Research Regarding Cultivation of Maize for Silage in Transylvanian Plateau

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Abstract. In this paper we studied two types of maize hybrids of two precocity groups according to FAO 250 – 320 (early) and FAO 340 – 450 (mid-early). Therefore we chase the evolution of each studied maize hybrid and how they turn account on climate condition of SCDA Turda

Key words: maize for silage, applied technology, climate conditions

INTRODUCTION

Maize cultivated for silage demands important questions for farmers like chosing the best maize hybrid, optimal density, applied technology or establishing the best moment to harvest. These problems wanted to be rezolved in this paper work. In the experimental field was studied the evolution of presented aspects such as the environment conditions, optimal density and the interaction between these factors.

MATERIAL AND METHOD

Station of Agricultural Research and Development from Turda is situated in the north west of Turda on 3 km from the national highway E60 and 30 km from Cluj – Napoca. The geographical coordinates are 46° 35’ north latitude and 23° 47’ estical longitude and 345 – 493 m altitude high by the Adriatical Sea. The relief condition of SCDA Turda is represented by three distinct formations: plateau with a hilly area; superior terrace of the Aries river; and secondary valleys. The pluviometric and thermic regime is presented in table 2.

At the Station of Agricultural Research and Development from Turda in the experimental fields where establish two types of experiments with maize hybrids first one according to FAO 250 – 320 and second to FAO 340 – 450 during 2005 – 2007.(table 2) The comparative cultures where realized in a polyfactorial system with subdivided variant, factor A: 60, 80, 100 thousands plants/hectar, factor B is represented by 8 genotypes and factor C the experimental years. For each comparative culture, where have been assured 3 repetitions. All densities and genotypes where randomized in each repetition. The cultivation density of 60 000 plant/hectare regular used for seeds maize culture was considered for reference (martor).
The pluviometric and thermic regime in the maize vegetation period on Turda during 2005 – 2007

<table>
<thead>
<tr>
<th>Specification</th>
<th>nov. 2004-march 2005</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
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<tbody>
<tr>
<td>Pluviometric regime (mm)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Month total 2005</td>
<td>170.9</td>
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<td>54.9</td>
<td>95.4</td>
<td>131.6</td>
<td>180.8</td>
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<tr>
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<td>118.4</td>
<td>70.8</td>
<td>77.9</td>
<td>118.2</td>
<td>16.5</td>
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<tr>
<td>Month total 2007</td>
<td>91.7</td>
<td>10.1</td>
<td>103.8</td>
<td>77.1</td>
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<td>118.1</td>
<td>84.7</td>
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<tr>
<td>Thermic regime Turda (°C)</td>
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<tr>
<td>Monthly average 2005</td>
<td>9.8</td>
<td>15.7</td>
<td>17.2</td>
<td>19.7</td>
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<tr>
<td>Monthly average 2006</td>
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<td>14.3</td>
<td>17.6</td>
<td>21.2</td>
<td>18.5</td>
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<tr>
<td>Monthly average 2007</td>
<td>10.8</td>
<td>17.0</td>
<td>20.3</td>
<td>22.0</td>
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The studied maize hybrids

<table>
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<th>Hybrid</th>
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<th>Author</th>
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<tr>
<td>1. Turda Super</td>
<td>Turda</td>
<td>1. Saturn</td>
<td>Turda + Saaten Union</td>
</tr>
<tr>
<td>2. Turda 165</td>
<td>Turda</td>
<td>2. Turda Star</td>
<td>Turda</td>
</tr>
<tr>
<td>3. Turda 145</td>
<td>Turda</td>
<td>3. Turda Favorit</td>
<td>Turda</td>
</tr>
<tr>
<td>4. Turda SU – 182</td>
<td>Turda + Saaten Union</td>
<td>4. Turda 201</td>
<td>Turda</td>
</tr>
<tr>
<td>5. Turda Mold 188</td>
<td>Turda + Porumbeni</td>
<td>5. Minerva</td>
<td>Fundulea</td>
</tr>
<tr>
<td>6. LG 2244</td>
<td>Limagrain</td>
<td>6. LG 2305</td>
<td>Limagrain</td>
</tr>
<tr>
<td>8. Lapessa</td>
<td>Pioneer</td>
<td>8. Sandrina</td>
<td>Pioneer</td>
</tr>
</tbody>
</table>

During 2005 – 2007 where some technological series of works to realize the experimental field such as:
- rotation; maize was cultivated after wheat;
- plowing in autumn;
- soil preparation;
- was applied fertilizers (20 N : 20 P) 400 kg/ha in each experimental year;
- applying herbicides preem with Guardian 2,5 l/ha + Sanazin 3,0 l/ha;
- sowing
- applying herbicides for *Cirsium arvense* and *Convolvulus sp.* with Guardian 1,5 l/hectare + Glyphosat 4 l/hectare;
- notation of maize behavior on SCDA Turda climate condition;
- harvest.

