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The behavior of some new chrysanthemum cultivars (*Chrysanthemum indicum* L.) cultivated in pots, in greenhouse conditions

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Abstract Being one of the most important species cultivated for autumn decoration, chrysanthemums are grown for cut flowers, gardens decoration and as pot plants. They can be grown by applying different technologies, depending of the cultivar, season, purpose and many more. Recently, as the needs of the market for chrysanthemums cultivated in pots has increased, we considered necessary to do the present research in order to observe the behavior of some cultivars destined for pot cultivation. The results have shown great differences between them regarding the phenology aspects, plant height, sprouting capacity and diameter of the flowers. It remains to the future to promote the cultivation of chrysanthemums as pot plants more often as the market needs are increasing and the number of cultivars created for this purpose grows continuously.

Keywords:

chrysanthemum, pots, technology, phenology

Chrysanthemum holds an important place in autumn flowers assortment cultivated in the opened due to the peculiar ornamental attributes and of the biotechnological property that permits the appliance of different cultural technologies (1). Of this reason, chrysanthemums can be cultivated in opened or closed areas as cut flowers, pot plants-they can be tended in cascades or even bonsai.

A short history of the cultivation of the species is that chrysanthemums are grown of over 2500 years in China. From China, they grasp in Japan where the species become the national emblem of the imperial. In Europe, they are first brought in England from Japan in 1861. It is appreciated that in our days, the cultivation of chrysanthemums is done on over 600 ha in Holland and Colombia, 200 ha in United Kingdom and 100 ha in France.

Regarding the technologies that are used in cultivating chrysanthemums, in our country two of them are wide used: the classic and the modern technology (3). As the modern technology has more steps and supposes high expenses to obtain high quality flowers it is less used than the classic one. In the classic technology the flowers are harvested in October-November (2).

In pots, the chrysanthemums can be grown for cut flowers or as pot plants. As pot plants, they need special care like pinching off the sprouts 4-5 times so that the plant gets the shape of a bush. Each of the sprouts will have 10-15 floral buds, even more in the case of some cultivars [(4),(5)].

Material and Method

In the present paper, four cultivars grown in pots, in greenhouse, have been researched: Branmaya cv., Branfortune cv., Branice cv. and Branstorm cv. The experience took place in 2008 and 2009 and the followed aspects were: plant's height, sprouting capacity, flowers dimension and the phenology of flowering. The measurements for plants height were made once a month during three months: August, September and October and for the other researched aspects in October each year. The treatment of the results was done by using the variant analysis, and the control was represented by the average of the four cultivars.

Results and Discussions

1.Results regarding the phenology of flowering in the two years of research (table 1)

Regarding the phenology of flowering in 2008 and 2009 it can be seen in Table 1 that in the first year of research Branstorm cv. was the first cultivar that has flowered and the latest was Branice cv. The longest flowering period was noticed by Branstorm cv. (56 days) and the shortest by Branice cv. (49 days).

Table 1

The phenology of flowering of the Chrysanthemum cultivars

Year 2008		
Cultivar	***Beginning of flowering***	***End of flowering***
'Branmaya'	**15.IX.2008**	**05.XI.2008**
'Branfortune'	**05.IX.2008**	**28.XI.2008**
'Branice'	**25.IX.2008**	**13.XI.2008**
'Branstorm'	**20.IX.2008**	**15.XI.2008**
Year 2009		
'Branmaya'	**13.IX.2009**	**03.XI.2009**
'Branfortune'	**02.IX.2009**	**14.XI.2009**
'Branice'	**22.IX.2009**	**25.XI.2009**
'Branstorm'	**17.IX.2009**	**13.XI.2009**

