Multiplication and shaping of *Chrysanthemum* varieties cultivated in pots

Buta Erzsebet¹*, Cantor Maria¹, Buta M¹, Horț Denisa¹

¹University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, 3-5 Mânășturi Street, Romania

*Corresponding author. Email: ebuta2008@yahoo.com

**Abstract** The increasing of global flower production is due to growing demand for ornamental plants and high incomes gained this activity. Genus of *Chrysanthemum* occupies an important place on flower production. *Chrysanthemum* cultivation importance derives from its esthetic qualities, what make it to match for any occasion, also the diversity of shapes, sizes and colors makes the chrysanthemum to be highly appreciated by the general public, and in the same time to be economical a profitable crop.

High consumption of chrysanthemums (especially during Autumn), in our country, determined the investigation and improvement of cultivation technology and possibilities for the propagation of the species *Chrysanthemum multiflora*. It was followed the influence of rooting substrate (peat + perlite Klassman, peat Klassman + Osmocote, peat Klassman + NPK) on the developing of 3 Chrysanthemum cultivars.

During the experiments were made some morphological observations. Were studied the following: length of cuttings, diameter of leaves rosette, number of leaves, number and length of roots, plant growth and development. Recorded data were interpreted statistically by variance analysis. Results showed that the rooting process were different and depends on the variety. Branmaya rooted at the earliest (14 days), and was followed by Branfortune and Branroyal (rooting period - 19 days). Best rooting substrate was Klassman peat + perlite, followed by Klassman peat + NPK and Klassman peat + Osmocote.

The high interest of *Chrysanthemum* cultivars used as cut flowers and pot plants in our country, determined to investigate the multiplication and shaping technology of *Chrysanthemum multiflora* L.

To better understand the multiplication technology was determine the influence of different rooting substrate on rooting process at three cultivars of ‘mums’ or ‘chrysanth’. The generic name comes from the Greek, *chryso* ("gold") and *anthos* ("flower"), probably referring to the yellow *Chrysanthemum coronarium*. Chrysanthemums have been cultivated in China for more than 2500 years and was a favorite flower of the Mandarin [7;2], but lovers of perennials and pot plants have watched this large genus being pared off by taxonomists and placed in genera all over the map. The florist mum and economically important chrysanthemums was switched to *Dendranthema*; [1] and the whole genera’s are belonging to the family of *Asteraceae*.

The other species previously included in the narrow view of the genus *Chrysanthemum* are now transferred to the genus *Glebionis*. The other genera separate from *Chrysanthemum* include *Argyranthemum, Leucanthemopsis, Leucanthemum, Rhodanthemum, and Tanacetum* [9].

The *Chrysanthemum* genus contains many hybrids and thousands of cultivars developed for horticultural purposes. In addition to the traditional yellow, other colors are available, such as white, purple, and red. The most important hybrid is *Chrysanthemum × morifolium* (syn. *C. × grandiflorum*), derived primarily from *C. indicum* but also involving other species.

Regarding the propagation, mums can be easy propagating by cuttings. In 1982 Pasquier et al. [8], have compared several culture media (peat moss, perlite, fine pine bark shavings, rough pine bark shavings and a mixture of rough pine bark and peat) for rooting and growth of pot *Chrysanthemum* cuttings obtained on the commercial market: *Chrysanthemum morifolium* Ramat cv ‘Always Pink’. The rooting was earlier in perlite and peat moss than in other substrates.

The flowers also can be daisy-like, decorative and buttons [3;6]. In landscape design can be combined with different grasses, *Perovskia, Fuchsia magellanica, Sedum, Aster, Solidago* and *Salvia* [4].

**Key words** cultivars, cuttings, mums, rooting substrates
Materials and Methods

The studies regarding the multiplication and shaping technology Chrysanthemum was developing in a privet company from Badon - Hereclean, Sălaj County. Rooting was carried out with different substrate in seedling trays.

The biological material used in experiments with Chrysanthemum multiflora L. was the following three cultivars: "Branmaya" (pink flowers), "Branfortune" (yellow flowers), „Branroyal” (brick-colored) – Fig.1.