RESULTS AND DISCUSSIONS

The main observation where concerning to the growing capacity of each maize hybrid, the reaction to low temperature, flourished and silk data period, when 50% of plants had the principal axes 1/3 flourished and the stigmas 2-3 cm. The technological maturity was established for each hybrid in wax stadium. The moment of harvest had been chosen directly by the technological maturity. The plants stay-green capacity had been noted at the moment of harvest through grades from 1 to 9. The harvest aspects where for each experimental variant such as the: total
production, corn cobs production which were counted and weighted for the calculation of the corn cobs percentage from the total production.

In Table 3 are presented the yields of early maize hybrids on the experimental years 2005, 2006 respectively in 2007. In terms of total green mass production as an overview in 2005 there were experimental values higher than 2006 respectively in 2007. All 8 early hybrids were observed in the cultivation of silage by yields obtained in 2005 such is the density of culture 60000 pl/ha. The obtained yields on early hybrids with higher considerable variation to control variant are: in 2005 at the cultivation density D1 60000 pl/ha by Lipessa with 42.43 t/ha green mass, 18.10 t/ha cobs and 19.17 t/ha DM, noted as the very significant positive; Clarica, with 36.37 t/ha green mass noted significantly distinct positive and 15.30 t/ha cobs noted significantly positive; Turda Super 35.73 t/ha green mass, noted significantly positive; 15.67 t / DM ha noted distinct significantly positive; and LG 2244 with 15.47 t/ha DM noted significantly positive. In 2006 on the cultivation density D1 60000 pl/ha Lipessa obtained 15.17 t/ha DM noted distinct significant positive, in D3 100000 pl/ha Lipessa obtained 33.47 t/ha green mass, 12.57 t/ha cobs in both cases noted significantly positive and 16.07 t/ha DM noted distinct significant. In 2007 yields obtained in the 8 studied early maize hybrids have not provided statistical variation.

Under the same experimental conditions as for early hybrids were tested eight mid early maize hybrids according to (FAO 340 - FAO 450) to identify the hybrid that carried the highest yields of green mass, DM and with a high percentage of cobs to be used in the production of silage in the central and western part of Transylvania. (Table 4) Compared with the early maize hybrids the mid early maize hybrids have used better the climate conditions in experimental years, the results are not comparable but statistically testing the experimental systems being made in separate but similar values, which shows that practically the differences between these two groups of hybrids are not high. In 2005 the mid early maize hybrids with higher obtained yields which have very significant positive variation from the controls were in D1 60000 pl/ha, Sandrina: (41.27 t/ha green mass, 17.40 t/ha cobs, 16.90 t/ha DM); LG 2305: (41.27 t/ha green mass, 17.43 t/ha DM); in the cultivation density D2 80000 pl/ha Sandrina (45.97 t/ha green mass, 17.90 t/ha cobs, 18.10 t/ha DM); LG 2305: (42.80 t/ha green mass, 16.60 t/ha cobs, 18.50 t/ha DM), Saturn: (38.30 t/ha green mass, 14.77 t/ha cobs, 15.97 t/ha DM); Minerva: (36.13 t/ha green mass); at the cultivation density D3 100000 pl/ha Sandrina obtained: (52.37 t/ha green mass, 19.80 t/ha cobs, 16.67 t/ha DM); LG 2305: (45.00 t/ha green mass, 19.50 t/ha cobs, 16.67 t/ha DM).Distinct differences from control significant positive were recorded in cultivation density D1 60000 pl/ha by: Minerva: (36.83 t/ha green mass); at the cultivation density D2 80000 pl/ha Minerva obtained: (13.57 t/ha cobs); Turda (35.13 t/ha green mass) and the cultivation density D3 100000 pl/ha Minerva obtained: (41.67 t/ha green mass and Saturn: (41.77 t/ha green mass). Positive significant differences were recorded for the following hybrids in the cultivation density D1 60000 pl/ha by: Minerva: (15.07 t/ha DM); LG 2305 (16.40 t/ha cobs); in cultivation density D2 80000 pl/ha Minerva obtained: (14.67 t/ha DM); Turda 201 (13.17 t/ha cobs); Turda Favorit (13.30 cobs); and at the cultivation density D3 100000 pl/ha Minerva obtained: (16.30 t/ha cobs, and 17.43 DM); Turda 201: (40.20 t/ha green mass) and Saturn (17.63 t/ha DM). Maize hybrids with yields which have very significant positive variation from control in 2006 are: in the cultivation density D1 60000 pl/ha, by Sandrina with (39.37 t/ha green mass, 16.17 t/ha cobs and 15.53 t/ha DM); LG 2305: (33.60 t/ha green mass, and 16.93 t/ha DM).
Tab. 3

