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

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Abstract

Two field trials were carried out at Tamie, Fayyum 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. Meanwhile, root length, TSS % and root yield were affected by MgSO4 level in the 1st season. The highest value of root yield (36.1 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 MgO in the 2nd season.

INTRODUCTION

A strategic decision has been taken to increase the area planted with sugar beet in Fayyum Governorate as an attempt to narrow the gap in sugar commodity. Tamie is a newly reclaimed farm in Fayyum Governorate. Therefore, it was necessary to test the performance of some multigerm sugar beet varieties under different levels of
nitrogen (N) and magnesium sulfate (MgSO₄) 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 Mitto. 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 (ton/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 (Fayyum 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. Phosphorus fertilizer was applied in the form of calcium superphosphate 15.5 % P$_2$O$_5$ at the rate of 30 kg P$_2$O$_5$/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

1. 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.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Varieties</th>
<th>Nitrogen (Kg N/ha)</th>
<th>Root length (cm) 2002/2003</th>
<th>Mean Root length (cm) 2002/2003</th>
<th>Magnesium (Kg MgO/ha)</th>
<th>Root length (cm) 2003/2004</th>
<th>Mean Root length (cm) 2003/2004</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>zero</td>
<td>4</td>
<td>0</td>
<td>zero</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Toro</td>
<td>75</td>
<td>24.10</td>
<td>24.43</td>
<td>25.23</td>
<td>24.59</td>
<td>26.20</td>
<td>28.28</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>26.70</td>
<td>27.40</td>
<td>28.30</td>
<td>27.47</td>
<td>27.00</td>
<td>26.62</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>26.43</td>
<td>27.63</td>
<td>28.67</td>
<td>27.58</td>
<td>27.67</td>
<td>30.20</td>
</tr>
<tr>
<td>Gloria</td>
<td>75</td>
<td>35.12</td>
<td>35.70</td>
<td>35.65</td>
<td>35.49</td>
<td>32.43</td>
<td>31.63</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>38.00</td>
<td>37.83</td>
<td>38.83</td>
<td>38.22</td>
<td>32.33</td>
<td>33.17</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>36.62</td>
<td>36.87</td>
<td>37.22</td>
<td>36.94</td>
<td>32.33</td>
<td>32.39</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>36.55</td>
<td>36.80</td>
<td>37.27</td>
<td>36.87</td>
<td>32.37</td>
<td>32.40</td>
</tr>
<tr>
<td>N x Mg</td>
<td>75</td>
<td>29.61</td>
<td>30.07</td>
<td>30.44</td>
<td>30.04</td>
<td>29.32</td>
<td>29.96</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>32.35</td>
<td>32.62</td>
<td>33.57</td>
<td>32.84</td>
<td>29.67</td>
<td>29.89</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>31.48</td>
<td>32.25</td>
<td>33.00</td>
<td>32.24</td>
<td>30.00</td>
<td>31.30</td>
</tr>
<tr>
<td>Total average</td>
<td></td>
<td>31.15</td>
<td>31.64</td>
<td>32.34</td>
<td>31.71</td>
<td>29.66</td>
<td>30.38</td>
</tr>
</tbody>
</table>

L S D at 5% level:
Varieties (V) 3.11 NS
Nitrogen (N) 1.32 NS
Magnesium (Mg) 0.36 NS
V x N NS
V x Mg 0.59 NS
N x Mg NS
V x N x Mg NS