The control was the average of experiment. The experiment was carried out during 2011-2012, was organized an experience with two factors, the analyzed factors were: cultivars and rooting substrate:

**Factor A: cultivars:**
- a1 "Branmaya"
- a2 "Branfortune"
- a3 „Branroyal”

**Factor B: rooting substrates:**
- b1 Klassman peat+perlite
- b2 Klassman peat+Osmocote
- b3 Klassman peat+NPK

Through the combination of those two factors were obtained 9 experimental variants, which were placed in randomized blocks, in three repetitions.

For the multiplication of chrysanthemums, on 15.06.2011 were collected 10 cuttings for each variant from the healthy mother plants, vigorous and free from diseases and pests. Cuttings were made from the middle-aged healthy shoots. The prepared cuttings were treated with Radistim 1 for a better rooting. After the appearance of the first roots, the cuttings were treated with Radifarm for the developing of root system.

The prepared cuttings had been planted in three rooting substrates, as follows: 1. Klassman peat+perlite, 2. Klassman peat+Osmocote, 3. Klassman peat+NPK, and the stalks being introduced in the substrate in an oblique position.

After 23 days of rooting, the cuttings were transferred in pot with a diameter of 12 cm.

Results and Discussions

Data concerning the total length of the analyzed cuttings are presented in Table 1. It appears that cultivars ‘Branfortune’ are most vigorous cuttings, with 4.46 cm, the difference was significant compared to the control.

Regarding the influence of different substrates on the rooting process can conclude that in this case the best substrate was the first (Klassman peat+perlite). The achieved difference was very significant comparing with the control of experiment (Table 2).

Table 1

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Length of cuttings</th>
<th>±D (cm)</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute (cm)</td>
<td>Relative (%)</td>
<td></td>
</tr>
<tr>
<td>Branmaya</td>
<td>3,93</td>
<td>94,7</td>
<td>-0,22</td>
</tr>
<tr>
<td>Branfortune</td>
<td>4,46</td>
<td>107,2</td>
<td>0,30</td>
</tr>
<tr>
<td>Branroyal</td>
<td>4,09</td>
<td>98,4</td>
<td>-0,07</td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>4,16</td>
<td>100,0</td>
<td>0,00</td>
</tr>
</tbody>
</table>

The results concerning the unilateral influence of cultivars on the diameter of leaves rosette, at the studied Chrysanthemum cuttings are presented in Table 3. Data shows that Branmaya achieved a positive
distinct significant difference of 4.05 cm. Branfortune and Branroyal present negative differences.

Table 2

<table>
<thead>
<tr>
<th>Rooting substrate</th>
<th>Length of cuttings</th>
<th>±D (cm)</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klassman peat-perlite</td>
<td>4.41</td>
<td>0.26</td>
<td>***</td>
</tr>
<tr>
<td>Klassman peat+Osmocote</td>
<td>4.05</td>
<td>-0.1</td>
<td>-</td>
</tr>
<tr>
<td>Klassman peat+NPK</td>
<td>4.01</td>
<td>-0.1</td>
<td>-</td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>4.15</td>
<td>0.00</td>
<td>-</td>
</tr>
</tbody>
</table>

 DL (p 5%) 0.12
 DL (p 1%) 0.17
 DL (p 0.1%) 0.24

Table 3

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Diameter of leaves rosette</th>
<th>±D (cm)</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branmaya</td>
<td>4.05</td>
<td>0.71</td>
<td>**</td>
</tr>
<tr>
<td>Branfortune</td>
<td>3.00</td>
<td>-0.34</td>
<td>oo</td>
</tr>
<tr>
<td>Branroyal</td>
<td>2.97</td>
<td>-0.37</td>
<td>oo</td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>3.34</td>
<td>0.00</td>
<td>-</td>
</tr>
</tbody>
</table>

