ACTA SCIENTIARUM POLONORUM
Acta Sci. Pol. Hortorum Cultus, 18(4) 2019, 137–148
https://czasopisma.up.lublin.pl/index.php/asphc ISSN 1644-0692 e-ISSN 2545-1405 DOI: 10.24326/asphc.2019.4.13
ORIGINAL PAPER
Accepted: 5.12.2018

POST-HARVEST LONGEVITY AND ORNAMENTAL VALUE OF CUT INFLORESCENCES OF *Crocosmia ×crocosmiiflora* 'LUCIFER' DEPENDING ON FLOWER FOOD AND STORAGE CONDITIONS

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ABSTRACT

Floral exchange markets drive steadily growing interest in ornamental plants sold as cut flowers. Unfortunately, vase life of some of these flowers remains unsatisfactory. Their ornamental value depends on their longevity and number of flowers, as well as overall appearance of the stem during its vase life. Our study determined the effects of storage conditions and Floralife flower food on vase life and ornamental value of *Crocosmia ×crocosmiiflora* 'Lucifer'. Crocosmia inflorescences can be attractive cut flowers after meeting some basic requirements. Cutting the branched shoots when the first flower in the main inflorescence was fully open, the second was opening and the subsequent buds showed visible color allowed for maintaining their decorative value for an average of 18.8 days, irrespective of storage conditions and flower food. Vase life and ornamental value depend on storage conditions. Keeping the inflorescences in a semi-lit room (16.8 $\mu mol \cdot m^{-2} \cdot s^{-1}$), at 18–20°C, and relative humidity of 55–60% or in darkness, at 14–16°C, and relative humidity of 60–70% reduced the number of developed flowers, inflorescence weight and the amount of absorbed solution, and also declined inflorescence vase life. Application of Floralife 200 and Floralife 300 flower food increases the vase life by respectively 7.9 and 8.2 days vs. water, and improves the quality of stored inflorescences.

Key words: cut flowers, vase life, Floralife, storage conditions

INTRODUCTION

Globally available range of cut flowers constantly fluctuates due to new floristic trends and changes in customer preferences. Plants with impressive inflorescences of vivid colors and high post-harvest longevity are in high demand. Ascough et al. [2009] and Reinten et al. [2011] suggested *Crocosmia ×crocosmiiflora* as a species meeting these requirements. The plant belongs to the *Iridaceae* family [Erhardt et al. 2014] and produces branched inflorescence shoots terminated with unilateral racemes [Armitage and Laushman 2008]. The flowers are in different shades of red, orange or yellow. Although intense breeding yielded well over 400 cultivars of *Crocosmia* genus [Goldblatt et al. 2004], the one most known and desired is cultivar 'Lucifer'. According to Żurawik et al. [2015], it produces numerous (16–18), blood-red flowers 4.0 to 4.6 cm in diameter and inflorescence stems up to 77.0 cm long.

The post-harvest longevity largely depends on the cutting phase [Janowska and Smolińska 2018, Rabiza-Świder et al. 2018], and storage conditions, e.g. temperature [Daryl and Anthony 2000, Cevallos and Reid 2001, Çelikel and Reid 2002], and light intensity [Jordi et al. 1994]. The storage period may also be controlled by applying flower foods that inhibit or accelerate aging processes [Dole et al. 2013, Rabiza-Świder

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et al. 2015, 2018]. Their effectiveness depends on the method of application, concentration [Elhindi 2012], species [Clark et al. 2010, Dole et al. 2013], and often also on the cultivar [Kim et al. 2005, Koszeghi and Kentelky 2013, Favero et al. 2017].

Available literature lacks data on prolonging the vase life and quality of cut *Crocosmia ×crocosmiiflora* inflorescences. Therefore, the aim of this study was to determine the effects of different storage conditions and selected Floralife preparations on vase life and ornamental value of cut inflorescences of cultivar 'Lucifer'.

