

THE IMPROVEMENT OF *ANTHURIUM ANDREANUM* ASSORTMENT WITH VARIETIES CULTIVATED IN POTS

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Abstract. *Anthurium andreanum* Lind. is an ornamental plant that is widely appreciated around the world primarily for cut flower and secondary as a perennial plant growing in pots. In recent years acquired an important place in the collections of ornamental plant cultivars in our country due to the large number of varieties occur worldwide, varieties of very many forms and colors and are well adapted to our flats. In recent years enrichment assortment with new varieties and hybrids of ornamental plants is a constant activity for the promotion and marketing innovations in order to obtain high income. This paper presents the behavior of six new cultivars of *Anthurium andreanum* which is suitable as pot plant, cultivars were imported from Holland and were studied in 2017, at the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Of these varieties were made observations and measurements on the main morphological traits: flower stalk length and leaf length, number of leaves, spathe breadth, length of spathe, and number of flowers per plant. Data were processed using statistical calculation by analysis of variance, LSD test and also, were analyzed the coefficients of variability. Significant differences among cultivars were noted for all characteristics evaluated. Cultivar 'Baleno' had the highest average number of flowers and 'Alpine' recorded significant deviations above average on most of the characters experience. Through present studies it is noticed that these cultivars can be used as pots plants because of them attractive flowers and foliage.

Keywords: *Anthurium andreanum*, cultivars, houseplant, morphological characteristics

INTRODUCTION

In the last decades due to the existence of a wide range of ornamental plants and the knowledge of cultivation technology, indoor plants became the most widespread passions. In any home the family environment is warmer, more agreeable and more restful with plants (Toma, 2009). *Anthurium andraeanum*, commonly called flamingo lily or painter's palette, is native to Columbia and Ecuador. It is an epiphytic evergreen tropical perennial of the Araceae family that is most noted for its attractive waxy, palette-shaped, bright red spathes and contrasting dark green foliage (12).

In the past this plant was particularly known as a cut flower, but in recent years it is increasingly appreciated as a potted plant due to the special elegance, to the contrast between the dark color of the leaves and the brightly color of the flowers and the large number hybrids appeared on world, hybrids that have many shapes and colors which can be grown in apartments (Anton *et al.*, 2007). *Anthurium* ranks ninth in the global flower trade and commands a respectable price both for its cut flower and whole plant (Islam *et al.*, 2013).

In Romania the *Anthurium andreanum* soil cultivation was practiced until 1989 at the Research Station for Fruit Production Cluj and then it was abandoned because of the high heating costs. Also, researches have been carried out until 1990 at the Research Institute for Floriculture at the Berceni laboratory Bucharest (Cantor, 2017). *Anthurium* develops well in rooms with eastern or southern spaces, with full light. A weak light will have the effect of reducing the number of flowers or the absence of flowering; as well can induce the leaves deformation.

The genus name is originated from Greek "anthos" which means flower and "oura" - tail and refers to the shape of inflorescence which is called spadix, accompanied by a large and convex, rich colored spathe. This initially protects cylindrical spadices, and then is running to exhibit the beauty of inflorescence (Şelaru, 2002). Anthurium genera have tropical distribution; it is originated from North America, more exactly mountain areas of Costa Rica, Panama, Brazil, and Colombia. Commercial crops have been established in recent years worldwide, but the largest producers are the United States of America (mainly Florida) and The Netherlands (Băla, 2012). The Anthurium genus includes about 300 species according Toma (2009) and more than 600 species cited by Anton *et al.* (2007), which are distinguished by the special beauty of the inflorescences (*A. andreanum*, *A. scherzerianum*) or by the richness and elegance of the leaves (*A. cristalinum*, *A. coriaceum*). In the current paper the researches were focused on the *A. andreanum* species as pot plant, which become an important crop worldwide, due to the appearance of small varieties by breeding activities characterized by many flowers and opportunity for potted culture.

Considering the importance of this flower crop, the researchers are focused on the behavior of some *A. andreanum* varieties. Based on the observations and measurement realized on the morphological traits of Anthurium, the best varieties can be promote on Romanian market as indoor pot plants.

