

RESEARCHES CONCERNING THE POSTHARVEST CARE OF *LISIANTHUS RUSSELLIANUS* CUT FLOWERS

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Abstract

Lisianthus popularity is due not only to the wide range of assortment (small-flowered varieties Piccolo type, edging - Panther Curly, striped - Lilac Shadow), but also due to the attractive character of flowers. Purple color of the petals is the dominant at the most variety (35 %), followed by white (21 %), pink (12 %), yellow (8 %), and green (9 %), varieties with bicolor petals (9 %). Experiences regarding the postharvest care, using *Lisianthus russellianus* varieties have been developed in the flower shop "Decor Studio", Cluj-Napoca, Cluj County.

Biological material used in experiments with *Lisianthus russellianus* varieties, consisted in tree cultivars as following: 'Piccolo White' (white flowers) 'Mariachi Pink' (pink flowers), 'Echo Blue' (blue flowers). During the experiences it was investigated the effect of four solutions (Belle Fleur, Floralife, Vitalife and tap/normal water) on the morphological characters of the studied varieties and the on period of storage. The results obtained show that the variety with the longest storage period is "Echo Blue" (30 days), and the most favorable nutrient solution was Fleur Bell.

Key words: preservation, nutrient solutions, *Eustoma*.

INTRODUCTION

Lisianthus russellianus is relatively new species in floricultural assortment which it belongs to the *Lisianthus* genus, family Gentianaceae. This species is known as *Eustoma grandiflorum* (Armitage, 2001). *Lisianthus* genus originates in North America, especially Mexico. Genus name allude at the beauty of calyx and corolla, the shiny satin aspect and very nice border of the flower („lissé" in French – means smooth).

In the areas of origin, it is spontaneous species inhabits grasslands stretching from Nebraska to Colorado, Texas and Mexico (Cantor 2010; Bala, 2010).

In Texas is popularly known as 'blue bell', 'prairie rose', and 'prairie gentian'.

From the wild forms with blue petals resulted through breeding new forms with a great perfection extremely varied flowers with colors and shapes (Toma, 2011; Draghia, 2011).

The leaves of this 40 cm tall plant are thick and blue-green. The flower are commonly violet to lavender but have been bred in white, pink, and purple, usually with a darker eye in the center. Flower can be simple or abundant and more

flowers are distributed on a stem that opens successively (Armitage, 2004).

Plant breeders around the world have discovered its marvelous properties as a cut flower, and flowers have been bred into a myriad of colors, occurring as singles or doubles in florists' coolers across the country (Armitage, 2001). *Lisianthus* is the most important greenhouse cut flowers, this North American species continues to be crossed by American, Dutch, Japanese, and Israeli breeders (Armitage and Laushman, 2003).

Some of the cut flower cultivars are also used in garden design, particularly the Yodel series (single flowers) and the Echo series (double). 'Yodel Lilac' and 'Echo White' have performed quite well in outdoor beds in Athens (Armitage, 2004).

It is needed well-drained soils, and can be propagated by seed. Plants are raised almost exclusively from seed by specialist propagators; terminal cuttings are only occasionally used because they tend to flower irregularly (Armitage, 2004).

Regarding the harvesting of *Lisianthus* many growers find that best results occur when the central bud is removed, so that more flowers will be open simultaneously. Harvest when one

flower is fully colored. Postharvest life is excellent, 10–15 days. Small buds often fail to develop after harvesting, and flowers (particularly blue and pink flowers) fade badly in low light conditions; if placed in high light, these conditions become less severe (Kawabata 1995). A 25% decrease in light intensity determine results a 40% decrease in color intensity (Griesbach 1992). Several solutions have been tested, with varying results. Interestingly, Song et al. (1994) found that pretreating stems with STS (silver thiosulfate) or Chrysal AVB prior to placing in preservatives had little effect on longevity but resulted in more flowers opening in the vase. Other research showed that treatment with 0.1 mM STS for 24 hours before placing in distilled water increased the vase life significantly. Sucrose too has been studied and recommended as an alternative to STS. Another recipe, consisting of 10% sugar, citric acid, and antimicrobial agents, pulsed for 24 hours, resulted in 13-day postharvest life and opening of all flower buds on the cut stem (Armitage, 2003).

MATERIALS AND METHODS

Experiments concerning the postharvest care of *Lisianthus russellianus* were done at „Decor Studio” flower shop from Cluj-Napoca, Cluj county. Experiments were installed on 11.11.2011. It took on average of 38 days. Observations were made at an interval of two days between 15.11-21.12.2011. Light and moisture conditions were specific as a normal living space.

The biological material used in experiments with species *Lisianthus russellianus*, consisted in three cultivars, as follows: Piccolo White (white flowers), Mariachi Pink (pink flowers), Echo Blue (blue flowers). The material used comes from the Netherlands and was acquired by the company Greenlit from Cluj-Napoca.

The control of experiments was Piccolo White cultivar.

As nutrient solution were used the followings: Belle Fleur, Floralife, Vitalife and tap/normal water.

The experience was bifactorial with 12 variants which were placed in randomized blocks, in three repetitions.