MATERIAL AND METHODS

The plant material included entire inflorescence stems of *Crocosmia ×crocosmiiflora* N.E.Br. 'Lucifer' collected from a field crop in Szczecin (14°31'E and 53°26'N). Corms 8–10 cm in circumference, stored for five months at 5–8°C and relative humidity 60–70% were planted on 14th May, 2017. Prior to planting, the soil was fertilized with multicomponent mineral fertilizer Azofoska (N 13.6, P_2O_5 6.4, K_2O 19.1, MgO 4.5, B 0.045, Cu 0.180, Fe 0.17, Mn 0.27, Mo 0.040, Zn 0.045) at 30 g·m^{-2}. During vegetation but before flowering, the top dressing was applied twice, 6 and 12 weeks after planting, with the same fertilizer at 20 g·m^{-2}. Inflorescence stems without mechanical damage and disease symptoms were harvested on 27 August. They were cut in the early morning when the first flower in the main inflorescence was fully open, the second was opening and the subsequent buds showed visible color typical for the cultivar. Two lateral branches and three fully developed leaves were left on the shoots. The stems were placed in containers filled with tap water within five minutes after cutting. On the same day, immediately prior to storage, all stems were cut to be 60 cm long, weighed and placed in freshly prepared floral food.

The inflorescences were stored under three variants of light, temperature and humidity conditions. Treatment 1 provided full light (186.7 µmol·m^{-2}·s^{-1}), temperature 18–25°C, relative humidity 40–50%, treatment 2 had limited light access (16.8 µmol·m^{-2}·s^{-1}), temperature 18–20°C, relative humidity 55–60%, and treatment 3 comprised darkness, temperature 14–16°C and relative humidity 60–70%. Lamps in treatments 1 and 2 were providing light for 12 hours each day. The experiment also compared flower foods produced by Floralife including: Floralife 100 Clear Hydrating Solution (for cut flowers immediately after harvest), Floralife 200 Clear Storage Solution (storage and transport solution for cut flowers) and Floralife 300 Clear (recommended for prolonging vase life of bouquets at customer's home). Solutions were prepared as recommended by the manufacturer (Smithers-Oasis Belgium N.V.), by dissolving in distilled water. Control inflorescence stems were kept in distilled water.

We assessed the vase life of inflorescences during storage based on the loss of ornamental quality due to discoloration, drying of petals and flower drop. Every two days of storage the number of developed and wilted flowers in the main and lateral inflorescences was counted. Length of main inflorescences, flower diameter, and leaf greenness index were measured 1, 7, 14, and 21 days after cutting. Leaf greenness was measured with a SPAD-502 meter (Minolta). The measurements involved central part of all leaves. The vase life was determined based the number of days when there were at least five developed flowers per inflorescence. At the end of the experiment, the number of undeveloped buds, weight of inflorescence stems and amount of solution absorbed during storage were determined.

The experiment included 12 variants created by a combination of storage conditions (3) and flower food type (4). Each variant comprised 20 inflorescence stems divided into two replicates of 10 individuals. Results on the dynamics of flower development were analyzed based on mean values, while those referring to morphological traits, leaf SPAD values, weight loss and solution consumption, were statistically analyzed by means of a two-factor analysis of variance in a completely randomized design. Mean results were compared using Tukey's test, at the significance level $\alpha = 0.05$.

RESULTS AND DISCUSSION

According to Clark et al. [2010], the effect of Floralife® flower food on vase life of cut flowers largely depends on species. Almeida et al. [2009] claimed that flower food Original Floralife® did not prolong the post-harvest longevity of cut roses. Contrary to

that, Dole et al. [2009] claimed that this preparation prolonged vase life of such species as *Dahlia hybrida* 'Karma Thalia', *Lupinus hartwegii* ssp. *cruickshanki*i 'Sunrise', or *Papaver nudicaule* 'Temptress'. The Floralife flower foods increased the number of developed flowers and prolonged flowering compared to the control solution in *Crocosmia ×crocosmiiflora* 'Lucifer' inflorescences irrespective of storage conditions. Stems stored under the most intense light (186.7 $\mu m \cdot m^{-2} \cdot s^{-1}$) and at the highest temperature (18–25°C) developed more flowers during storage than those exposed to the semi-lit and dark storage conditions (Fig. 1–3). Differences in flower development in inflorescences between control and flower food variant were the smallest in the fully lit room (186.7 $\mu m \cdot m^{-2} \cdot s^{-1}$), at 18–25°C and relative humidity 40–50% (Fig. 1). In these conditions, control inflorescences and those treated with Floralife 100 ceased to bloom after 25 days, and those treated with Floralife 200 and 300 two days later. In the semi-lit room (16.8 $\mu m \cdot m^{-2} \cdot s^{-1}$), at 18–20°C and relative humidity 55–60%, flowers in the control inflorescences wilted after 11 days (Fig. 2). Inflorescences treated with Floralife 300 bloomed the longest, i.e. for 29 days. Those kept in Floralife 200 bloomed four days shorter, but developed more flowers during the storage. Flowers in control inflorescences maintained in the dark at 14–16°C, and relative humidity 60–70%, wilted af-