2.Results regarding plants height in 2008 and 2009

Table 2

Plant's height (cm) in 2008

YEAR 2008				
VARIANT	**AVERAGE**	**%**	**DIFFERENCE**	**SIGNIFICANCE**
AUGUST				
'Branmaya'	***17.53***	***102.92***	***0.5***	**-**
'Branfortune'	***17.08***	***100.28***	***0.05***	**-**
'Branice'	***17.13***	***100.57***	***0.1***	**-**
'Branstorm'	***16.38***	***96.17***	***-0.65***	**-**
Average	***17.03***	***100***	***0***	***control***
DL 5% - 1.09		***DL 1% - 1.53***		***DL 0.1% - 2.16***
SEPTEMBER				
'Branmaya'	***19.65***	***102.72***	***0.52***	**-**
'Branfortune'	***18.11***	***94.68***	***-1.02***	***o***
'Branice'	***21.3***	***111.34***	***2.17***	***xxx***
'Branstorm'	***17.46***	***91.28***	***-1.67***	***ooo***
Average	***19.13***	***100***	***0***	***control***
DL 5% - 0.79		***Dl 1% - 1.11***		***DL 0.1% - 1.57***
OCTOBER				
'Branmaya'	***27.48***	***96.08***	***-1.12***	***ooo***
'Branfortune'	***28.02***	***97.97***	***-0.58***	***oo***
'Branice'	***25.16***	***87.97***	***-3.44***	***ooo***
'Branstorm'	***31.4***	***109.79***	***2.8***	***xxx***
Average	***28.03***	***100***	***0***	***control***
DL 5% - 0.38		***DL 1% - 0.53***		***DL 0.1% - 0.74***

In August 2008 the average height of the cultivars was 17.03 cm, to which none of the cultivars has shown any difference.

In September, the best results were given by Branice cv., which was very significant positive to the average of 19.13 cm. The weakest results were observed in the case of Branstorm cv., which was very significant negative to the control.

In October, though it had the weakest results in terms of plant height the month before, Branstorm cv. was very significant positive to the control while the other cultivars were al negative to the average of the experience.

In 2009, the results were different than the year before. In August, the best results regarding the plant height, were noticed in the case of Branice cv., which has shown positive differences to the control, as the other researched cultivars were negative.

In September, Branice cv. was, again, positive to the average of the experience while Branstorm cv. was negative to the control. The other two cultivars didn't show any differences to the average of the experience.

In October, the highest plants were the ones belonging to Branstorm cv. (32cm) which has shown significant differences positive to the control, and the weakest results were given by Branice cv. which was distinct significant negative to the average of the experience.

Table 3

Plant's height (cm) in 2009

YEAR 2009				
VARIANT	**AVERAGE**	**%**	**DIFFERENCE**	**SIGNIFICANCE**
AUGUST				
'Branmaya'	***19.08***	***100.29***	***0.06***	**-**
'Branfortune'	***18.03***	***94.77***	***-1***	***o***
'Branice'	***21.36***	***112.32***	***2.34***	***xxx***
'Branstorm'	***17.61***	***92.6***	***-1.41***	***oo***
Average	***19.02***	***100***	***0***	***control***
DL 5% - 0.85	***DL 1% - 1.2***	***DL 0.1% - 1.69***		
SEPTEMBER				
'Branmaya'	***22.23***	***102.91***	***0.63***	**-**
'Branfortune'	***20.96***	***97.06***	***-0.64***	**-**
'Branice'	***23.16***	***107.25***	***1.57***	***xx***
'Branstorm'	***20.04***	***92.78***	***-1.56***	***oo***
Average	***21.6***	***100***	**-**	***control***
DL 5% - 0.81	***DL 1% - 1.13***	***DL 0.1% - 1.6***		
OCTOBER				
'Branmaya'	***28.35***	***99.2***	***-0.23***	**-**
'Branfortune'	***29.35***	***102.69***	***0.77***	**-**
'Branice'	***24.65***	***86.25***	***-3.93***	***00***
'Branstorm'	***32***	***111.97***	***3.42***	***x***
Average	***28.58***	***100***	***0***	***control***
DL 5% - 2.54	***DL 1% - 3.7***	***DL 0.1% - 5.54***		

3.Results regarding the sprouting capacity of the chrysanthemum cultivars used in the experience in 2008 and 2009