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.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Varieties</th>
<th>Nitrogen (Kg N/fed)</th>
<th>Root diameter (cm)</th>
<th>Mean</th>
<th>Root diameter (cm)</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>zero</td>
<td>4</td>
<td>8</td>
<td>zero</td>
<td>4</td>
</tr>
<tr>
<td>Toro</td>
<td>75</td>
<td>18.27</td>
<td>12.93</td>
<td>15.73</td>
<td>15.64</td>
<td>15.37</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>16.20</td>
<td>15.57</td>
<td>16.53</td>
<td>16.10</td>
<td>16.83</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>15.60</td>
<td>15.86</td>
<td>16.87</td>
<td>16.09</td>
<td>17.50</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>16.69</td>
<td>14.71</td>
<td>16.38</td>
<td>15.94</td>
<td>16.57</td>
</tr>
<tr>
<td>Gloria</td>
<td>75</td>
<td>15.35</td>
<td>15.90</td>
<td>15.82</td>
<td>15.99</td>
<td>16.17</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>18.16</td>
<td>18.07</td>
<td>18.73</td>
<td>18.32</td>
<td>16.83</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>16.70</td>
<td>17.07</td>
<td>17.50</td>
<td>17.09</td>
<td>16.17</td>
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<tr>
<td>Average</td>
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<td>16.74</td>
<td>17.01</td>
<td>17.35</td>
<td>17.03</td>
<td>16.42</td>
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<tr>
<td>N x Mg</td>
<td>75</td>
<td>17.61</td>
<td>14.42</td>
<td>15.78</td>
<td>15.67</td>
<td>15.82</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>17.18</td>
<td>16.82</td>
<td>17.63</td>
<td>17.21</td>
<td>16.83</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>16.15</td>
<td>16.43</td>
<td>17.18</td>
<td>16.59</td>
<td>16.83</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>16.71</td>
<td>15.89</td>
<td>16.86</td>
<td>16.49</td>
<td>16.49</td>
</tr>
</tbody>
</table>

L S D at 5% level:
Varieties (V)\ N.S.
Nitrogen (N)\ N.S.
Magnesium (Mg)\ N.S.
V x N\ N.S.
V x Mg\ N.S.
N x Mg\ N.S.
V x N x Mg\ 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 conclude with that reported by El-Taweel (1999).

All interactions among the studied factors did not significant affect 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 Salif (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

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Varieties</th>
<th>Nitrogen</th>
<th>Magnesium</th>
<th>Mean</th>
<th>Magnesium</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(kg N/ha)</td>
<td>(kg Mg/ha)</td>
<td></td>
<td>(kg Mg/ha)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>zero</td>
<td>4</td>
<td>8</td>
<td>zero</td>
<td>4</td>
</tr>
<tr>
<td>Toro</td>
<td>75</td>
<td>941.0</td>
<td>970.0</td>
<td>1030.0</td>
<td>981.7</td>
<td>1112.5</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>1115.0</td>
<td>1167.6</td>
<td>1249.0</td>
<td>1174.2</td>
<td>1262.5</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>1295.0</td>
<td>1355.6</td>
<td>1435.0</td>
<td>1321.7</td>
<td>1412.5</td>
</tr>
<tr>
<td>Average</td>
<td>1151.7</td>
<td>1197.8</td>
<td>1378.3</td>
<td>1212.0</td>
<td>1340.8</td>
<td>1404.9</td>
</tr>
<tr>
<td>Gloria</td>
<td>75</td>
<td>1151.0</td>
<td>1192.0</td>
<td>1286.0</td>
<td>1278.8</td>
<td>1395.0</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>1262.0</td>
<td>1335.0</td>
<td>1405.0</td>
<td>1374.1</td>
<td>1420.0</td>
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<tr>
<td></td>
<td>125</td>
<td>1372.0</td>
<td>1430.0</td>
<td>1522.0</td>
<td>1427.6</td>
<td>1512.5</td>
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<tr>
<td>Average</td>
<td>1320.3</td>
<td>1373.8</td>
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<td>N x Mg</td>
<td>75</td>
<td>1248.3</td>
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</tr>
<tr>
<td></td>
<td>100</td>
<td>1338.6</td>
<td>1391.3</td>
<td>1522.0</td>
<td>1424.1</td>
<td>1500.0</td>
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<tr>
<td></td>
<td>125</td>
<td>1477.6</td>
<td>1535.5</td>
<td>1728.8</td>
<td>1621.6</td>
<td>1693.0</td>
</tr>
<tr>
<td>Total average</td>
<td>1353.5</td>
<td>1419.7</td>
<td>1529.0</td>
<td>1495.0</td>
<td>1607.1</td>
<td>1674.0</td>
</tr>
</tbody>
</table>