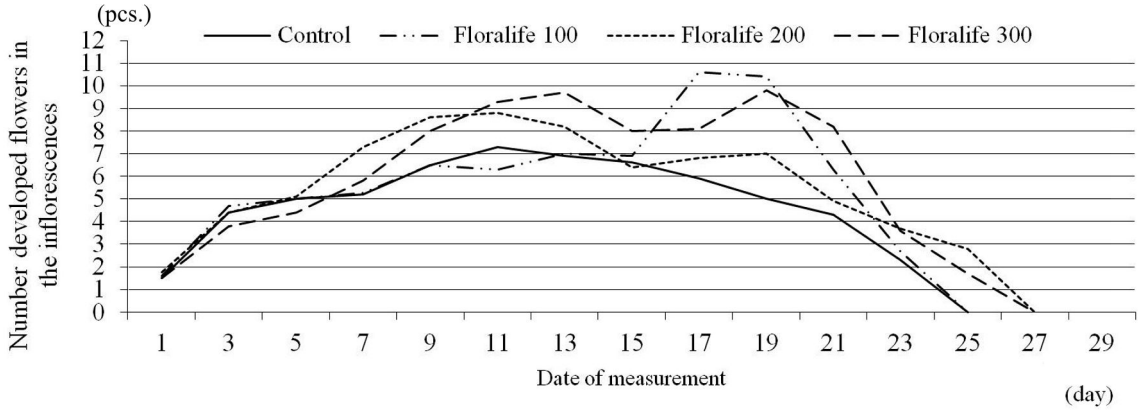

Fig. 1. Number of *Crocosmia ×crocosmiiflora* 'Lucifer' flowers exposed to light at 186.7 $\mu mol \cdot m^{-2} \cdot s^{-1}$ for 12 h/day, 18–25°C and relative humidity 40–50%, kept in four different vase solutions

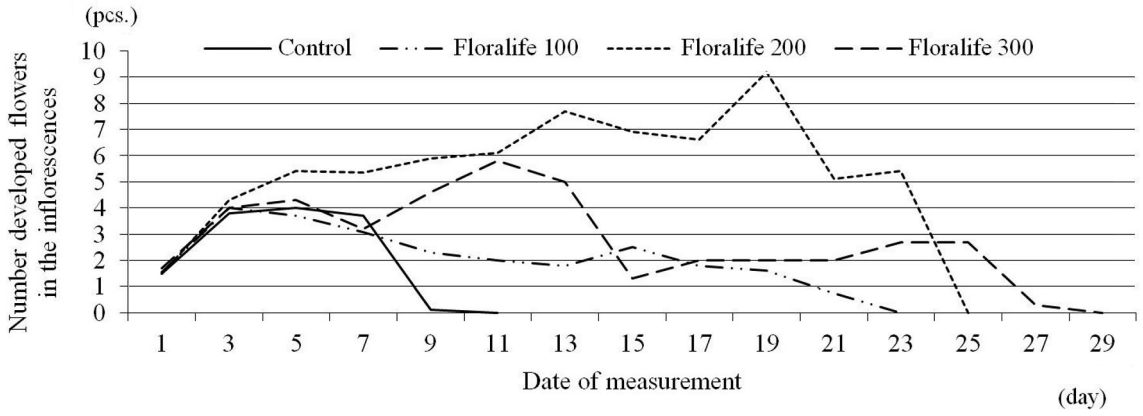

Fig. 2. Number of *Crocosmia ×crocosmiiflora* 'Lucifer' flowers exposed to light at 16.8 $\mu mol \cdot m^{-2} \cdot s^{-1}$ for 12 h/day, 18–20°C and relative humidity 55–60%, kept in four different vase solutions

