EVALUATION OF POTENTIAL BIOLOGICAL AND MORPHOLOGICAL TO SOME *CHRYSANTHEMUM X HORTORUM* Bailey. VARIETIES IN SOLARIUM

EVALUAREA POTENŢIALULUI BIOLOGIC ŞI MORFOLOGIC LA UNELE SOIURI DE *CRYSANTHEMUM X HORTORUM* BAILEY. ÎN SOLAR

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Abstract. *China and Japan over 5,000 years, favourite flowers are roses and chrysanthemums. Chrysanthemums are an important crop in the world flower assortment and our country. Special qualities of this flower are: beauty, great range of shapes and colors, keeping the water resistance of cut flowers, malleability in terms of culture system, the possibility of cultivation throughout the year. All these qualities determine the extensive use of Chrysanthemums. In special protected areas, which can create certain environmental conditions the chrysanthemums can be grown throughout the year, enriching the assortment of flowers in all seasons. Due to these reasons experiments were carried out for 2 years (2008-2009) in the solarium, in a private firm from Cluj County. The studies were performed on 5th of Chrysanthemum varieties type Turner, referring to the main morpho-decorative characteristics. All data obtained were interpreted statistically by calculating the average and the significance of differences was tested using the test version "Duncan."*

Key words: characteristics, cultivars, type Turner, observations

Rezumat. *În China şi Japonia, de peste 5000 de ani, florile favorite sunt trandafirul şi crizantema. Crizantemele reprezintă o cultură importantă în sortimentul floricol mondial şi din ţara noastră. Calităţile deosebite ale acestei flori constau în: frumuseţe, gamă deosebită de forme şi culori, rezistenţă la păstrare în apă a florilor tăiate, maleabilitatea în ceea ce priveşte sistemul de cultură, posibilitatea cultivării în tot timpul anului. Toate aceste calităţi determină o largă utilizare a crizantemelor. În spaţii protejate, unde se pot crea anumite condiţii de mediu, crizantema se poate cultiva în tot timpul anului, îmbogăţind sortimentul de flori din toate anotimpurile. Datorită acestor considerente experimentările s-au efectuat timp de 2 ani (2008-2009) în solar, in cadrul unei ferme private din judeţul Cluj. Studiile s-au efectuat asupra a 5 soiuri de crizanteme tip Turner, referindu-se la principalele caracteristici morfo-decorative. Toate datele obţinute au fost interpretate statistic, calculându-se media şi s-a testat semnificaţia diferenţelor dintre variante cu ajutorul testului "Duncan".*

Cuvinte cheie: caracteristici, soiuri, tip Turner, observaţii

INTRODUCTION

Chrysanthemums are second only to roses in length of time used as ornamental plants. Their written history extends back almost 3,000 years, with references to them appearing in the writings of Confucius (Vidrascu and Teodorescu, 1993).

Chrysanthemum x hortorum, often called mums or chrysanths, are a genus (*Chrysanthemum*) of about 30 species of perennial flowering plants in the family Asteraceae, native to Asia and northeastern Europe.

Chrysanthemums were first cultivated in China as a flowering herb as far back as the 15th century BC. (http://www.mums.org.). An ancient Chinese city was named Ju-Xian, meaning "chrysanthemum city". The plant is particularly significant during the Double Ninth Festival. The flower was introduced into Japan probably in the 8th century AD, and the Emperor adopted the flower as his official seal. There is a "Festival of Happiness" in Japan that celebrates the flower (http://en.wikipedia.org).

The flower was brought to Europe in the 17th century. They were introduced to Europe in about 1688 and to England in 1764 but their history in North America extend back less than 200 years. Linnaeus named it from the Greek word *chrysous* - golden (the colour of the original flowers), and *anthemon*, meaning flower. In 1789 a French navigator, who came from the Far East China, has a collection of chrysanthemums which gave Paris Museum of Natural Sciences. In 1875 it established Chrysanthemum French Company that operates today. Thereafter concerns appear first finding of this flower growing technologies in Europe ecoclimatic conditions. We can say, based on numerous written testimonies that in 1829 it was known throughout the cone chrysanthemum the European continent. In 1842, China brought new types of chrysanthemums, which led to increasing interest in this flower, Chrysanthemum culture since that time to the attention of specialists from the main centers of Europe. In 1842, China brought new types of chrysanthemums, which led to increasing interest in this flower, culture chrysanthemum since that time, to the attention of specialists from the main centers of Europe.

In Romania for the first were mentioned in 1750 under the name “margareta de toamna”. The first imports were made in Bucharest before the 1st world war.

