectively. This result concide with those reported by El-Taweel (1999) and Osman (2001).

All interaction between the studied factors did not affect significant on purity % in both seasons.

III. Yield and yield components:

1. Top yield (tons/fed)

Results in Table 7 show that Gloria variety gave higher top yield (ton/fed) compared with Toro with a significant differences in the 1st season. The increase in top yield recorded by Gloria over Toro was 7.88 % in the 1st season. This result is in line with those reported by Ismail (2002).

Table 7. Effect of varieties, nitrogen and magnesium levels fertilizer on top yield (ton/fed) during the two successive seasons 2002/2003 and 2003/2004

Treatment		Top yield (tons/fed) 2002/2003			Mean	Top yield (tons/fed) 2003/2004			Mean
Varieties	Nitrogen	Magnesium (Kg MgO/fed)				Magnesium (Kg MgO/fed)			
(V)	(Kg N/fed)	zero	4	8		zero	4	8	
Toro	75	17.82	16.81	15.71	16.78	16.46	16.98	17.18	16.88
	100	16.93	16.68	17.71	17.11	18.69	18.[illegible]	18.43	18.39
	125	15.64	19.26	17.69	17.53	19.03	18.62	18.23	18.63
Average		16.80	17.58	17.04	17.14	18.06	17.88	17.95	17.96
Gloria	75	17.44	19.67	16.95	18.02	18.56	17.14	15.89	17.19
	100	18.43	18.97	19.02	18.81	16.25	18.14	17.68	17.35
	125	17.89	19.27	18.75	18.64	18.65	18.10	19.72	18.83
Average		17.92	19.31	18.24	18.49	17.82	17.78	17.77	17.79
N x Mg	75	17.63	18.24	16.33	17.40	17.51	17.05	16.54	17.03
	100	17.68	17.83	18.37	17.96	17.47	18.08	18.06	17.87
	125	16.77	19.26	18.22	18.08	18.84	18.36	18.98	18.73
Total average		17.36	18.44	17.64	17.81	17.94	17.83	17.86	17.88
L S D at 5% level:									
Varieties (V)					1.11				N.S
Nitrogen (N)					N.S				0.70
Magnesium (Mg)					N.S				N.S
V x N					N.S				N.S
V x Mg					N.S				N.S
N x Mg					N.S				N.S
V x N x Mg					N.S				N.S

Once more, the results obtained in Table 7 show that top yield was significantly increased in the 2nd season by nitrogen fertilizer, the highest level of N fertilizer recorded the highest values of top yield was 18.08 and 18.73 ton/fed in both seasons, respectively. This result concide with those reported by El-Shafai (2000) and Ismail (2002).

Results in Table 7 show that Mg fertilizer level gave insignificant effect on top yield in both seasons. This result concide with those reported by El-Taweel (1999) and Osman (2001).

All interactions between the studied factors showed no effect on top yield in both seasons.

2. Root yield (tons/fed)

Results in Table 8 show that Gloria variety gave higher root yield (ton/fed) with Toro with a significant difference in the 1st seasons. The increase in root yield recorded by Gloria over Toro was 2.91 ton/fed in the 1st season. This result is in line with those reported by Saif (2000) and Ismail (2002).

Table 8. Effect of varieties, nitrogen and magnesium levels fertilizer on root yield (tons/fed) during the two successive seasons 2002/2003 and 2003/2004.

Treatment Varieties	Nitrogen (Kg N/fed)	Root yield (tons/fed) 2002/2003 Magnesium (Kg MgO/fed) zero	4	8	Mean	Root yield (tons/fed) 2003/2004 Magnesium (Kg MgO/fed) zero	4	8	Mean
Toro	75	28.35	32.44	33.23	31.34	34.58	33.33	36.08	34.66
	100	33.45	35.03	37.20	35.23	37.54	39.34	37.13	38.00
	125	32.85	35.55	37.95	35.45	36.71	40.58	36.09	37.79
Average		31.55	34.34	36.13	34.01	36.28	37.75	36.43	36.82
Gloria	75	32.55	35.78	35.60	34.64	29.68	31.80	35.71	32.40
	100	36.54	38.65	38.49	37.89	34.13	33.00	34.13	33.75
	125	38.90	38.40	37.38	38.23	36.38	38.01	38.71	37.70
Average		36.00	37.61	37.15	36.92	33.39	34.27	36.18	34.62
N x Mg	75	30.45	34.11	34.41	32.99	32.13	32.57	35.89	33.53
	100	34.99	36.84	37.84	36.56	35.83	36.17	35.63	35.88
	125	35.88	36.98	37.66	36.84	36.54	39.29	37.40	37.74
Total average		33.77	35.97	36.64	35.46	34.84	36.01	36.31	35.72
L S D at 5% level:									
Varieties (V)					2.29				N.S
Nitrogen (N)					2.75				2.76
Magnesium (Mg)					1.81				N.S
V x N					N.S				N.S
V x Mg					N.S				N.S
N x Mg					N.S				N.S
V x N x Mg					N.S				N.S

The effect of nitrogen fertilizer levels on root yield was significant in both seasons. Adding, 125 kg N/fed surpassed 75 and 100 kg N/fed by 11.67, 0.70% in the 1st seasons and 12.56, 5.18% in the 2nd season., respectively. This result concide with those reported by Kruger and Nowakowski (1995), El-Shafai (2000) and Ismail (2002).