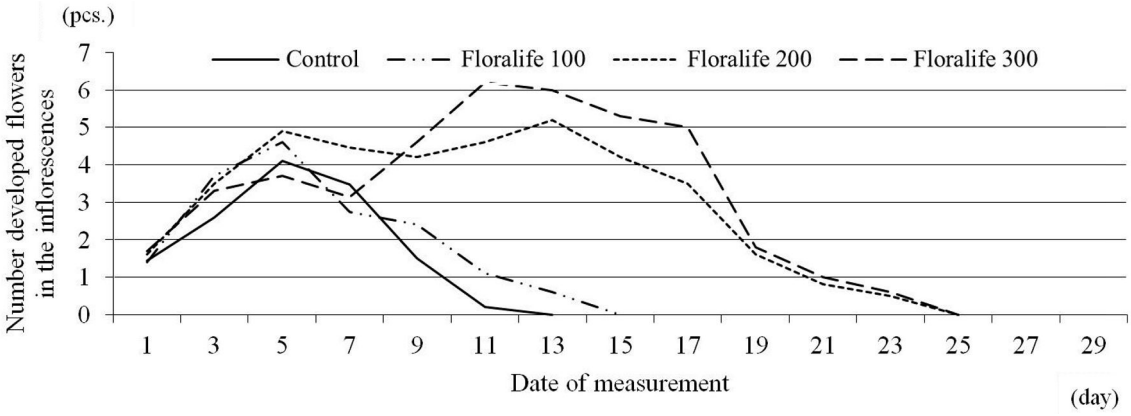

Fig. 3. Number of *Crocosmia ×crocosmiiflora* 'Lucifer' flowers stored in darkness at 14–16°C and relative humidity 60–70%, kept in four different vase solutions

ter 13 days, and those treated with Floralife 100 after 15 days. Inflorescences kept in Floralife 200 and 300 showed similar blooming dynamics, as flowers developed on average for 25 days. Nowak and Rudnicki [1990] claimed that crocosmia inflorescences should be harvested when half of the flowers are open. Contrary to that, our studies on flower development dynamics in crocosmia demonstrated that stems harvested with one open flower would continue to develop irrespective of storage conditions or flower food.

Available literature lacks information on the effect of storage conditions and type of flower food on the decorative value of stored crocosmia inflorescences. In the fully lit room (186.7 $\mu m \cdot m^{-2} \cdot s^{-1}$), at 18–25°C and relative humidity 40–50%, the flower food and measurement time significantly affected the ornamental value of cultivar 'Lucifer' inflorescence (Tab. 1). According to Almeida et al. [2009], Original Floralife® flower food accelerates the rose bud opening. In our study, Floralife preparation increased the number of developed flowers in the first order inflorescence vs. control, irrespective of the measurement time (Tab. 1). The greatest number of flowers developed in the variant treated with Floralife 300, and the lowest in control and the inflorescences treated with Floralife 100. The inflorescences kept in Floralife 200 produced flowers with diameter larger than those maintained in water or Floralife 100. Ulczycka and Krzymińska [2013] reported that nutrition does not cause elongation of inflorescence stems in *Camassia quamash*. We confirmed this finding in our study, as application of flower food did not elongate crocosmia inflorescences. The inflorescences stored in Floralife 100 and Floralife 300 had greater leaf greenness index, irrespective of the measurement time, than those kept in Floralife 200. On seventh day of storage, the inflorescences of the first order had more open flowers than on other measurement dates. Flowers measured on the first and second date had also greater diameter than those assessed during the third and last examination. The first order inflorescences were longer only when compared with freshly cut plants on 14th day of the experiment. On the ninth day of their research, Jordi et al. [1994] found that chlorophyll loss in *Alstroemeria* leaves was slower in the presence of light. However, in our study leaf greenness index gradually declined by 8.4, 19.7 and 30.8 SPAD on consecutive measurement dates. This was probably due to a longer storage period. We found significant correlations between the number of developed flowers in the first order inflorescence and total number of flowers and leaf greenness index.