Table 4

The sprouting capacity of the cultivars in the two years of research

YEAR 2008				
VARIANT	**AVERAGE**	**%**	**DIFFERENCE**	**SIGNIFICANCE**
October				
'Branmaya'	***3.8***	***104.68***	***0.17***	**-**
'Branfortune'	***3.3***	***90.91***	***-0.33***	**-**
'Branice'	***3.2***	***88.15***	***-0.43***	**-**
'Branstorm'	***4.25***	***117.08***	***0.62***	***x***
Average	***3.63***	***100***	***0***	***control***
DL 5% - 0.56	***DL 1% - 0.78***	***DL 0.1% - 1.08***		
YEAR 2009				
October				
'Branmaya'	***4***	***115.94***	***0.55***	***x***
'Branfortune'	***2.5***	***72.46***	***-0.95***	***oo***
'Branice'	***3***	***86.96***	***-0.45***	**-**
'Branstorm'	***4.3***	***124.64***	***0.85***	***xx***
Average	***3.45***	***100***	***0***	***control***
DL 5% - 0.53	***DL 1% - 0.77***	***DL 0.1% - 1.16***		

Regarding the sprouting capacity of the Chrysanthemum cultivars, it can be observed in table 4 that in 2008 the average number of sprouts on plant was 3.63 to which, cultivar Branstorm cv was significant positive. The other cultivars didn't show any difference to the control.

In 2009, the average number of sprouts on plant had lower values than the year before – 3.45, to which, cultivars Branstorm cv. and Branmaya cv. were positive and cultivar Branfortune cv. was negative.

4.Results regarding the diameter of the flowers in the two years of research.

Table 5

The diameter of the flowers (cm) in the two years of research

YEAR 2008				
VARIANT	**AVERAGE**	**%**	**DIFFERENCE**	**SIGNIFICANCE**
October				
'Branmaya'	***4.01***	***102.1***	***0.08***	***-***
'Branfortune'	***4.16***	***105.92***	***0.23***	***x***
'Branice'	***3.55***	***90.33***	***-0.38***	***oo***
'Branstorm'	***3.99***	***101.46***	***0.06***	***-***
Average	***3.93***	***100***	***0***	***control***
DL 5% - 0.22	***DL 1% - 0.31***		***DL 0.1% - 0.44***	
YEAR 2009				
October				
'Branmaya'	***4.15***	***78.3***	***-1.15***	***ooo***
'Branfortune'	***4.25***	***80.19***	***-1.05***	***ooo***
'Branice'	***3.8***	***71.7***	***-1.5***	***ooo***
'Branstorm'	***5***	***94.34***	***0.3***	***x***
Average	***4.3***	***100***	***0***	***control***
DL 5% - 0.25	***DL 1% - 0.35***		***DL 0.1% - 0.49***	

Concerning the diameter of the flowers in 2008, the average of the experience was 3.93, to which Branfortune cv. was significant positive and Branice cv. was distinct significant negative. The other two cultivars didn't show any difference to the control.

In 2009, except Branstorm cv. that was significant positive to the control, all the rest of the cultivars had negative differences to the average of the experience.

Conclusions

Regarding the results of the present research, we can conclude:

- The first cultivar that flowered in 2008 and 2009 was Branfortune cv. and the latest was Branice cv.;
- The longest flowering period in both years of research was registred by Branfortune cv., 56 days in 2008 and 58 days in 2009;
- In October 2008, the plant height had the greatest values in the case of Branstorm cv. (31.4cm) and in October 2009 the highest plants were formed by the same cultivar as the year before (32cm);
- The sprouting capacity of the cultivars had the highest values in both years in case of Branstorm cv.;
- In 2008 the biggest diameter of the flowers was noticed by Branfortune cv. (4.16cm) while in 2009 the highest values of the same index were noticed by Branstorm cv. (5cm).

As the results of the present research were mostly very tight, we recommend taking into culture all the cultivars that were researched but a special attention has to be given to those that had the best results for each of the followed indexes.

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