L.S.D at 5% level:
Varieties (V) 136.77 N.S
Nitrogen (N) 88.23 53.24
Magnesium (Mg) 26.41 22.16
V x N 36.93 N.S
N x Mg 36.93 N.S
V x N x Mg 36.93 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 coincide 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 coincide 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.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Varieties</th>
<th>Nitrogen (Kg N/ fed)</th>
<th>Total soluble solids % 2002/2003 Mean</th>
<th>Total soluble solids % 2003/2004 Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>zero</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Toro</td>
<td>75</td>
<td>17.96</td>
<td>18.20</td>
<td>18.74</td>
</tr>
<tr>
<td>Gloria</td>
<td>75</td>
<td>19.33</td>
<td>19.74</td>
<td>19.70</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>20.31</td>
<td>20.54</td>
<td>20.86</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>20.22</td>
<td>20.50</td>
<td>20.80</td>
</tr>
<tr>
<td>N x Mg</td>
<td>75</td>
<td>18.65</td>
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<tr>
<td>Average</td>
<td></td>
<td>19.71</td>
<td>20.05</td>
<td>20.53</td>
</tr>
</tbody>
</table>

L S D at 5% level:

| Varieties (V) | N.S |
| Nitrogen (N)   | 0.91 |
| Magnesium (Mg) | 0.25 |
| V x N          | N.S |
| V x Mg         | 0.35 |
| N x Mg         | N.S |
| V x N x Mg     | 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 hold 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 coincide 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 coincide with those reported by El-Taweel (1999) and Osman (2001).

Moreover, variety and magnesium 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.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Nitrogen (Kg N/fed)</th>
<th>Sucrose % 2002/2003 Mean</th>
<th>Sucrose % 2003/2004 Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>zero 4 8</td>
<td>zero 4 8</td>
</tr>
<tr>
<td>Toro</td>
<td>75</td>
<td>13.88 15.11 15.33 14.77 14.85 14.80 15.87 15.21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>14.34 15.16 16.11 15.20 14.86 15.62 16.88 15.79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>14.82 15.32 17.03 15.73 15.75 16.69 16.56 16.37</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>14.75 15.19 16.16 15.73 15.15 15.70 16.47 15.78</td>
<td></td>
</tr>
<tr>
<td>Gloria</td>
<td>75</td>
<td>14.92 15.32 16.29 15.51 14.11 14.25 15.73 14.79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>15.57 16.13 16.48 16.06 13.63 14.70 15.51 14.46</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>15.57 15.97 16.51 16.02 13.46 14.53 15.17 14.39</td>
<td></td>
</tr>
<tr>
<td>N x Mg</td>
<td>75</td>
<td>14.40 15.22 15.81 15.14 14.48 14.52 15.85 14.95</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>14.96 15.64 16.30 15.63 14.24 14.91 16.21 15.17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>15.53 15.89 16.91 16.11 14.20 15.92 15.40 15.17</td>
<td></td>
</tr>
<tr>
<td>Total average</td>
<td></td>
<td>14.96 15.58 16.34 15.60 14.31 15.12 15.82 15.08</td>
<td></td>
</tr>
</tbody>
</table>

L S D at 5% level:

- Varieties (V) N.S.
- Nitrogen (N) N.S.
- Magnesium (Mg) 0.46 0.36
- V x N N.S.
- V x Mg N.S.
- N x Mg N.S.
- V x N x Mg 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>
<thead>
<tr>
<th>Treatment</th>
<th>Varieties</th>
<th>Purity % Mean</th>
<th>Purity % Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nitrogen (Kg N/fed)</td>
<td>2003/2004</td>
<td>2003/2004</td>
</tr>
<tr>
<td>Toro</td>
<td>75</td>
<td>77.33</td>
<td>74.71</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>77.71</td>
<td>74.36</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>78.15</td>
<td>77.15</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>77.71</td>
<td>74.71</td>
</tr>
<tr>
<td>Gloria</td>
<td>75</td>
<td>77.71</td>
<td>74.71</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>77.71</td>
<td>74.71</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>77.71</td>
<td>74.71</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>77.71</td>
<td>74.71</td>
</tr>
<tr>
<td>N x Mg</td>
<td>75</td>
<td>77.71</td>
<td>74.71</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>77.71</td>
<td>74.71</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>77.71</td>
<td>74.71</td>
</tr>
<tr>
<td>Total average</td>
<td></td>
<td>77.71</td>
<td>74.71</td>
</tr>
</tbody>
</table>