Regarding the effect of Mg fertilizer, results showed that applying 8 kg MgO/fed increased root yield in both seasons. This increment was significant in the 1st season only. This result is in line with those reported by El-Taweel (1999) and Osman (2001).

All interaction between the studied factors did not affect significantly on root yield in both seasons.

3. Sugar yield (tons/fed)

The results in Table 9 indicate that there were no significance effect on sugar yield due to examined varieties in both seasons. This result is in line with those reported by El-Taweel (1999) and Ismail (2002).

Table 9. Effect of varieties, nitrogen and magnesium levels fertilizer on sugar yield (tons/fed) during the two successive seasons 2002/2003 and 2003/2004

Treatment Varieties	Nitrogen (Kg N/fed)	Sugar yield (tons/fed) 2002/2003 Magnesium (Kg MgO/fed) zero	4	8	Mean	Sugar yield (tons/fed) 2003/2004 Magnesium (Kg MgO/fed) zero	4	8	Mean
Toro	75	3.93	4.89	5.06	4.63	5.14	4.99	5.75	5.29
	100	4.81	5.33	5.99	5.38	5.61	6.17	6.34	6.04
	125	4.86	5.44	6.44	5.58	5.78	6.78	5.96	6.17
Average		4.54	5.22	5.83	5.20	5.51	5.98	6.02	5.84
Gloria	75	4.85	5.50	5.82	5.39	4.19	4.53	5.61	4.78
	100	5.66	6.25	6.35	6.09	4.65	4.70	5.30	4.88
	125	6.31	6.30	6.26	6.29	4.60	5.76	5.53	5.30
Average		5.61	6.02	6.15	5.92	4.48	4.99	5.48	4.99
N x Mg	75	4.39	5.20	5.44	5.01	4.66	4.76	5.68	5.04
	100	5.24	5.79	6.17	5.73	5.13	5.43	5.82	5.46
	125	5.59	5.87	6.35	5.94	5.39	6.27	5.74	5.74
Total average		5.07	5.62	5.99	5.56	5.00	5.49	5.75	5.41
L S D at 5% level:									
Varieties (V)					N.S				N.S
Nitrogen (N)					0.59				N.S
Magnesium (Mg)					0.28				0.34
V x N					N.S				N.S
V x Mg					0.40				N.S
N x Mg					N.S				0.59
V x N x Mg					N.S				N.S

Regarding the effect of nitrogen fertilizer, results show that applying 125 kg N/fed increased the sugar yield in both seasons compared with 75 and 100 kg N/fed by 0.93 and 0.21 tons/fed in the 1st season and 0.70 and 0.28 tons/fed in the 2nd season, respectively. This increment was significant in the 1st season only. This result concide with those reported by El-Shafai (2000) and Ismail (2002).

Once more, the results obtained in Table 9 show that sugar yield was significantly by affected by the applied doses Mg in both seasons. Application of 8 kg MgO/fed gave the highest values of sugar yield 5.99 ton/fed in the 1st season and 5.75 ton/fed in the 2nd season, respectively. This result concide with those reported by El-Taweel (1999) and Osman (2001).

Results indicated that sugar yield was significant affected by the interaction between variety x Mg in the 1st season. The highest sugar yield was 6.35 ton/fed recorded with Gloria variety and 8 kg MgO/fed in the 1st season under addition of 100 kg N/fed. While, the interaction between N x Mg significant affected sugar yield in the 2nd season, the highest sugar yield (6.27 ton/fed) was recorded with 125 kg N/fed and 4 kg MgO/fed in the 2nd season.

REFERENCES

1. Carruthers, A., J. F. T. Oldfield and H. J. Teague. 1962. Assessment of beet quality. Paper presented to the 15th Annual Technical Conference, British Sugar Corporation Ltd. 28 pp.

2. El-Shafai, A. M. A. 2000. Effect of nitrogen and potassium fertilization on yield and quality of sugar beet in Sohag. Egypt. J. Agric. Res., 78 (2): 759 - 767.

3. El- Taweel, F. M. A. 1999. Response of some sugar beet varieties to potassium and magnesium fetilizers. Ph. D. Thesis., Fac. Agric., Moshtohor, Zagazig University.

4. Ismail, A. M. A. 2002. Evaluation of some sugar beet varieties under different nitrogen levels in El-Fayium. Egypt. J. Appl. Sci., 17 (2): 2002

5. Kruger, K. W. and M. Nowakowski. 1995. Effect of nitro-chalk and potassium salt fertilization on sugar beet yield and quality. Burak cukrowy I Pastewny, Bydgoszcz, Poland, 20 - 22 Sep. 1995. Biuletyn Insttytutu Hodowli I Aklimatyzacji Roslin. 1997, 202: 125 - 130.