 DL (p 5%) 0.26
 DL (p 1%) 0.59
 DL (p 0.1%) 0.80

Table 4

<table>
<thead>
<tr>
<th>Rooting substrate</th>
<th>Diameter of leaves rosette</th>
<th>±D (cm)</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klassman peat-perlite</td>
<td>3.25</td>
<td>-0.08</td>
<td>o</td>
</tr>
<tr>
<td>Klassman peat+Osmocote</td>
<td>3.33</td>
<td>0.00</td>
<td>*</td>
</tr>
<tr>
<td>Klassman peat+NPK</td>
<td>3.43</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>3.33</td>
<td>0.00</td>
<td>-</td>
</tr>
</tbody>
</table>

 DL (p 5%) 0.08
 DL (p 1%) 0.12
 DL (p 0.1%) 0.20

Table 5

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Number of leaves</th>
<th>±D</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branmaya</td>
<td>4.80</td>
<td>-0.76</td>
<td>oo</td>
</tr>
<tr>
<td>Branfortune</td>
<td>5.32</td>
<td>-0.24</td>
<td>-</td>
</tr>
<tr>
<td>Branroyal</td>
<td>6.58</td>
<td>1.02</td>
<td>**</td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>5.56</td>
<td>0.00</td>
<td>-</td>
</tr>
</tbody>
</table>

 DL (p 5%) 0.56
 DL (p 1%) 1.01
 DL (p 0.1%) 1.75

Regarding the influence of rooting substrate on the leaves number Chrysanthemum cuttings (Table 6), can conclude that no one substrate registered significant differences. However, the substrate
compound by Klassman peat+NPK realized positive differences, but not statistically assured.

In the Table 7 are presented data concerning the number of roots of *Chrysanthemum multiflorum* cuttings. Branfortune cultivar registered significant differences and exceed the control with 0.23 cm.

The unilateral influence of rooting substrate on the number of roots at the *Chrysanthemum* cuttings is presented in Table 8. Analyzing the results can conclude that the most significant differences were recorded at substrate Klassman peat+Osmocote. The obtained differences overtake the control with 1.22. The difference was distinct significant and statistically assured.

Table 6

<table>
<thead>
<tr>
<th>Rooting substrate</th>
<th>Leaves number</th>
<th>±D</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute</td>
<td>Relative (%)</td>
<td></td>
</tr>
<tr>
<td>Klassman peat+perlite</td>
<td>5,47</td>
<td>98,3</td>
<td>-0,09</td>
</tr>
<tr>
<td>Klassman peat+Osmocote</td>
<td>5,55</td>
<td>99,8</td>
<td>-0,01</td>
</tr>
<tr>
<td>Klassman peat+NPK</td>
<td>5,68</td>
<td>102,1</td>
<td>0,12</td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>5,56</td>
<td>100,0</td>
<td>0,00</td>
</tr>
<tr>
<td>DL (p 5%)</td>
<td>0,15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 1%)</td>
<td>0,20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 0.1%)</td>
<td>0,28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7

Statistical data concerning the number of roots of *Chrysanthemum multiflorum* cuttings

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Number of roots</th>
<th>±D</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute</td>
<td>Relative (%)</td>
<td></td>
</tr>
<tr>
<td>Branmaya</td>
<td>6,75</td>
<td>98,5</td>
<td>-0,33</td>
</tr>
<tr>
<td>Branfortune</td>
<td>7,08</td>
<td>103,3</td>
<td>0,23</td>
</tr>
<tr>
<td>Branroyal</td>
<td>6,72</td>
<td>98,1</td>
<td>-0,13</td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>6,85</td>
<td>100,0</td>
<td>0,00</td>
</tr>
<tr>
<td>DL (p 5%)</td>
<td>0,12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 1%)</td>
<td>0,27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 0.1%)</td>
<td>0,86</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 8

Unilateral influence of rooting substrate on the number of roots at the *Chrysanthemum* cuttings

<table>
<thead>
<tr>
<th>Rooting substrate</th>
<th>Number of roots</th>
<th>±D</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute</td>
<td>Relative (%)</td>
<td></td>
</tr>
<tr>
<td>Klassman peat+perlite</td>
<td>6,42</td>
<td>93,7</td>
<td>-0,43</td>
</tr>
<tr>
<td>Klassman peat+Osmocote</td>
<td>8,07</td>
<td>117,8</td>
<td>1,22</td>
</tr>
<tr>
<td>Klassman peat+NPK</td>
<td>6,07</td>
<td>88,6</td>
<td>-0,78</td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>6,85</td>
<td>100,0</td>
<td>0,00</td>
</tr>
<tr>
<td>DL (p 5%)</td>
<td>0,65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 1%)</td>
<td>1,02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 0.1%)</td>
<td>1,61</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Regarding the influence of cultivars on the root length at *Chrysanthemum* cuttings it remarks that distinct significant differences were recorded in case of cultivars Branmaya and Branfortune (Table 9). The obtained differences were between 0.43-0.45 cm.