LSD at 5% level:
- Varieties (V): N.S
- Nitrogen (N): N.S
- Magnesium (Mg): N.S
- V x N: N.S
- V x Mg: N.S
- N x Mg: N.S
- V x N x Mg: 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 coincide 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 7.86 % 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

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Varieties (V)</th>
<th>Nitrogen (Kg N/fed)</th>
<th>Top yield (tons/fed) 2002/2003</th>
<th>Mean</th>
<th>Top yield (tons/fed) 2003/2004</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>zero 4 8</td>
<td>Mean</td>
<td></td>
<td>zero 4 8</td>
<td></td>
</tr>
<tr>
<td>Toro</td>
<td>75</td>
<td>17.82 16.81 15.71</td>
<td>16.78</td>
<td>16.46</td>
<td>16.98</td>
<td>17.18</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>16.93 16.68 17.31</td>
<td>17.11</td>
<td>18.69</td>
<td>18.14</td>
<td>18.63</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>15.64 15.26 17.69</td>
<td>17.53</td>
<td>19.93</td>
<td>18.62</td>
<td>19.20</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>16.80 17.58 17.04</td>
<td>17.14</td>
<td>18.96</td>
<td>17.88</td>
<td>17.95</td>
</tr>
<tr>
<td>Gloria</td>
<td>75</td>
<td>17.44 19.67 16.55</td>
<td>18.02</td>
<td>18.36</td>
<td>17.14</td>
<td>15.89</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>18.43 18.97 16.02</td>
<td>18.81</td>
<td>16.35</td>
<td>18.14</td>
<td>17.68</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>17.89 19.27 18.75</td>
<td>18.64</td>
<td>18.65</td>
<td>16.10</td>
<td>19.72</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>17.92 19.31 18.24</td>
<td>18.49</td>
<td>17.82</td>
<td>17.78</td>
<td>17.77</td>
</tr>
<tr>
<td>N x Mg</td>
<td>75</td>
<td>17.63 18.24 16.53</td>
<td>17.90</td>
<td>17.13</td>
<td>17.05</td>
<td>16.54</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>17.68 17.83 18.37</td>
<td>17.96</td>
<td>17.47</td>
<td>18.09</td>
<td>18.06</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>16.77 19.26 18.72</td>
<td>18.08</td>
<td>18.84</td>
<td>18.36</td>
<td>18.98</td>
</tr>
<tr>
<td>Total average</td>
<td></td>
<td>17.35 18.44 17.64</td>
<td>17.81</td>
<td>17.94</td>
<td>17.83</td>
<td>17.86</td>
</tr>
</tbody>
</table>

