



World Scientific News

WSN 83 (2017) 229-234

EISSN 2392-2192

SHORT COMMUNICATION

Effect of nitric oxide and production location on vase life of cut *Eucomis* 'Sparkling Burgundy' flowers

Piotr Salachna*, Andżelika Byczyńska

Department of Horticulture, Faculty of Environmental Management and Agriculture,
West Pomeranian University of Technology, Szczecin, Poland

*E-mail address: piotr.salachna@zut.edu.pl

ABSTRACT

The available range of cut flowers is constantly supplemented with new species and cultivars, and thus recommendations for their vase life are required. *Eucomis* 'Sparkling Burgundy' is an ornamental bulbous plant with huge potential on the cut flower market. This research investigated the effect of different concentrations of sodium nitroprusside (SNP, a donor of NO) on postharvest quality of cut *Eucomis* 'Sparkling Burgundy'. Plants grown in the two different production locations (field, plastic tunnel). Cut stems were kept in solution containing 0.1 μmol , 100 μmol and 1mmol SNP. The average vase life of *Eucomis* 'Sparkling Burgundy' flowers over all treatments was 44.5 days. Flowers held in 100 μmol SNP had longer vase life, greater fresh weight and solution uptake than the control. Flowers harvested from the plastic tunnel had increased fresh weight, stem length and solution uptake than those from the field.

Keywords: longevity; pineapple lily, preservative solution; sodium nitroprusside

1. INTRODUCTION

Eucomis, commonly known as Pineapple Lily, is a genus of an ornamental bulbous plants in the family Asparagaceae, native to southern Africa [1]. The plants have an original raceme-type inflorescences consisting of numerous star-like flowers [2]. Flower colour varies from white to yellowish green, pink, purple or burgundy, with or without margins varying from pale to dark purple [3]. At the tip of the inflorescence, there is a characteristic rosette of fine leaves. Species and cultivars of *Eucomis* are used as garden and pot plants [4-5] as well as cut plants with a long vase life [6-7]. Apart from the ornamental value, *Eucomis* is an important plant in natural medicine due to its high biological activity [2,8]. A particularly precious cut flower on the florist market is *Eucomis* 'Sparkling Burgundy'. It features a purple-spotted, dark green leaves and erect burgundy stems bear a dense raceme of cream and purple-pink waxy star-shaped flowers. Stems of *Eucomis* 'Sparkling Burgundy' should be harvested when at least half of the florets are open, and stored for no more than 7 days at 2 °C [6]. Cut *Eucomis* 'Sparkling Burgundy' flowers have been shown to respond poorly to floral commercial preservatives [9]. Therefore, more effective preservative solutions to improve the keeping quality of cut *Eucomis* 'Sparkling Burgundy' flowers should be exploited.

Nitric oxide (NO) plays a variety of physiological processes in plants [9-10]. For example, it improves break dormancy, seed germination, plant growth and root system development [11-13]. Furthermore, it is demonstrated that the application of nitric oxide can extend the vase life of some cut flowers [14-17]. The knowledge on exogenous nitric oxide as preservatives for geophytes cut flowers is very limited. Therefore, the purpose of the present study was to investigate the effect of sodium nitroprusside (donor of nitric oxide) on vase life of *Eucomis* 'Sparkling Burgundy' grown in the two different production locations.

2. MATERIALS AND METHODS

Cut *Eucomis* 'Sparkling Burgundy' flowers were obtained from plants grown in the two different production locations: unheated high plastic tunnel and the experimental field plots (Fig. 1) of West Pomeranian University of Technology in Szczecin, Poland (53° 25' N, 14° 32' E, 25 m asl., sub-zone 7a USDA). In mid-August 2016 stems were cut randomly at 9:00-11:00 h using a sharp knife and weighted using an electronic scale electronic (RADWAG PS 200/2000/C/2). Stems were harvested when at least 50% of the florets were open. Flowers in groups of two were placed in 1000 ml flasks (Fig. 2). The treatments were four concentrations of sodium nitroprusside (SNP): 0 (control), 0.1 µmol, 100 µmol and 1mmol SNP. Solutions were prepared at the beginning of the experiment and were not renewed during the experiment. Controls were kept in distilled water. The flowers were kept in a room with controlled temperature and light conditions (20±2 °C, 60-65 % humidity RH, 10-12 µmol m⁻² s⁻¹ light intensity) under a daily light period of 12 h (Fig. 2). Vase life was expressed in days. On the day when the decorative value of the flowers was lost, their fresh weight and length were assessed. Results were statistically analyzed using analysis of variance (ANOVA) and Tukey's test using 12.0 Statistica software.