RESULTS AND DISCUSSIONS

The recorded data concerning the effect of nutrient solution on the postharvest life of *Lisianthus* were statistical interpreted with „LSD” test (Least Significant Difference) to illustrate the significance of differences.

At the set up of experiences, were made some observations were made on morphological characters of varieties studied. Were analyzed the following characteristics: flower stem length, number of leaves, flower diameter, number of petals and number of flowers per stem.

Regarding the effect of nutrient solution on the length of floral stem can observe that all solutions appear with a non significant difference, which means that neither influenced this character (Table 1). The result from Table 2 shows the similar data. Neither cultivar influenced favorable the stem length.

Table 1. The influence of nutrient solution on the length of floral stem at *Lisianthus russellianus*

Nutrient solution	Stem length		±D (days)	Signification of difference
	Absolute (cm)	Relative (%)		
Tap water (C)	68,11	100,0	0,00	-
Bell Fleur	66,47	97,6	-1,64	-
Vitalife	67,89	99,7	-0,22	-
Floralife	66,28	97,3	-1,83	-
LSD (p 5%)			2,11	
LSD (p 1%)			2,89	
LSD (p 0,1%)			3,93	

Table 2. Unilateral influence of cultivars on the stem length at *Lisianthus russellianus*

Cultivars	Stem length		±D (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Piccolo White (C)	66,79	100,0	0,00	-
Mariachi Pink	66,10	99,0	-0,69	-
EchoBlue	68,67	102,8	1,88	-
LSD (p 5%)			2,57	
LSD (p 1%)			4,25	
LSD (p 0,1%)			7,96	

In the Table 3 are presented the data concerning the influence of nutrient solution on the number of leaves at *Lisianthus russellianus* cultivars. The result shows that the best nutrient solution was Vitalife, which achieved a very

significant difference. The solutions like Bell Fleur and Floralife registered significant positive difference. Regarding the cultivar influence, Mariachi Pink shows a distinct significant difference, that exceed the control with 7,67 pieces (Table 4).

Table 3. The influence of nutrient solution on the number of leaves at *Lisianthus russellianus* cultivars

Nutrient solution	Number of leaves		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Tap water (C)	22,0	100,0	0,00	-
Bell Fleur	28,89	131,3	6,89	*
Vitalife	32,67	148,5	10,67	***
Floralife	28,33	128,8	6,33	*
LSD (p 5%)			5,56	
LSD (p 1%)			7,63	
LSD (p 0,1%)			10,38	

Table 4. Unilateral influence of cultivars on the number of leaves at *Lisianthus russellianus*

Cultivars	Number of leaves		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Piccolo White (C)	24,67	100,0	0,00	-
Mariachi Pink	32,32	131,1	7,67	**
EchoBlue	26,92	109,1	2,25	-
DL (p 5%)			4,31	
DL (p 1%)			7,14	
DL (p 0,1%)			13,36	

Just one of the nutrient solution influenced favorable the diameter of flower. Bell Fleur generated a difference of 0.53 cm, which shows a significant differences comparing with the control (tap water). The rest of solutions determine a negative difference (Table 5).

Table 5. The influence of nutrient solution on the diameter of flowers at *Lisianthus russellianus* cultivars

Nutrient solution	Flowers diameter		±D (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Tap water (C)	5,42	100,0	0,00	-
Bell Fleur	5,96	109,8	0,53	*
Vitalife	5,36	98,8	-0,07	-
Floralife	5,38	99,2	-0,04	-
LSD (p 5%)			0,43	
LSD (p 1%)			0,59	
LSD (p 0,1%)			0,81	

Table 6. The unilateral influence of cultivar upon flower diameter at *Lisianthus russellianus*

Cultivars	Flower diameter		±D (cm)	Signification of difference
	Absolute (cm)	Relative (%)		
Piccolo White (C)	4,33	100,0	0,00	-
Mariachi Pink	5,75	132,7	1,42	*
Echo Blue	6,50	150,0	2,17	***
LSD (p 5%)			0,94	
LSD (p 1%)			1,56	
LSD (p 0,1%)			2,91	

Concerning the unilateral influence of cultivar upon flower diameter at *Lisianthus russellianus*, the results described in the Table 6 shows that Echo Blue registered very significant differences that exceed the control with 2.17 cm.

Data from Table 7 shows that one of nutrient solutions had a favorable influence on the number of flowers/stem. Bell Fleur nutrient solution determines a very significant difference of 1.05 cm, which exceeds the control of experiment with 9.3%.