The flowers are good cut flowers as well. Modern chrysanthemums are much showier than their wild relatives. The flowers occur in various forms, and can be daisy-like, decorative, pompons or buttons. This 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. Yellow or white chrysanthemum flowers are boiled to make a sweet drink in some parts of Asia. The resulting beverage is known simply as "chrysanthemum tea". Chrysanthemum tea has many medicinal uses, including an aid in recovery from influenza. In Korea, a rice wine flavored with chrysanthemum flowers is called *gukhwaju*.

Chrysanthemum leaves are steamed or boiled and used as greens, especially in Chinese cuisine. Other uses include using the petals of chrysanthemum to mix with a thick snake meat soup in order to enhance the aroma. Chrysanthemum plants have been shown to reduce indoor air pollution by the NASA Clean Air Study (Wolverton B.C, Rebecca C. McDonald, and E. A. Watkins, Jr. 2006). Extracts of Chrysanthemum plants (stem and flower) have been shown to have a wide variety of potential

medicinal properties, including anti - HIV-1 (Collins et al., 1997), antibacterial (Sassi et al., 2008) and antimycotic (Marongiu et al., 2009). In the world Chrysanthemums are different cultural significance and symbolism. Thus in some countries of Europe (e.g., France, Italy, Poland, Croatia), white chrysanthemums are symbolic of death and are only used for funerals or on graves - similarly, in China, Japan and Korea, white chrysanthemums are symbolic of lamentation and/or grief. In some other countries, it represents honesty. In the United States, the flower is usually regarded as positive and cheerful.

MATERIAL AND METHOD

The subjects of the research in our experimental field at the solarium from a private firm named SC Flox / Art, close to Cluj-Napoca (Fig 1.), during 2009 periods were the study of **5** new *Chrysanthemum* cultivars, belong to Turner type: 'White Snowdon', 'Escort', 'Robiam', 'Regan Sundi' and 'Escapade'. We used rooting cuttings, 60 plants /variant in 3 randomizing variants, total 300 plants. The moon plants were bought from Holland.

The biological materials were planted in the solarium in July 5-12, 2009, and then where applied the culture technology specific of chrysanthemums. So after preparing the soil, beds were marked with a width of 120 cm and 40-50 cm path between them (Cantor and Pop, 2008). In order to support plants a support system was installed that was provided with four levels of nets (fig. 1). For planting rooted cuttings were used which had 3 to 4 leaves and roots 5-6 cm long. Planting was done manually in pits. After planting a watering was done for promote better rooting. During the growing season were made more watering according to season and in relation to other environmental factors. To achieve soil loosening and keep clean of weeds culture were performed three weeding. When plants have grown we make fertilization with Polyfeed 1% concentration and nitrogen. A new fertilization was performed in three weeks with complex III, the relationship between elements being 1:2:1.5. During the growing season were applied to specific works of the plant: pinching tip growth; choosing flower stems and remove the lateral flower buds.

Fig.1. Experimental field of *Chrysanthemum* cultivars

These entire cultivars were monitoring and investigated in solarium conditions, for the main morpho-decorative characteristics: blooming time, colour of flowers, plant height, and circumference of plant, number of stems, number of flower, flower diameters and number of ligules. The observations were made for 60 plants from each cultivars and were calculated the average. All data were statistically interpreted for each character, were calculated by statistical analysis methods average - M, standard deviation - s and coefficient of variability - s% to determine the variety and variability of

the character stability in subsequent generations and test significance of differences between the test versions using Duncan (Ardeleanu et al., 2002).

RESULTS AND DISCUSSIONS

The observations and the measurements achieved concerning the main morphological characteristics of new 5 cultivars *Chrysanthemum x hortorum* type Turner studied at the experimental field in a solarium are presented in the following tables (1-6). Analyzing the tables, we can conclude the following:

The *Chrysanthemum* cultivars presented a large variety of color for the flowers. The cultivars investigated are monocolour, such as: 'White Snowdon' - white, 'Robiam' - yellow, 'Escapade' – pink, 'Escort' – red and 'Coniac' – orange - cognac. Concerning the vigor of the plants, we can show the different height between the cultivars of *Chrysanthemum* and also between the diameters of flowers. All of the Chrysanthemum cultivars had over 100 cm height of the plant, the cultivar 'Robiam' is the highest (119.6 cm), while 'White Snowdon' had only 100.8 cm. We can observe that between the height of plant and floral stem it is a positive correlation, generally the cultivar vigor had also a longer stem. The coefficient of variability is values less than 10% for the characteristics height and floral stem length which indicate high stability of varieties for this character.