MATERIALS AND METHODS

The present experiment was conducted during 2017 in a greenhouse which is belonging to the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca (UASVM). The biological material was provided from a Dutch company and consist in six *Anthurium andreanum* cultivate varieties as pot plants: `Alpine`, `Absolut`, `Baleno`, `Alabama`, `Cherry Champion` and `Otazu` (Fig. 1). The experimental design was standard for horticultural experiments (Randomized Complete Block Design method) with three replicates. Concerning this, each experimental variant was represented by one variety. At each experimental variant were studied five plants, that means 15 plants per variety, resulting a total of 90 pot plants for the whole experiment. During the development of plants, maintenance work was applied to the *Anthurium* pot culture, with particular attention on the diseases and pests control. Measurements and observations were made on the main morpho-decorative charactersitics of the *Anthurium* varieties: flower stalk length and leaf length, number of leaves, spathe breadth, length of spathe, and number of flowers per plant.

The obtained data were interpreted statistically using the variant analysis method (LSD test) and coefficients of variation (Ardelean *et al.*, 2007).



Fig. 1. Biological material

RESULTS AND DISCUSSIONS

Some morphological traits were analyzed like flower stalk length, number of leaves, leaves length, spathe breadth, spathe length and number of flowers per plants. Analyzing the Table 1 it can be seen that data concerning the flower stalk length reveals a great diversity of this trait within the studied varieties. The differences are significant positive or negative, in four cases out of the six studied varieties. Depending on the length of the flower stalk, `Alpine` variety (35.67 cm) with very significant positive differences was noted. At the opposite side were the following varieties `Absolute`, `Obtuz` and `Alabama` which recorded with the smallest length of the stalk, with very significant negative deviations from the average of the experience.

The coefficient of variation calculated for the flower stalk length in the analyzed varieties has relatively low values, all the analyzed cases being below 10 %. The average s% per experiment is 3.7% and the variation limits s% for the flower stalk length varied between 3.1 % (`Baleno`) and 4.6 % (`Absolute`).

Table 1.

Flower stalk length at *Anthurium andreaeanum* cultivars

Var. no.	Cultivar	Flower stalk Length (cm)	Relative value (%)	± Difference (cm)	Significance of difference	CV %
1	Alpine	35.67	189.4	16.83	xxx	3.2
2	Absolute	12.67	67.3	-6.17	ooo	4.6
3	Otazu	13.33	70.8	-5.50	ooo	4.3
4	Baleno	18.33	97.3	-0.50	-	3.1
5	Alabama	14.67	77.9	-4.17	ooo	3.9
6	Cherry Champion	18.33	97.3	-0.50	-	3.1
Average of experiment		18.83	100.0	-	-	3.7
LSD 5% 1.13; LSD 1% 1.57; LSD 0.1% 2.27						

Islam *et al.* (2013) showed the variation in different *Anthurium* varieties regarding to flower stalk length. Variety `Triticaca` had tallest flower stalk (40.5 cm), while shortest stalk (20.3 cm) was recorded in `Ivory`. Similar results recorded by Henny (1999) in cultivar `Red Hot`. All varieties differed significantly with respect to the number of leaves (Table 2). The highest number of leaves was recorded in the `Alpine` and `Baleno` varieties, with very significant positive differences. At the opposite side, the varieties `Otazu` and `Alabama` recorded distinctly significant differences, and the Absolute variety significantly negative.

The coefficients of variation calculated for the number of leaves in the studied varieties have relatively medium values; with three of the analyzed cases exceed 20 %. The mean s% per experiment was 18.4 % and the variation limits s% for the number of leaves varied between 12.4 % (`Baleno`) and 22.9 % (`Absolute`).

The leaves length had similar values in the studied varieties (Table 3), recording a great diversity of this trait between 13.67 cm (`Absolute`) and 19.67 cm (`Alabama`). Similar results were noticed at variety Esmeralda which produced maximum leaf length (18.49 cm) and minimum leaf length (12.74 cm) was recorded in variety `Flame` (Agasimani *et al.*, 2010). Results were on par with variety `Grace` (12.86 cm) and variety `Chias` (13.32 cm) (Henny, 1999). The average of experiment for the studied characteristic among the six varieties was 16.94 cm and the obtained differences within the varieties were not statistically assured (Table 3).