Table 7. The unilateral influence of nutrient solutions on the number of flowers/stem at *Lisianthus russellianus*

Nutrient solution	No. of flowers/stem		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Tap water (C)	11.28	100,0	0,00	-
Bell Fleur	12.33	109,3	1,05	***
Vitalife	10.36	91.8	-0,92	ooo
Floralife	11.38	100.8	0,01	-
LSD (p 5%)			0,43	
LSD (p 1%)			0,59	
LSD (p 0,1%)			0,81	

Table 8. Cultivars influence upon the number of flowers/stem at *Lisianthus russellianus*

Cultivars	Number of flowers/stem		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Piccolo White (C)	10,17	100,0	0,00	-
Mariachi Pink	13,08	128,7	2,92	*
Echo Blue	9,75	95,9	-0,42	-
LSD (p 5%)			2,02	
LSD (p 1%)			3,34	
LSD (p 0,1%)			6,26	

Results from table 8 shows that Mariachi Pink registered significant differences concerning the number of flowers/stem. The difference was 2.92 pieces, which exceed the control cultivar. Concerning the results from Table 9 neither solutions influenced favorable the no. of petals/flowers. Bell Fleur generates a difference of 0.33 cm, but it is not statistically assured.

Table 9. Unilateral influence of nutrient solution on the no. of petals/flowers at *Lisianthus russellianus* cultivars

Nutrient solution	No. of petals/flowers		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Tap water (C)	10,22	100,0	0,00	-
Bell Fleur	10,56	103,3	0,33	-
Vitalife	9,89	96,7	-0,33	-
Floralife	9,22	90,2	-1,00	-
LSD (p 5%)			2,10	
LSD (p 1%)			2,87	
LSD (p 0,1%)			3,91	

Table 10. The unilateral influence of cultivars upon the number of petals/flower at *Lisianthus russellianus*

Cultivars	Number of petals/flower		±D (piece)	Signification of difference
	Absolute (piece)	Relative (%)		
Piccolo White (C)	5,00	100,0	0,00	-
Mariachi Pink	13,33	266,7	8,33	***
Echo Blue	11,58	231,7	6,58	***
LSD (p 5%)			1,79	
LSD (p 1%)			2,96	
LSD (p 0,1%)			5,54	

Data from Table 10 shows the unilateral influence of cultivars upon the number of petals/flower at *Lisianthus russellianus*. Cultivars Mariachi Pink and Echo Blue show very significant differences exceeding the control cultivar with 8.33 pieces respectively 6.58 pieces.

In the Table 11 is presented the unilateral influence of nutrient solution on the postharvest of *Lisianthus russellianus*. Bell Fleur and Floralife assure a long period of postharvest life from 12.78 days to 11.89 days, comparing with the control.

Table 11. Unilateral influence of nutrient solutions on the postharvest period

Nutrient solution	Number of days		±D (days)	Signification of difference
	Absolute (days)	Relative (%)		
Tap water (C)	22,11	100,0	0,00	-
Bell Fleur	34,89	157,8	12,78	***
Vitalife	17,67	79,9	-4,44	000
Floralife	34,00	153,8	11,89	***
LSD (p 5%)			2,53	
LSD (p 1%)			3,47	
LSD (p 0,1%)			4,72	

Regarding the unilateral influence of cultivars upon postharvest period, the results from Table 12 show that Echo Blue cultivar achieved significant difference and this exceed the control cultivar with 4.92 days.

Table 12. The unilateral influence of cultivars upon postharvest period

Cultivars	Number of days		±D (days)	Signification of difference
	Absolute (days)	Relative (%)		
Piccolo White (C)	25,67	100	0,00	-
Mariachi Pink	25,25	98,4	-0,42	-
Echo Blue	30,58	119,2	4,92	*
LSD (p 5%)			3,04	
LSD (p 1%)			5,03	
LSD (p 0,1%)			9,41	

CONCLUSIONS

Analyzing the obtained results from researches concerning the postharvest care of *Lisianthus* cut flowers using three cultivars and four nutrient solutions results the following conclusions:

Analyzing the length of floral stem under the effect of four nutrient solutions can conclude that neither solution influenced favorable this character. Results shows that neither cultivar influenced favorable the stem length.

The best nutrient solution regarding the number of leaves was Vitalife, which achieved a very significant difference. The solutions like Bell Fleur and Floralife registered significant positive difference. Regarding the cultivar influence, Mariachi Pink shows a distinct significant difference, that exceed the control with 7,67 pieces.

It was studied the influence of nutrient solutions on the diameter of flowers at *Lisianthus russellianus* cultivars. Bell Fleur generated a difference of 0.53 cm, significant differences comparing with the control (tap water). Echo Blue registered very significant differences that exceed the control with 2.17 cm.

Regarding the unilateral influence of nutrient solutions on the number of flowers/stem at *Lisianthus russellianus*, that Bell Fleur achieved a very significant positive difference of 1.05 cm, which exceed the experiment control. Mariachi Pink registered significant differences concerning the number of flowers/stem. The difference was 2.92 pieces, which exceed the control cultivar.

Concerning the influence of nutrient solution on the no. of petals/flowers at *Lisianthus russellianus* cultivars, results show that neither solution recorded favorable influence. Cultivars Mariachi Pink and Echo Blue show very significant differences exceeding the control cultivar with 8.33 pieces respectively 6.58 pieces.

In the case of the unilateral influence of nutrient solution on the postharvest of *Lisianthus russellianus*, can conclude that solutions as Bell Fleur and Floralife assure a long period of postharvest life from 12.78 days to 11.89 days, comparing with the control.

Echo Blue cultivar achieved significant difference and this exceeds the control cultivar with 4.92 days.

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