Differences table of the interaction between hybrids x years x cultivation densities, through productions (t/ha) on early maize hybrids (Turda 2005, 2006 şi 2007)

<table>
<thead>
<tr>
<th>Nr. crt.</th>
<th>Hybrid</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total g.m. production t/ha</td>
<td>Corn cobs production t/ha</td>
<td>DM production t/ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total g.m. production t/ha</td>
<td>Corn cobs production t/ha</td>
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<td>DM production t/ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total g.m. production t/ha</td>
<td>Corn cobs production t/ha</td>
<td>DM production t/ha</td>
</tr>
<tr>
<td>D1 60 000 pl/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Turda 165</td>
<td>31,13 Mt</td>
<td>12,87 Mt</td>
<td>13,03 Mt</td>
</tr>
<tr>
<td>2.</td>
<td>Turda Mold 188</td>
<td>28,57 -</td>
<td>10,00 00</td>
<td>12,77 -</td>
</tr>
<tr>
<td>3.</td>
<td>Turda SU 182</td>
<td>33,00 -</td>
<td>13,23 -</td>
<td>14,50 -</td>
</tr>
<tr>
<td>4.</td>
<td>Turda 145</td>
<td>30,63 -</td>
<td>12,97 -</td>
<td>13,77 -</td>
</tr>
<tr>
<td>5.</td>
<td>Turda Super</td>
<td>35,73 * 15,43</td>
<td>15,67 **</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>LG 2244</td>
<td>35,00 - 14,80</td>
<td>15,47 *</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Lipessa</td>
<td>42,43 *** 18,10</td>
<td>19,17 ***</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Clarica</td>
<td>36,37 ** 15,30</td>
<td>14,70 -</td>
<td></td>
</tr>
<tr>
<td>D2 80 000 pl/ha</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1.</td>
<td>Turda 165</td>
<td>34,73 Mt</td>
<td>14,80 Mt</td>
<td>15,13 Mt</td>
</tr>
<tr>
<td>2.</td>
<td>Turda Mold 188</td>
<td>31,13 -</td>
<td>10,60 0000</td>
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<td>3.</td>
<td>Turda SU 182</td>
<td>35,10 -</td>
<td>13,17 -</td>
<td>15,43 -</td>
</tr>
<tr>
<td>4.</td>
<td>Turda 145</td>
<td>34,17 -</td>
<td>13,90 -</td>
<td>15,17 -</td>
</tr>
<tr>
<td>5.</td>
<td>Turda Super</td>
<td>34,03 -</td>
<td>14,00 -</td>
<td>14,50 -</td>
</tr>
<tr>
<td>6.</td>
<td>LG 2244</td>
<td>33,37 -</td>
<td>15,33 -</td>
<td>14,33 -</td>
</tr>
<tr>
<td>7.</td>
<td>Lipessa</td>
<td>36,90 -</td>
<td>15,07 -</td>
<td>16,27 -</td>
</tr>
<tr>
<td>8.</td>
<td>Clarica</td>
<td>33,77 -</td>
<td>14,57 -</td>
<td>15,77 -</td>
</tr>
<tr>
<td>D3 100 000 pl/ha</td>
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<td></td>
</tr>
<tr>
<td>1.</td>
<td>Turda 165</td>
<td>42,90 Mt</td>
<td>17,70 Mt</td>
<td>18,13 Mt</td>
</tr>
<tr>
<td>2.</td>
<td>Turda Mold 188</td>
<td>36,13 000</td>
<td>13,23 0000</td>
<td>15,90 0</td>
</tr>
<tr>
<td>3.</td>
<td>Turda SU 182</td>
<td>41,43 -</td>
<td>16,87 -</td>
<td>19,30 -</td>
</tr>
<tr>
<td>4.</td>
<td>Turda 145</td>
<td>35,53 000</td>
<td>14,67 00</td>
<td>15,40 00</td>
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<td>17,13 -</td>
<td>17,93 -</td>
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<td>42,73 -</td>
<td>17,57 -</td>
<td>18,90 -</td>
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<td>7.</td>
<td>Lipessa</td>
<td>45,30 -</td>
<td>18,70 -</td>
<td>19,70 -</td>
</tr>
<tr>
<td>8.</td>
<td>Clarica</td>
<td>42,07 -</td>
<td>17,20 -</td>
<td>18,50 -</td>
</tr>
</tbody>
</table>