Due to a total loss of ornamental value we performed no measurements on control inflorescences kept in the semi-lit room (16.8 $\mu m \cdot m^{-2} \cdot s^{-1}$), at 18–20°C and relative humidity 55–60% for 14 and 21 days (Tab. 2), and in the dark room at 14–16°C and relative air humidity 60–70% for 14 and 21 days, and in the variant treated with Floralife 100 for 21 days (Tab. 3). Irrespective of measurement date, Floralife treatments inconsistently affected ornamental value of inflorescences kept in the semi-lit room (Tab. 2).

Table 1. Quality of *Crocosmia ×crocosmiiflora* 'Lucifer' flowers exposed to light at 186.7 µmol·m^{-2}·s^{-1}, at 18–25°C and relative humidity 40–50%, kept in four different vase solutions

Trait	Flower food type (A)	Date of measurement (day) (B)				Mean
		1	7	14	21	
Number of flowers in first order inflorescence	I	1.5	3.6	1.2	0.2	1.6
	II	1.6	3.9	1.7	1.8	2.2
	III	1.8	5.5	2.1	1.0	2.6
	IV	1.5	4.7	2.1	2.4	2.7
	Mean	1.6	4.4	1.8	1.3	2.3
	$LSD_{0.05}$	A – 0.55 B – 0.55 A × B – 1.11 B × A – 1.11				
Total number of flowers in first order and further inflorescences	I	1.5	5.2	7.3	4.2	4.6
	II	1.6	5.3	6.9	4.7	4.6
	III	1.8	7.3	8.2	6.2	5.9
	IV	1.5	5.8	10.3	10.0	6.9
	Mean	1.6	5.9	8.2	6.3	5.5
	$LSD_{0.05}$	A – 0.98 B – 0.98 A × B – 1.97 B × A – 1.97				
Flower diameter in first order inflorescence (cm)	I	4.3	3.7	3.4	3.0	3.6
	II	4.5	3.7	2.9	2.8	3.5
	III	4.3	4.5	3.8	3.5	4.0
	IV	4.2	4.4	3.3	3.4	3.8
	Mean	4.3	4.1	3.3	3.2	3.7
	$LSD_{0.05}$	A – 0.37 B – 0.37 A × B – n.s.				
Length of the first order inflorescence (cm)	I	15.4	16.5	16.9	16.3	16.3
	II	15.5	16.8	17.4	16.2	16.5
	III	15.5	16.8	17.3	17.1	16.7
	IV	15.5	15.9	16.5	16.4	16.1
	Mean	15.5	16.5	17.0	16.5	16.4
	$LSD_{0.05}$	A – n.s. B – 1.39 A × B – n.s.				
Greenness index of leaves (SPAD)	I	50.6	42.6	31.7	15.9	35.2
	II	49.8	43.3	27.8	27.0	37.0
	III	49.4	39.6	23.0	16.2	32.1
	IV	50.0	40.9	38.7	17.9	36.9
	Mean	50.0	41.6	30.3	19.2	35.3
	$LSD_{0.05}$	A – 3.81 B – 3.81 A × B – 7.61 B × A – 7.61				

I – control – distilled water, II – Floralife 100 Clear Hydrating Solution, III – Floralife 200 Clear Storage Solution, IV – Floralife 300 Clear, n.s. – not significant difference

Table 2. Quality of *Crocosmia ×crocosmiiflora* 'Lucifer' flowers exposed to light at 16.8 µmol·m^{-2}·s^{-1}, 18–20°C and relative humidity 55–60%, kept in four different vase solutions