Table 2

Number of leaves per plant at *Anthurium andreaeanum* cultivars

Var. no.	Cultivar	Number of leaves/plant	Relative value (%)	± Difference	Significance of difference	CV %
1	Alpine	28.33	125.6	5.78	xxx	14.3
2	Absolute	19.67	87.2	-2.89	o	22.9
3	Otazu	18.67	82.8	-3.89	oo	22.3
4	Baleno	28.33	125.6	5.78	xxx	12.4
5	Alabama	18.67	82.8	-3.89	oo	22.3
6	Cherry Champion	21.67	96.1	-0.89	-	16.2
Average of experiment		22.56	100.0	-	-	18.4
LSD 5% 2.25; LSD 1% 3.19; LSD 0.1% 4.62						

Table 3

Leaves length at *Anthurium andreaeanum* cultivars

Var. no.	Cultivar	Leaves length (cm)	Relative value (%)	± Difference (cm)	Significance of difference	CV%
1	Alpine	18.33	108.2	1.39	-	35.5
2	Absolute	13.67	80.7	-3.28	-	11.2
3	Otazu	17.33	102.3	0.39	-	40.5
4	Baleno	15.33	90.5	-1.61	-	19.9
5	Alabama	19.67	116.1	2.72	-	12.8
6	Cherry Champion	17.33	102.3	0.39	-	3.3
Average of experiment		16.94	100.0	-	-	20.5
LSD 5% 5.42; LSD 1% 7.70; LSD 0.1% 11.15						

The coefficients of variation calculated for the leaves length of the varieties are medium to large, two varieties of the all analyzed cases exceed 20 %. The average s% per experiment was 20.5 % and the variation limits s% for leaves length varied between 3.3 % (Cherry Champion) and 40.5 % (Otazu).

Data presented in table 4 showed that different varieties presented significant influence on spathe breadth. Two varieties show statistically assured differences compared to the average value of experiment per studied trait (7.22 cm), considered as the control of experience. The variety that had the widest spathe breadth was: Otazu (10.67 cm), with very significant positive differences, while the Cherry Champion (4.33 cm) has very significant negative differences.

Comparative results were obtained by Agasimani *et al.* (2010) which reported that variety Titicaca had the maximum spathe breadth (16.18 cm) and minimum spathe breadth was recorded in variety Aymara (7.04 cm).

The coefficient of variation calculated for the spathe breadth of the varieties has relative low values, the most of varieties are below 10 %. The average s% per experiment was 9.5 % and the variation limits s% for spathe breadth varied between 6.9 % (Alabama) and 13.3 % (Cherry Champion).

Spathe length significantly influenced by different anthurium cultivars was presented in Table 5. Maximum spathe length was recorded in cultivar Alabama (12.33 cm) whereas minimum (4.0 cm) was recorded in Cherry Champion.

Table 4

Spathe breadth at *Anthurium andreanum* cultivars

Var. no.	Cultivar	Spathe breadth (cm)	Relative value (%)	± Difference (cm)	Significance of difference	CV%
1	Alpine	6.33	87.7	-0.89	-	9.1
2	Absolute	7.33	101.5	0.11	-	7.9
3	Otazu	10.67	147.7	3.44	xxx	10.8
4	Baleno	6.33	87.7	-0.89	-	9.1
5	Alabama	8.33	115.4	1.11	-	6.9
6	Cherry Champion	4.33	60.0	-2.89	ooo	13.3
Average of experiment		7.22	100.0	-	-	9.5
LSD 5% 1.18; LSD 1% 1.68; LSD 0.1% 2.44						

Table 5

Spathe length at *Anthurium andreanum* cultivars

Var. no.	Cultivar	Spathe length (cm)	Relative value (%)	± Difference (cm)	Significance of difference	CV%
1	Alpine	11.67	120.0	1.94	x	30.1
2	Absolute	10.00	102.9	0.28	-	20.0
3	Otazu	11.33	116.6	1.61	-	27.0
4	Baleno	9.00	92.6	-0.72	-	11.1
5	Alabama	12.33	126.9	2.61	xxx	20.4
6	Cherry Champion	4.00	41.1	-5.72	ooo	50.0
Average of experiment		9.72	100.0	-	-	26.4
LSD 5% 1.68; LSD 1% 2.39; LSD 0.1% 2.51						