In the case of the influence of substrate on the roots length at *Chrysanthemum* cuttings, can conclude that distinct significant differences were recorded at Klassman peat+NPK (Table 10). However the substrate consists in Klassman peat+perlite registered positive differences, but not statistically assured.
The influence of cultivars on the root length, at the *Chrysanthemum* cuttings

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Root length</th>
<th>±D (cm)</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute (cm)</td>
<td>Relative (%)</td>
<td></td>
</tr>
<tr>
<td>Branmaya</td>
<td>8.75</td>
<td>105.4</td>
<td>0.45 **</td>
</tr>
<tr>
<td>Branfortune</td>
<td>8.73</td>
<td>105.1</td>
<td>0.43 **</td>
</tr>
<tr>
<td>Branyroal</td>
<td>7.43</td>
<td>89.5</td>
<td>-0.87 oo</td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>8.30</td>
<td>100.0</td>
<td>0.00 -</td>
</tr>
<tr>
<td>DL (p 5%)</td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 1%)</td>
<td>0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 0.1%)</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The influence of substrate on roots length at *Chrysanthemum* cuttings

<table>
<thead>
<tr>
<th>Rooting substrate</th>
<th>Roots length</th>
<th>±D (cm)</th>
<th>Signification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute (cm)</td>
<td>Relative (%)</td>
<td></td>
</tr>
<tr>
<td>Klassman peat+perlite</td>
<td>8.35</td>
<td>100.6</td>
<td>0.05 -</td>
</tr>
<tr>
<td>Klassman peat+Osmocote</td>
<td>8.08</td>
<td>97.3</td>
<td>-0.22 oo</td>
</tr>
<tr>
<td>Klassman peat+NPK</td>
<td>8.48</td>
<td>102.1</td>
<td>0.18 **</td>
</tr>
<tr>
<td>Average of experiment (C)</td>
<td>8.30</td>
<td>100.0</td>
<td>0.00 -</td>
</tr>
<tr>
<td>DL (p 5%)</td>
<td>0.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 1%)</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL (p 0.1%)</td>
<td>0.24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusions

Analyzing the obtained results from researches with *Chrysanthemum* cuttings using different varieties and rooting substrates results the following conclusions:

1. Analyzing the total length of cutting we can observe that the higher cutting of 4.46 cm was Branfortune which recorded a difference of 0.30 cm being significant compared with the control.

2. Very significant differences were registered under the influence of Klassman peat+perlite in case of length of cuttings.

3. Concerning the diameter of leaves rosette, can conclude that Branmaya cultivar registered a significant difference of 0.71 cm. The best substrate in this case was Klassman peat+NPK.

4. It was studied the influence of cultivars on the number of leaves at *Chrysanthemum* cuttings. The results show that Branyroal achieved a positive difference of 0.58, being distinct significant comparing with the control.

5. Regarding the influence of substrate on the number of leaves can conclude that the substrate consists in Klassman peat+NPK overtakes the control with a positive difference of 0.12.

6. Concerning the influence of cultivars on the number of roots it remarks Branfortune with a significant difference of 0.23. Analyzing the influence of substrate on this character can conclude that distinct significant differences were recorded at the substrate composed by Klassmann peat + Osmocote.

7. In the case of the influence of cultivars on the length of roots at *Chrysanthemum* cuttings, can conclude that distinct significant differences were registered at Branmaya and Branfortune.

The best substrate in this case was Klassman peat+NPK which achieved a distinct significant difference of 0.18 cm.

References