Trait	Flower food type (A)	Date of measurement (day) (B)				Mean
		1	7	14	21	
Number of flowers in first order inflorescence	I	1.5	3.2	0.0	0.0	1.2
	II	1.6	2.3	0.0	0.0	1.0
	III	1.5	4.2	0.0	0.0	1.4
	IV	1.7	2.4	0.0	0.0	1.0
	Mean	1.6	3.0	0.0	0.0	1.1
Total number of flowers in first order and further inflorescences	I	1.5	3.7	0.0	0.0	1.3
	II	1.6	3.1	2.5	0.8	2.0
	III	1.5	5.4	6.9	5.1	4.7
	IV	1.7	3.2	2.0	2.0	2.2
	Mean	1.6	3.8	2.9	2.0	2.6
Flower diameter in first order inflorescence (cm)	I	4.2	2.7	0.0	0.0	1.7
	II	4.4	3.1	2.3	2.7	3.1
	III	4.3	4.1	3.1	3.6	3.8
	IV	4.3	4.0	2.6	3.0	3.5
	Mean	4.3	3.5	2.0	2.3	3.0
Length of the first order inflorescence (cm)	I	14.8	16.3	0.0	0.0	7.8
	II	15.1	15.8	16.5	15.3	15.7
	III	16.0	17.8	17.9	17.8	17.4
	IV	15.2	16,4	17.2	14.4	15.8
	Mean	15.2	16.6	12.9	11.9	14.1
Greenness index of leaves (SPAD)	I	50.7	49.0	0.0	0.0	24.9
	II	49.9	50.4	47.8	26.1	43.5
	III	48.9	49.2	31.7	23.2	38.2
	IV	51.4	51.3	41.0	23.3	41.7
	Mean	50.2	49.9	30.1	18.2	37.1

Explanations as in Table 1

Table 3. Quality of *Crocosmia ×crocosmiiflora* 'Lucifer' flowers stored in darkness, at 14–16°C and relative humidity 60–70%, kept in four different vase solutions

Trait	Flower food type (A)	Date of measurement (day) (B)				Mean
		1	7	14	21	
Number of flowers in first order inflorescence	I	1.5	2.9	0.0	0.0	1.1
	II	1.4	2.2	0.0	0.0	0.9
	III	1.6	3.3	0.0	0.0	1.2
	IV	1.7	2.0	1.2	0.0	1.2
	Mean	1.5	2.6	0.3	0.0	1.1
Total number of flowers in first order and further inflorescences	I	1.5	3.5	0.0	0.0	1.2
	II	1.4	2.6	0.6	0.0	1.2
	III	1.6	4.5	5.3	1.1	3.1
	IV	1.7	3.1	5.5	1.4	2.9
	Mean	1.5	3.5	2.9	0.6	2.1
Flower diameter in first order inflorescence (cm)	I	4.6	3.0	0.0	0.0	1.9
	II	4.5	3.0	3.4	0,0	2.7
	III	4.7	3.5	2.9	2.9	3.5
	IV	4.6	3.5	3.3	3.2	3.7
	Mean	4.6	3.2	2.4	1.5	2.9
Length of the first order inflorescence (cm)	I	14.1	16.0	0.0	0.0	7.5
	II	14.7	17.1	16.5	0.0	12.1
	III	15.4	16.6	16.6	16.4	16.2
	IV	14.7	16.4	16.6	17.0	16.1
	Mean	14.7	16.5	12.4	8.3	13.0
Greenness index of leaves (SPAD)	I	51.2	50.5	0.0	0.0	25.4
	II	51.1	49.0	42.4	0.0	35.6
	III	51.0	50.2	39.3	27.6	42.0
	IV	51.2	47.6	40.3	22.1	40.3
	Mean	51.1	49.3	30.5	12.4	35.8

Explanations as in Table 1

Table 4. Number of wilted and undeveloped buds in *Crocosmia ×crocosmiiflora* 'Lucifer' inflorescences depending on the storage conditions and flower food type – end of the storage period

Trait	Storage conditions (A)	Flower food type (B)				Mean
		I	II	III	IV	
Number of wilted buds in first order inflorescence	PB	8.5	10.5	15.2	14.4	12.2
	PO	8.7	10.0	17.4	13.4	12.4
	PP	19.2	19.8	23.3	21.5	20.7
	Mean	12.1	13.4	18.3	16.4	15.1
	$LSD_{0.05}$	A – 1.20 B – 1.54 A × B – 2.40 B × A – 2.67				
Number of wilted buds in first order and further inflorescences	PB	1.2	2.3	17.4	16.1	9.3
	PO	0.6	2.5	19.4	12.5	8.8
	PP	28.5	22.9	33.6	30.7	28.9
	Mean	10.1	9.2	23.5	19.8	15.7
	$LSD_{0.05}$	A – 8.11 B – 10.42 A × B – n.s.				
Number of undeveloped buds in first order inflorescence	PB	4.8	5.5	5.7	7.4	5.9
	PO	9.8	6.6	6.0	7.7	7.5
	PP	3.9	3.5	0.9	1.2	2.4
	Mean	6.2	5.2	4.2	5.4	5.3
	$LSD_{0.05}$	A – 4.29 B – n.s A × B – n.s.				
Number of undeveloped buds in first order and further inflorescences	PB	33.4	29.5	16.2	15.2	23.6
	PO	32.1	25.8	9.7	14.9	20.6
	PP	7.9	10.4	3.6	6.0	7.0
	Mean	24.5	21.9	9.8	12.0	17.1
	$LSD_{0.05}$	A – 10.05 B – 12.91 A × B – n.s.				