LSD of total green mass production (g.m.) differences (p 5%) = 3,89 t/ha; (p 1%) = 5,14 t/ha; (p 0.1%) = 6,61 t/ha;
LSD of corn cobs production differences (p 5%) = 2,01 t/ha; (p 1%) = 2,65 t/ha; (p 0.1%) = 3,41 t/ha;
LSD of DM production differences (p 5%) = 1,84; (p 1%) = 2,44; (p 0.1%) = 3,13 t/ha;
Tab. 4

Differences table of the interaction between **hybrids x years x cultivation densities**, through productions (t/ha) on mid early maize hybrids (Turda 2005, 2006 și 2007)

<table>
<thead>
<tr>
<th>Nr. crt.</th>
<th>Hybrid</th>
<th>Total g.m. production t/ha</th>
<th>Corn cobs production t/ha</th>
<th>DM production t/ha</th>
<th>Total g.m. production t/ha</th>
<th>Corn cobs production t/ha</th>
<th>DM production t/ha</th>
<th>Total g.m. production t/ha</th>
<th>Corn cobs production t/ha</th>
<th>DM production t/ha</th>
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<tbody>
<tr>
<td><strong>D1 60 000 pl/ha</strong></td>
<td></td>
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</tr>
<tr>
<td>1.</td>
<td>Turda Star</td>
<td>32.00 Mt</td>
<td>14.13 Mt.</td>
<td>12.97 Mt.</td>
<td>26.17 -</td>
<td>10.20 Mt.</td>
<td>11.93 Mt.</td>
<td>25.87 Mt.</td>
<td>11.17 Mt.</td>
<td>11.37 Mt.</td>
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<td>2.</td>
<td>Minerva</td>
<td>36.83 **</td>
<td>15.57 -</td>
<td>15.07 *</td>
<td>29.47 -</td>
<td>12.73 **</td>
<td>12.97 -</td>
<td>27.90 *</td>
<td>11.87 -</td>
<td>12.00 -</td>
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<tr>
<td>4.</td>
<td>Turda Favorit</td>
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<td>12.73 -</td>
<td>12.60</td>
<td>24.57 -</td>
<td>9.20 -</td>
<td>10.70 -</td>
<td>26.27 -</td>
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<td>6.</td>
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<td>7.</td>
<td>Sandrina</td>
<td>40.67 ***</td>
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<td>12.40 -</td>
<td>12.37 -</td>
</tr>
<tr>
<td><strong>D2 80 000 pl/ha</strong></td>
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<tr>
<td>1.</td>
<td>Turda Star</td>
<td>29.37 Mt</td>
<td>11.03 Mt</td>
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<td>27.60 Mt.</td>
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<td>12.70 Mt.</td>
<td>27.87 Mt.</td>
<td>12.17 Mt.</td>
<td>12.90 Mt.</td>
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<td>5.</td>
<td>Saturn</td>
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<td>15.97 ***</td>
<td>30.37 -</td>
<td>10.27 -</td>
<td>13.30 -</td>
<td>26.73 -</td>
<td>11.70 -</td>
<td>12.20 -</td>
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<td>6.</td>
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<td>18.50 ***</td>
<td>38.33 ***</td>
<td>14.63 ***</td>
<td>18.57 ***</td>
<td>31.70 *</td>
<td>13.53 -</td>
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<td>7.</td>
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<td>18.10 ***</td>
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<td>15.83 ***</td>
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<td>36.07 ***</td>
<td>15.83 ***</td>
<td>15.00 *</td>
</tr>
<tr>
<td><strong>D3 100 000 pl/ha</strong></td>
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<td>1.</td>
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<td>15.47 Mt.</td>
<td>29.87 -</td>
<td>10.60 Mt.</td>
<td>12.70 Mt.</td>
<td>25.73 Mt.</td>
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<td>11.43 Mt.</td>
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<td>2.</td>
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<td>16.30 *</td>
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<td>33.37 -</td>
<td>11.33 -</td>
<td>13.80 -</td>
<td>29.67 *</td>
<td>12.00 -</td>
<td>13.10 -</td>
</tr>
<tr>
<td>5.</td>
<td>Saturn</td>
<td>41.77 **</td>
<td>15.93 -</td>
<td>17.63 *</td>
<td>34.17 *</td>
<td>10.63 -</td>
<td>13.30 -</td>
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<td>6.</td>
<td>LG 2305</td>
<td>45.00 ***</td>
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<td>43.63 ***</td>
<td>15.20 ***</td>
<td>17.77 ***</td>
<td>35.37 ***</td>
<td>13.80 ***</td>
<td>14.07 **</td>
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<tr>
<td>8.</td>
<td>Ribera</td>
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<td>16.10 -</td>
<td>30.57 -</td>
<td>12.83 *</td>
<td>14.97 *</td>
<td>23.70 -</td>
<td>11.47 -</td>
<td>10.10 -</td>
</tr>
</tbody>
</table>