6. Le Docte, A. 1927. Commercial determination of sugar in beet root using the Sacks Le Docte Int. Sugar J., 29: 488 - 492.

7. Osman, A. M. H. 2001. Effect of nutrition and pacoloburazol (PGR) on sugar beet yield and quality (*Beta vulgaris* L). Ph. D. Thesis., Fac. Agric., Moshtohor, Zagazig University.

8. Osman, A. M. H., G. S. El-Sayed, M. S. H. Osman and K. S. El-Sogheir. 2003. Soil application of some micro-elements with relation to yield and quality of sugar beet varieties. (*Beta vulgaris*, L.). Annals of Agric. Sc., Moshtohor., 41 (3): 1135 - 1152.

9. Saif, Laila. M. A. 2000. The relative importance of potassium fertilizer for sugar beet under Upper Egypt conditions. Minufiya J. Agric. Res., 25 (5): 1215 - 1227.

10. Snedecor, G. W. and W. G. Cochran 1981. Statistical Methods. Seventh Ed., Iowa State Univ. Press, Ames, Iowa, USA.

تأثير التسميد الآزوتي والماغنسيوم على محصول وجودة صنفين من بنجر السكر

جمال سعد السيد

معهد بحوث المحاصيل السكرية – مركز البحوث الزراعية – الجيزة – مصر

أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بطامية بمحافظه الفيوم لدراسة تأثير الاضافة الارضية للتسميد الازوتى وكبريتات الماغنسيوم على حاصل وجوده بنجر السكر خلال موسمى الزراعه ٢٠٠٢/٢٠٠٣ و ٢٠٠٣/٢٠٠٤ وقد اشتملت الدر اسه على صنفين من اصناف بنجر السكر عديد الاجنة جلوريا وتورو وثلاثة معدلات من التسميد الازوتى ٧٥ و ١٠٠ و ١٢٥ كجم نيتروجين للفدان وثلاثة مستويات من التسميد بعنصر الماغنسيوم صفر و ٤ و ٨ كجم اكسيد ماغنسيوم للفدان ووزعت المعاملات فى تصميم قطع منشقه مره واحده فى أربع مكررات حيث وضعت الأصناف فى القطع الرئيسية و مستويات التسميد في القطع الشقيه.

أوضحت النتائج المتحصل عليها:

١- تفوق الصنف جلوريا على الصنف تورو معنويا فى الصفات التالية: طول الجذر ووزن الجذر الطازج و حاصلى العرش والجذر فى الموسم الاول فقط.

٢- ادت اضافة السماد الازوتى بمعدل ١٠٠ كجم نيتروجين للفدان بزيادة معنويه لكلا من الصفات التالية: طول الجذر ووزن الجذر والنسبة المئوية للمواد الصلبة الكلية فى الموسم الأول بينما تفوق معدل ١٢٥ كجم نيتروجين للفدان فى حاصل السكر لنفس الموسم كما تفوق فى الصفات التالية: وزن الجذر الطازج وسمك الجذر والنسبة المئوية للمواد الصلبة الذائبة الكلية وحاصل العرش طن/فدان للموسم الثانى فقط. اما حاصل الجذور فقد تفوق المعدل ١٢٥ كجم نيتروجين للفدان فى كلا الموسمين.

٣- أوضحت النتائج تفوق التسميد بعنصر الماغنسيوم معنويا بمعدل ٨ كجم أكسيد الماغنسيوم للفدان فى كلا الموسمين فى الصفات التالية: النسبة المئوية للسكروز والنقاوة ووزن الجذر الطازج و حاصل السكر طن للفدان بينما تفوق فى الموسم الأول فقط فى كلا من الصفات التالية: طول الجذر و النسبة المئوية للمواد الصلبة الذائبة الكلية وحاصل الجذور.

٤- اوضحت النتائج ان احسن حاصل من الجذور (٣٨,٩ طن للفدان) نتج من التفاعل بين الصنف جلوريا مع اضافة المعدل ١٢٥ كجم نيتروجين للفدان ومعاملة الكونترول لاكسيد الماغنسيوم فى الموسم الاول بينما كان فى الموسم الثانى (٣٨,٧١ طن للفدان) نتج من التفاعل بين الصنف جلوريا و ١٢٥ كجم نيتروجين للفدان و ٨ كجم لأكسيد ماغنسيوم.

٥- اوضحت النتائج ان احسن حاصل من السكر (٦,٤٤ طن للفدان) نتج من التفاعل بين الصنف تورو مع اضافة المعدل ١٢٥ كجم نيتروجين للفدان و٨ كجم اكسيد ماغنسيوم للفدان فى الموسم الاول بينما كان فى الموسم الثانى (٦,٧٨ طن للفدان) نتج من التفاعل بين الصنف تورو و١٢٥ كجم نيتروجين للفدان و ٤ كجم لاكسيد ماغنسيوم للفدان.