Data published by Islam *et al.* (2013) reported maximum spathe length in variety `Triticaca` (15.3 cm), whereas minimum was recorded in `Ivory` (6.3 cm). Other researchers (Femina *et al.*, 2006) conducted a similar experiment and founded that variety `Esmeralda` had the maximum spathe length (15.71 cm) and minimum spathe length (7.54 cm) was recorded in variety `Ivory`.

As a result of the statistical processing of data on this morphological trait three varieties show statistical differences compared to the average value of experiment (9.72 cm), considered as the control sample. Depending on the spathe length the `Alpine` and `Alabama` varieties were recorded a significant differences. At the opposite side was qualified `Cherry Champion` variety with very significant negative differences with the lowest spathe length. The coefficients of variation calculated for the length of spathe in the studied varieties have relatively high values for all varieties being over 10%. The average value of the coefficient of variation s% per experiment was 26.4% and the variation limits s% for spathe length varied between 11.1% (`Baleno`) and 50% (`Cherry Champion`). This means that `Baleno` variety with the lowest coefficient of variation, but the flowers have the greatest sameness in terms of spathe length, while the `Cherry Champion` variety shows the greatest inequality of the flowers in terms of their length.

Analyzing Table 6 it can be conclude that cultivar `Baleno` produced maximum number of flowers per plant (17.67) which was significantly superior to other varieties. The minimum number of flower per plant (6.33) was recorded in cultivar `Otazu`, recording significant negative differences comparing with the control of experiment (average of varieties).

Table 6

Number of flowers per plant at *Anthurium andreanum* cultivars

Var. no.	Cultivar	Number of flowers per plant	Relative value (%)	± Difference	Significance of difference	CV%
1	Alpine	12.33	124.7	2.44	x	20.4
2	Absolute	8.33	84.3	-1.56	-	6.9
3	Otazu	6.33	64.0	-3.56	oo	9.1
4	Baleno	17.67	178.7	7.78	xxx	14.2
5	Alabama	7.33	74.2	-2.56	o	7.9
6	Cherry Champion	7.33	74.2	-2.56	o	7.9
Average of experiment		9.89	100.0	-	-	11.0
LSD 5% 2.44; LSD 1% 3.46; LSD 0.1% 4.59						

Among different varieties Agasimani *et al.* (2010), reported that the maximum number of flowers produced per plant per year was in variety 'Esmeralda' (9.33) and minimum in case of variety 'Ivory' (3.33). Islam *et al.* (2013) showed that maximum number of flowers per plant was recorded in variety 'Titicaca' (7.2), while minimum (4.1) was recorded in 'Ivory'.

Variation in number of flowers could be expected among the cultivars due to their inherent genetic character.

The coefficients of variation calculated for the number of flowers per plants in the studied varieties had relatively low values, with four of the analyzed cases below 10 % and only two varieties recorded values that can be considered as average values. The average s% per experiment was 11.0 % and the variation limits s% for the average number of flowers per plant varied between 6.9 % ('Absolute') and 20.4% ('Alpine').

CONCLUSIONS

The present study on the vegetative and flower characteristics of six varieties of *Anthurium andreanum* grown as pot plants were noted significant differences among cultivars for all attributes evaluated.

Cultivar 'Alpine' had maximum stalk length, spathe length and number of leaves while cultivar 'Baleno' was noticed for the highest number of flowers. Through present analysis it is noticed that, varieties 'Alpine' and 'Baleno' are exceedingly preferred by the anthurium user, because of their attractive flowers and leaves and are recommended for potted crop in Romania.

Data presented in this paper put on view that the variability coefficients generally have low values, less than 10 % for flower stalk length, spathe breadth and number of flowers, which denotes good stability and possibility of downward transmission of these characters in breeding works for obtaining new varieties.

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