LSD of total green mass production (g.m.) differences (p 5%) = 3.59 t/ha; (p 1%) = 4.75 t/ha; (p 0.1%) = 6.11 t/ha;
LSD of corn cobs production differences (p 5%) = 1.80 t/ha; (p 1%) = 2.38 t/ha; (p 0.1%) = 3.07 t/ha;
LSD of DM production differences (p 5%) = 1.81 t/ha; (p 1%) = 2.39 t/ha; (p 0.1%) = 3.08 t/ha;
As well in the cultivation density D2 80000 pl/ha, LG 2305 obtained: (38.33 t/ha green mass, 14.63 t/ha cobs, and 18.57 t/ha DM); and in the cultivation density D3 100000 pl/ha Sandrina: obtained: (43.63 t/ha green mass, 15.20 t/ha cobs and 17.77 t/ha DM); LG 2305: (39.33 t/ha green mass and 18.57 t/ha DM). Positive significant differences were recorded by LG 2305 with: (12.87 t/ha cobs), Minerva with: (12.73 t/ha cobs). In the cultivation density D1 60000 pl/ha significantly distinct positive was noted: LG 2305 with: (14.17 t/ha cobs); Ribera: (12.83 t/ha cobs); and the same hybrid obtained: (14.97 t/ha DM) with a significantly positive note in D3 100000 pl/ha. In 2007 maize hybrid yields with a very significant variation from control was in D2 80000 pl/ha by Sandrina with 36.07 t/ha green mass, 15.83 t/ha cobs and in the cultivation density D3 100000 pl/ha with 35.37 t/ha green mass and 13.80 t/ha cobs. Distinctly positive significant differences were recorded for hybrids: Sandrina (31.97 t/ha green mass) and Saturn (11.83 t/ha DM) in the cultivation density D1 60000 pl/ha, LG 2305 (31.47 t/ha green mass, and 14.13 t/ha DM), Sandrina (14.07 t/ha DM) in the cultivation density D3 100000 pl/ha. Significant positive differences have been for: LG 2305 (30.40 t/ha green mass), Minerva (27.90 t/ha green mass), in the cultivation density D1 60000 pl/ha, LG 2305 obtained (31.70 t/ha green mass and 14.83 t/ha DM) and Sandrina (15.00 t/ha DM) in cultivation density D2 80000 pl/ha, while in cultivation density D3 100000 pl/ha LG 2305, obtained (12.73 t/ha cobs), Saturn (29.97 t/ha green mass, and 13.37 t/ha DM), Turda 201, (30.07 t/ha green mass) and Minerva (29.67 t/ha green mass).

CONCLUSION

Maize hybrids grown for silage production are noted for those who have made significant and similar high output, comparing these two studied cultures, recommending the mid early maize hybrids group comparing to early hybrids which showed that can efficiently exploit the climatic conditions of the Transylvanian Plateau.

As for the early and mid early maize hybrids the best productions were obtained in 2005 compared to 2006 and 2007, because of the lower levels of rainfall of the latest years especially in June and July.

From the group of early maize hybrids cultivated for silage were noted: Lipessa, LG 2244, and Turda Turda Super SU 182.

The analysis yields obtained in the experimental years, the group of mid early hybrids cultivated for silage were observed the following hybrids: Sandrina, LG 2305, Saturn and Minerva.

REFERENCES