PB – dark room with temperature 14–16°C and relative humidity 60–70%; PO – semi-lit room (16.8 $\mu mol \cdot m^{-2} \cdot s^{-1}$), with temperature 18–20°C and relative humidity 55–60%; PP – fully lit room (186.7 $\mu mol \cdot m^{-2} \cdot s^{-1}$), with temperature 18–25°C and relative air humidity 40–50%; I – control – distilled water, II – Floralife 100 Clear Hydrating Solution, III – Floralife 200 Clear Storage Solution, IV – Floralife 300 Clear; n.s. – not significant difference

Table 5. Post-harvest longevity of *Crocosmia ×crocosmiiflora* 'Lucifer' inflorescences (days) depending on storage conditions and flower food type

Storage conditions (A)	Flower food type (B)				Mean
	I	II	III	IV	
PB	10.0	11.0	20.0	20.0	15.3
PO	9.0	13.5	21.0	21.0	16.3
PP	24.0	24.0	25.5	26.5	25.0
Mean	14.3	16.2	22.2	22.5	18.9
$LSD_{0.05}$	A – 3.80 B – 4.89 A × B – 5.92 B × A – 6.14				

Explanations as in Table 4

Table 6. Weight loss in *Crocosmia ×crocosmiiflora* 'Lucifer' inflorescences (g) depending on storage conditions and flower food type after the storage period

Storage conditions (A)	Flower food type (B)				Mean
	I	II	III	IV	
PB	5.3	6.5	9.6	9.2	7.6
PO	5.9	6.9	9.9	13.4	9.2
PP	13.7	11.8	11.5	9.9	11.7
Mean	8.3	8.4	10.3	10.8	9.5
$LSD_{0.05}$	A – 2.46 B – n.s. A × B – 4.83 B × A – 5.57				

Explanations as in Table 4

Table 7. Amount of solution (ml) absorbed by *Crocosmia ×crocosmiiflora* 'Lucifer' inflorescences depending on storage conditions and flower food type after the storage period

Storage conditions (A)	Flower food type (B)				Mean
	I	II	III	IV	
PB	148.5	213.0	513.5	352.0	306.8
PO	247.5	369.0	550.5	547.5	428.6
PP	940.0	750.0	665.0	627.5	743.1
Mean	445.3	444.0	573.0	509.0	492.8
$LSD_{0.05}$	A – 182.5 B – n.s. A × B – 264.9 B × A – 306.1				

Explanations as in Table 4

The plant material kept in Floralife 200 developed more flowers in total and longer first order inflorescences than the variants kept in Floralife 100 and 300. A reverse relationship occurred for leaf greenness intensity. In the dark room, ornamental value of crocosmia inflorescences was unaffected by flower food Floralife 200 and 300 irrespective of measurement date.

Differences in storage conditions of *Crocosmia ×crocosmiiflora* 'Lucifer' significantly influenced the number of wilted and undeveloped flower buds (Tab. 4). The inflorescences kept in fully-lit room developed more buds than those stored in dark or semi-lit room. In the first order inflorescence, these differences were 69.7% and 66.9%, respectively, and in the inflorescences of further orders they were even bigger and amounted to 210.7% and 228.4%, respectively. The first order inflorescences had more undeveloped buds in the semi-lit room than in the fully-lit room. In semi-lit and dark room, the inflorescences of further orders also produced more undeveloped flower buds than those stored in full light. Irrespective of storage conditions, we noticed the greatest number of developed buds in the variant treated with Floralife 200, and the lowest in that treated with Floralife 100 and control. Similar relationships transpired for the number of wilted buds in the inflorescences of further orders. The number of wilted buds was the greatest in the inflorescences kept in Floralife 200 and the lowest in those treated with Floralife 100. The differences reached 155.4%. The number of undeveloped buds in the in-

florescences of further orders was greater in material stored in tap water only in comparison with Floralife 200. The difference between storage conditions and flower food type was visible only for the number of wilted buds in the first order inflorescences.