I . 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 |

N.S: Not Significant
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 coincide 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 coincide 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>
<thead>
<tr>
<th>Treatment</th>
<th>Varieties</th>
<th>Nitrogen (Kg N/ha)</th>
<th>Root yield (tons/fed) 2002/2003</th>
<th>Mean</th>
<th>Root yield (tons/fed) 2003/2004</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>zero</td>
<td>4</td>
<td>8</td>
<td>zero</td>
<td>4</td>
</tr>
<tr>
<td>Toro</td>
<td>75</td>
<td>28.35</td>
<td>32.44</td>
<td>33.23</td>
<td>31.34</td>
<td>34.59</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>33.45</td>
<td>35.03</td>
<td>37.20</td>
<td>35.23</td>
<td>37.54</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>32.85</td>
<td>35.50</td>
<td>37.95</td>
<td>35.45</td>
<td>36.71</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>31.55</td>
<td>34.34</td>
<td>36.13</td>
<td>34.01</td>
<td>36.28</td>
</tr>
<tr>
<td>Gloria</td>
<td>75</td>
<td>32.55</td>
<td>35.78</td>
<td>35.60</td>
<td>34.64</td>
<td>29.68</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>36.54</td>
<td>36.65</td>
<td>36.49</td>
<td>37.89</td>
<td>34.13</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>39.90</td>
<td>38.40</td>
<td>37.38</td>
<td>38.23</td>
<td>36.38</td>
</tr>
<tr>
<td>Average</td>
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<td>37.61</td>
<td>37.15</td>
<td>36.92</td>
<td>33.39</td>
</tr>
<tr>
<td>N x Mg</td>
<td>75</td>
<td>39.45</td>
<td>34.11</td>
<td>34.41</td>
<td>32.99</td>
<td>32.13</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>39.99</td>
<td>38.84</td>
<td>37.84</td>
<td>36.36</td>
<td>35.83</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>35.88</td>
<td>36.98</td>
<td>37.66</td>
<td>36.84</td>
<td>36.54</td>
</tr>
<tr>
<td>Total average</td>
<td></td>
<td>31.77</td>
<td>35.97</td>
<td>36.64</td>
<td>35.46</td>
<td>34.94</td>
</tr>
</tbody>
</table>

L.S.D at 5% level:
- Varieties (V): 2.29
- Nitrogen (N): 2.75
- Magnesium (Mg): 1.81
- V x N: N.S
- V x Mg: N.S
- N x Mg: N.S
- V x N x Mg: N.S
The effect of nitrogen fertilizer levels on root yield was significant in both seasons. Adding, 125 kg N/ha surpassed 75 and 100 kg N/ha by 11.67, 0.70% in the 1st seasons and 12.56, 5.18% in the 2nd season, respectively. This result concur 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/ha 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/ha)

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/ha) during the two successive seasons 2002/2003 and 2003/2004

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Varieties</th>
<th>Nitrogen (Kg N/ha)</th>
<th>Sugar yield (tons/ha)</th>
<th>Mean</th>
<th>Sugar yield (tons/ha)</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>zero</td>
<td>4</td>
<td>8</td>
<td>zero</td>
<td>4</td>
</tr>
<tr>
<td>Toro</td>
<td>75</td>
<td>3.93</td>
<td>4.89</td>
<td>5.06</td>
<td>4.63</td>
<td>5.14</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>4.81</td>
<td>5.33</td>
<td>5.99</td>
<td>5.38</td>
<td>5.61</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>4.88</td>
<td>6.44</td>
<td>6.44</td>
<td>5.58</td>
<td>5.78</td>
</tr>
<tr>
<td>Average</td>
<td>4.54</td>
<td>5.22</td>
<td>5.63</td>
<td>5.26</td>
<td>5.51</td>
<td>5.98</td>
</tr>
<tr>
<td>Gloria</td>
<td>75</td>
<td>4.85</td>
<td>5.50</td>
<td>5.82</td>
<td>5.39</td>
<td>4.19</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>5.66</td>
<td>6.25</td>
<td>6.35</td>
<td>6.09</td>
<td>4.65</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>6.31</td>
<td>6.30</td>
<td>6.26</td>
<td>6.29</td>
<td>4.60</td>
</tr>
<tr>
<td>Average</td>
<td>5.61</td>
<td>6.02</td>
<td>6.15</td>
<td>5.92</td>
<td>4.48</td>
<td>4.99</td>
</tr>
<tr>
<td>N x Mg</td>
<td>75</td>
<td>4.39</td>
<td>5.20</td>
<td>5.44</td>
<td>5.01</td>
<td>4.66</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>5.24</td>
<td>5.79</td>
<td>6.17</td>
<td>5.73</td>
<td>5.13</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>5.59</td>
<td>6.87</td>
<td>6.35</td>
<td>5.94</td>
<td>5.39</td>
</tr>
<tr>
<td>Total average</td>
<td>5.07</td>
<td>5.62</td>
<td>5.59</td>
<td>5.56</td>
<td>5.20</td>
<td>5.49</td>
</tr>
</tbody>
</table>