Figure 1. *Eucomis* 'Sparkling Burgundy' plants growing in the field (left) and in the unheated high plastic tunnel (right)

3. RESULTS AND DISCUSSION

Table 1. Effect of different concentrations of sodium nitroprusside (SNP) and production location on vase life and quality of cut *Eucomis* 'Sparkling Burgundy' flowers. Each value presents a mean±standard errors of 10 replicates for each treatment

Factors	Vase life (days)	Solution uptake (ml)	Final fresh weight (g)	Final length (cm)
SNP concentration				
0	42.2 ± 1.34 b	215 ± 18.5 ab	73.2 ± 1.92 b	75.0 ± 2.56 a
1 µmol	44.3 ± 1.57 ab	180 ± 7.1 c	73.0 ± 1.46 b	76.9 ± 1.68 a
100 µmol	48.4 ± 0.53 a	233 ± 33.5 a	77.2 ± 1.04 a	77.7 ± 6.35 a
1mmol	43.4 ± 0.68 b	185 ± 6.5 bc	74.0 ± 1.80 b	76.9 ± 1.59 a

Production location				
Field	43.5 ± 1.10 a	183 ± 4.91 b	71.5 ± 1.12 b	73.7 ± 2.29 b
Tunnel	45.6 ± 0.83 a	224 ± 17.9 a	77.2 ± 0.27 a	79.5 ± 1.73 a

Sodium nitroprusside used in the preservative solutions had a significant effect on vase life of *Eucomis* 'Sparkling Burgundy' (Table 1). Flowers held in 100 μmol SNP had longer vase life by 6.2 days, over control. On the other hand, application of 0.1 μmol and 1mmol SNP had no effect in prolonging vase life. Previous results also showed that the NO donor sodium nitroprusside (SNP) at proper dose could extend the vase life in cut flowers. Zeng et al. [15] reported that increasing the concentration of SNP from 0.05 to 0.15 mmol significantly extended obviously the vase life of *Dianthus caryophyllus* 'Monte' while treatment with 0.2 and 0.5 mmol SNP did not increase longevity of flowers as compared to control. Liao et al [15] found that exogenous application of the 50 μM SNP for 48 h could increase vase life of cut *Rosa hybrida* 'Kardinal' flowers, while 500-1000 μM SNP treatments decreased flower display life. The enhancement in vase life in solutions containing SNP might be due to the fact that nitric oxide could act as agent plant by modulation of endogenous ethylene emission [9-10].



Figure 2. *Eucomis* 'Sparkling Burgundy' flowers exposed to sodium nitroprusside; inflorescences from the field (left) and tunnel (right)

As shown in Table 1, there were no significant differences in length of inflorescences cut *Eucomis* 'Sparkling Burgundy' flowers between the control and treatment with the 0.1 μmol , 100 μmol and 1mmol SNP. Different concentrations of SNP had significant effect on fresh weight of cut *Eucomis* 'Sparkling Burgundy' inflorescences on the last day of their decorative value (Table 1). The fresh weight were higher than the control when stems were placed in a solution with 100 μmol SNP. The treatments with 100 μmol SNP also significantly enhanced solution uptake. The increase in relative fresh weight of cut flowers

under nitric oxide treatments has also been reported in *Lilium* 'Eyeliner' [17] and *Rosa* 'Utopia' [18]. The positive effect of NO on fresh weight may be attributed to the regulation of water status in cut flowers [15].

Carlson [7] reported that stems of *Eucomis* 'Sparkling Burgundy' harvested from the greenhouse had a longer vase life than those from the field. In current study, results showed that production location had no effect on vase life of cut *Eucomis* 'Sparkling Burgundy' flowers but affected flowers quality regardless of treatment. Solution uptake, fresh weight and stem length of flowers were greater in the greenhouse than in the field (Table 1).

There was no significant interaction between treatments of SNP and production location (data not presented). The average vase life of *Eucomis* 'Sparkling Burgundy' over all treatments was 44.5 days. According to Carlson and Dole [6] *Eucomis* plants may be suitable for greenhouse, tunnel, or field production and has marketable potential as a specialty cut flower possess a long vase life.

4. CONCLUSION

These results indicate that 100 μmol SNP treatment has the potential to be used as a commercial cut flower preservative solution to enhance postharvest quality and prolong the vase life of cut *Eucomis* 'Sparkling Burgundy' flowers. Production location of plants affects on fresh weight, stem length and solution uptake.

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(Received 05 August 2017; accepted 20 August 2017)