Cevallos and Reid [2001] reported greater post-harvest longevity of irises and narcissi stored at 0 to 10°C, while optimal storage temperature for gladiolus is 5°C [Costa et al. 2017]. Increasing storage temperature negatively affects inflorescence vase life [Çelikel and Reid 2002], but higher temperatures are recommended for tropical species [Vieira at al. 2014]. Our study did not confirm these findings. Irrespective of flower food type, the inflorescences stored at higher temperatures and full light showed the longest vase life (Tab. 5). The stems kept in semi-lit room and lower temperature survived by 8.7 days shorter, and those kept in the dark and the lowest temperature by 9.7 days shorter. Rabiza-Świder et al. [2015] reported that treatments with Floralife 200 and Floralife 300 improved the post-harvest longevity of cut lily inflorescences. Our study positively verified this report. As compared with control, only Floralife 200 and 300 significantly increased vase life of *Crocosmia ×crocosmiiflora* 'Lucifer' inflorescences. The differences were 55.2% and 57.3%, respectively. We also found a significant relationship between storage conditions and the type of flower food. In both semi-lit and dark room, the inflorescences kept in Floralife 200 and 300 survived longer than those maintained in tap water or Floralife 100. Contrary to that, the flower foods did not significantly affect the post-harvest longevity of inflorescences stored in fully lit room.

Weight of cut inflorescence stems of *Camassia quamash* declined during storage [Ulczycka and Krzymińska 2013]. In our study, this drop was stable and amounted to 9.5 g. It varied significantly depending on storage conditions (Tab. 6). Water deficit appears in the inflorescences when the amount of absorbed water is lower than that removed during transpiration [Vieira et al. 2012]. Our experiment confirmed this, as the inflorescences stored in fully lit room lost more weight than those stored in either dark or semi-lit room. The differences were substantial and reached 27.2% and 53.9%, respectively. According to Ulczycka and Krzymińska [2013] flower foods inhibit weight loss in stored inflorescences of *Camassia quamash*. Floralife preparations that we used did not affect weight loss of crocosmia inflorescences vs. those stored in distilled water. However, we noticed variable results depending on a combination of storage conditions and flower food type. In semi-lit room weight loss of the inflorescences treated with Floralife 300 increased compared with those kept in distilled water or Floralife 100. No significant differences were found for other storage conditions.

Intense transpiration accompanied by limited water absorption negatively affects quality of cut flowers [Costa et al. 2015]. In our study, the inflorescences stored in fully lit room absorbed the greatest amount of water, irrespective of flower food type (Tab. 7). This was probably due to intense transpiration occurring in these conditions. Differences with inflorescences kept in semi-lit and dark room amounted to 73.4% and 142.2%, respectively. Water absorption by crocosmia inflorescences did not depend on flower food type. However, we identified one significant interaction between the storage conditions and flower food type. Control inflorescences and those treated with Floralife 100 absorbed more water in fully lit room than in darkness or semi-light. This translated into markedly longer vase life of the inflorescences under these conditions.

CONCLUSIONS

1. Branched inflorescence stems of *Crocosmia ×crocosmiiflora* 'Lucifer' may be stored when the first flower in the main inflorescence is fully open, the second is opening, a further buds show visible color.

2. Storage conditions determine both post-harvest longevity and quality of the inflorescences, irrespective of flower food type. The inflorescences stored in fully lit room (186.7 $\mu mol \cdot m^{-2} \cdot s^{-1}$), at 18–25°C and relative humidity 40–50% showed the greatest vase life and the highest ornamental value.

3. Flower food Floralife 200 and Floralife 300 improved vase life and ornamental value of cut inflorescences of *Crocosmia ×crocosmiiflora* 'Lucifer' under all storage conditions.

ACKNOWLEDGMENTS

The research has been funded by West Pomeranian University of Technology in Szczecin.

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