L S D at 5% level:

<table>
<thead>
<tr>
<th>Varieties (Y)</th>
<th>N.S.</th>
<th>N.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen (N)</td>
<td>0.59</td>
<td>N.S.</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>0.28</td>
<td>0.34</td>
</tr>
<tr>
<td>V x N</td>
<td>N.S.</td>
<td>N.S.</td>
</tr>
<tr>
<td>V x Mg</td>
<td>0.40</td>
<td>N.S.</td>
</tr>
<tr>
<td>N x Mg</td>
<td>N.S.</td>
<td>0.59</td>
</tr>
<tr>
<td>V x N x Mg</td>
<td>N.S.</td>
<td>N.S.</td>
</tr>
</tbody>
</table>
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


تأثير التسويق الأزوتوي والماغنسيوم على محصول وجودة صنفين من بذور السكر

جمال سعد السيد

معيد بحوث المحاصيل السكرية - مركز البحث الزراعية - الجبيرة - مصر

أجريت تجربتيان حديثين بمحطة البحث الزراعية بطانية بمحافظة قومن لدراسة تأثير الإضافة الأرضية للتيار ماذية وكبيرات الماغنسيوم على حصول وجودة بذور السكر خلال موسم الزراعتين 2020/2021 و 2021/2022. وقد أظهرت النتائج ارتفاع من تصنيفي بذور السكر عند الجريزة جلوريا وتيروجين وثلاثة معدلات من التسويق الأزوتوي 75 و 100 و125 كجم/هكتار للذرة. وفترة توزيع العمولات في عنصري ميكون، منشق ماء واحد، في أربع مكبات حيث تم وضع الأصناف في القسم الرئيسي وسائحة النسبة المئوية في القسم الصغير، حيث

أظهرت النتائج المحصلة عليها:

1- تفوق الصنف جلوريا على الصنف تيروجين في المحاصيل التالية: طول الجذور وزينة الجذور الطلاء والرذاذ على الجذور في الموسم الأول فقط.
2- فقدت اضواء السنة الأزوتوي مع دعم 100 كجم/هكتار للذرة زيادة معدلها كلًا من الأصناف النهائية. طول الجذور وزينة الجذور الطلاء والرذاذ على الجذور في الموسم الأول بينما تفوق معدل 125 كجم/هكتار للذرة في حصول السكر لنفس المجموع كما تقول في المحاصيل النهائية. زينة الطلاء وصلح الجذور وسياحة النسبة المئوية للمواد الصلبية الكتلة على حصول السكر طول الجذور
3- المحاصيل تتوقف نسب التسويق بين الماغنسيوم مع موميا بالكامل 8 كجم أكسيد الماغنسيوم للذرة في كلة المحاصل في السنة التالية: النسبة المئوية للذرة وتوزيع زينة الجذور الطلاء والرذاذ على الجذور في الموسم الأول فقط في كلة من الصنف ثانية: طول الجذور وصلح النسبة المئوية للمواد الصلبية الكتلة على حصول الجذور.
4- أظهرت النتائج أن sufficiently جلوريا مع دعم مختلفة المحمول 125 كجم/هكتار للذرة وامكانيات التكثيف لاشكولت الماغنسيوم في الموسم الأول بينما كان في المحمول الثاني 270 كجم/هكتار من التفاعل بين الخلفيات جلوريا وتيروجين للذرة و8 كجم أكسيد الماغنسيوم.
- أُوضح النتائج أن أحسن حصاد من السكر (4.44 طن للقنان) تنتج من التفاعل بين الصف تورو مع اضافة المعدل 120 كجم نتروجين للقنان و 8 كجم أكسيد ماغنسيوم للقنان في الموسم الأول بينما كان في الموسم الثاني (3.78 طن للقنان) تنتج من التفاعل بين الصف تورو و 125 كجم نتروجين للقنان و 4 كجم أكسيد ماغنسيوم للقنان.