The diameter of the flower also differs as a function of varieties, thus have between 10.3 cm ('Robian' and 'Coniac') and 13.4 cm ('White Snowdon'). The coefficient o variability denote a medium stability for this character, the value are situated between 10-20%. Coefficient of variability that has values less than 10%, indicating high stability of varieties. The difference between any two alternatives is not significant if those options are followed by the same letter or letters.

Table 1

Coefficient of variability of the main characteristics of *Chrysanthemum* varieties

Cultivars	Color of flowers	Coef. of variab.	Height of plant (cm)	Floral stem length (cm)	Diameter of flower (cm)
Escapade	Roz	M	108,8	97,40	10,40
		S	3,97	4,44	2,07
		S%	3,66	4,57	19,94
Robiam	Galben	M	119,6	117,0	10,30
		S	3,81	3,81	1,34
		S%	3,17	3,25	12,66
White Snowdon	Alb	M	100,8	96,3	13,40
		S	7,62	9,16	2,41
		S%	6,63	8,8	17,97
Coniac	Oranj	M	111,8	106,8	10,30
		S	4,67	10,23	1,34
		S%	4,43	9,58	12,66
Escort	Rosu	M	110,0	106,9	11,50
		S	9,45	10,22	1,41
		S%	8,54	9,52	12,86

Table 2

Summary of experimental results including the differences between variants and their significance.
The average height of Turner plants

Variants	Height average (cm)	Variants and height (cm)			
		4	**5**	**1**	**3**
		111,8	110,0	108,8	100,8
2	Robiam	7,8*	9,6*	10,8*	18,8*
4	Coniac	---	1,8*	3*	11*
5	Escort		---	1,2*	9,2*
1	Escapade			---	8*
3	White Snowdon				---

Table 3

Summary tables

Variants	Cultivars	Height average of plant (cm)	Signification of results
2	Robiam	119,6	a
4	Coniac	111,8	b
5	Escort	110,0	b
1	Escapade	108,8	b
3	White Snowdon	100,8	c

Table 4

Nr. var.	Cultivars	Length of floral stem (cm)	Signification of results
2	Robiam	117.0	a
5	Escort	106.8	b
4	Coniac	106.9	b
1	Escapade	97.4	c
3	White Snowdon	96.3	c

Table 5

Nr. var.	Cultivars	Diameter of flower (cm)	Signification of results
2	White Snowdon	13.4	a
4	Escort	11.5	b
5	Escapade	10.4	c
1	Robian	10.3	c
3	Coniac	10.2	c

Table 6

Synthesis of experimental results (Duncan test) at *Chrysanthemum x hortorum,* type Turner

Cultivars	Studied characters		
	Height of plant (cm)	Length of floral stem (cm)	Diameter of flower (cm)
White Snowdon	$100,8^{c}$	$96,3^{c}$	$13,4^{a}$
Robiam	$119,6^{a}$	$117,0^{a}$	$10,3^{c}$
Escapade	$108,8^{b}$	$97,4^{c}$	$10,4^{c}$
Coniac	$111,8^{b}$	$106,9^{b}$	$10,2^{c}$
Escort	$110,0^{b}$	$106,8^{b}$	$11,5^{b}$
DS 5%	4,63 – 5,06	5,5 – 5,95	0,88 – 0,95

Note: Different letters between cultivars denote significant differences (Duncan test, $p < 0.05$).

Analyzing the table 6 we can conclude that between 'Escapade', 'Coniac' and 'Escort' is not difference concerning the height of plant. The length of plants depend of cultivars, 'Robian' had the bigger stem. Diameter of flower is around 10 cm for 'Robiam', 'Escapade' and 'Coniac' and bigger for 'White Snowdon' and 'Escort'.

CONCLUSIONS

The floral collection of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Department of Floriculture was enriched with some new cultivars of *Chrysanthemum x hortorum* Turner type, which have been not cultivated by now in Romania.

The knowledge of the morphology and biology of the new cultivars is very important because those can be recommended for new varieties that will be adequate to the Romanian local conditions.

The analyzed cultivars in the experimental field have a great diversity of morphological characteristics. The studies of their characteristic behavior under the solarium conditions have an essential role concerning the ornamental value of some cultivars belonging to this specie.

These varieties can be special as cut flowers ('Robiam', 'White Snowdon' şi 'Escapade') for any occasions or make beautiful in the vase, most of them have a very unique color, and are recommended for shows and excellent commercial culture.

The results will be also used by a large number of commercial growers which will be able to obtain substantial profits from this research activity (using new varieties for cut flowers).

The students of U.S.A.M.V. Cluj-Napoca can be using the researches obtained for their graduate thesis. The most representative varieties can also be used in our future breeding program as genitors for hybrid combinations in order to obtain new hybrids.

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