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Full Length Research Paper

Effects of 1–MCP (1–methylcyclopropene) and STS (silver thiosulphate) on the vase life of cut *Freesia* flowers

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This study was to determine the effects of 1-methylcclopropene (1-MCP) and silver thiosulphate (STS) treatment on the vase life of *Freesia* "Cordula" flowers. 1-MCP and STS extended the vase life of florets and spikes of cut -*Freesia* "Cordula". The longest spike vase life was also obtained in the 1-MCP (4 nl.l^{-1} + 3 hours) treatment as 9.06 days, spike vase life of control group flowers was 6.33 days.

Key words: *Freesia*, 1-methylcyclopropene (1-MCP), silver thiosulphate (STS), vase life.

INTRODUCTION

Freesia refracta (Jacq) is one of the most commonly produced cut – flower species among bulbous, tuberous and rhizomous ornamental plants, especially in European countries (Zencirkiran, 2002). Cut - *Freesia* flowers have a relatively short vase life (c. 5 days). The development of short vase life is thought to be caused by various factors, such as bacteria, respiration and ethylene production (Eason et al., 1997; Ichimura et al., 1999; Zencirkiran, 2002).

To preserve the best quality of cut- flowers after harvest and to make resistant to fluctuations in environmental conditions, treatment with floral preservatives is recommended (Nowak and Rudnicki, 1990). The addition of many substances to vase solutions promotes the development of young flower buds and delays the senescence of mature flowers (Eason and Webster, 1995).

On the other hand, ethylene is one of the factors involved in causing senescence and short vase life of many cut – flowers (Ichimura et al., 2002). The inhibition of ethylene action by pulse pre-treatment with STS has become an important commercial technique for improving the vase life of flowers, especially when they are to be handled in ethylene-contaminated environments such as supermarkets (Serek et al., 1995; Zencirkiran, 2005). However, Silver is a potent environmental pollutant. Therefore, it needs to be replaced by other non – toxic chemicals (Serek et al., 1995; Ichimura et al., 2002).

A volatile compound, 1-methylcyclopropene (1-MCP), is an inhibitor of ethylene action and appears to be non-toxic chemicals. It has been reported that the vase life of various cut – flowers such as Carnation, *Matthiola*, *Consolida*, *Chrysanthemum*, *Zingiber*, *Anthirrinum* and *Delphinium*, can be extended by exposure to 1–MCP (Serek et al., 1995; Sisler et al., 1996 a, b; Ichimura et al., 2002; Hassan and Gerzson, 2002; Almeida et al., 2002).

The objective of the current research was to determine the effects of two chemical treatments on the vase life of *Freesia* "Cordula" flowers.

MATERIALS AND METHODS

Plant material

Corms of *F. refracta* "Cordula" were used for research material. Corms were kept at 30 ± 1°C in 85 - 90% relative humidity (RH) conditions for 6 weeks to overcome dormancy (Hartesema, 1962). Sprouted corms were planted in plastic house at a distance 10 × 10 cm with shoot tips at the soil surface, on November 2008. During the cultivation period, plant were subjected to natural day length conditions and plastic house temperature was controlled at 18 ± 1°C day, 12 ± 1°C night. Plants were fertilised with 15 N: 6.6 P: 12.5 K/L irrigation water, when 2 - 3 flowers had formed, until bloom as previously described (Wulster and Gianfagna, 1991). The flowers were picked in the morning, when the first coloured buds began to open (Nowak and Rudnicki, 1990), and brought into the laboratory.

1-MCP treatment

The stem of each cut flower was re-cut to 28 - 30 cm and placed in a 3 L jar containing water. Flowers were placed with their bases in

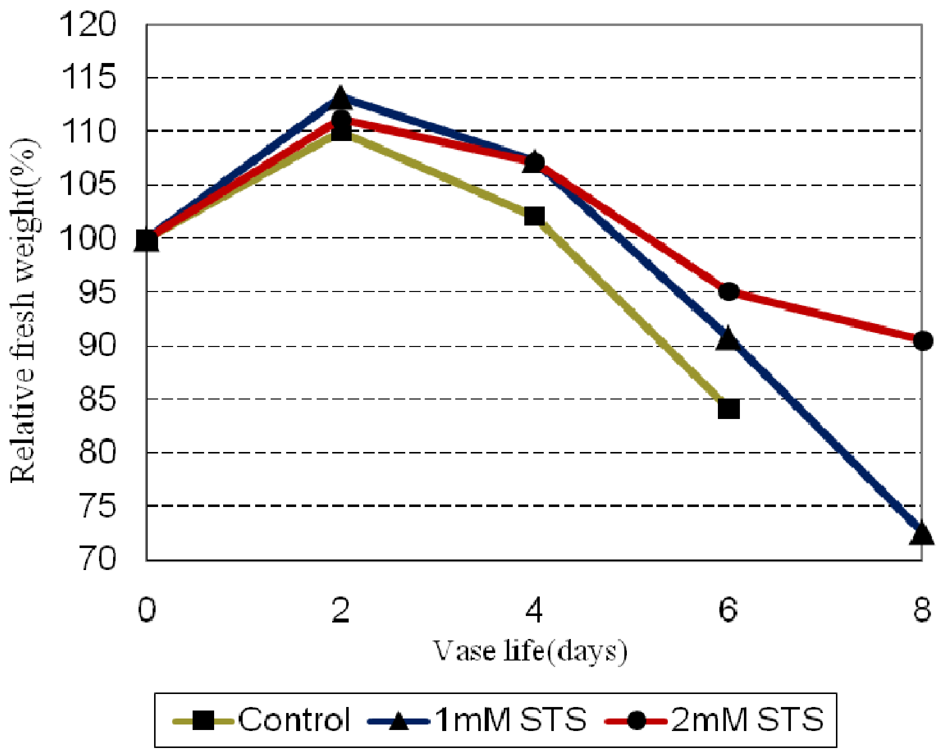

Figure 1. Effects of STS treatment on relative fresh weight in cut - *Freesia* "Cordula" flowers.

water and then in sealed glass chambers at 20°C, and 1 – MCP (2 and 4nL.L^{-1} concentration) was injected into the jar. The flowers were exposed to 1 – MCP for 3 and 6 h (Serek et al., 1995; Sisler et al., 1996a). After the treatments, flowers were transferred to 3 L jar containing 1 L distilled water.

STS treatment

Flowers were pulse – treated for 2 h with 1 and 2 mM STS, prepared as described by Reid et al. (1980). After the treatments, flowers were transferred to 3 L jar containing 1 L distilled water. Control flowers were held in jars without chemical treatment.

Evaluation of fresh weight loss

Fresh weight loss of flowers was measured every 2 days of the vase life period for the various treatments (Waithaka et al., 2001).

Evaluation of vase life

Vase life of cut – flowers was assessed in a controlled environment maintained at 20 ± 1°C, 85 - 90% RH, and a 12 h day length under cool white fluorescent lighting at intensity of 15 mol m^{2}s^{-1}. The vase life of flowers was terminated when 30% of the florets and whole florets (spike) on a cut stem had senesced (Zencirkiran, 2002; Zencirkiran and Mengüç, 2003).

Statistical analysis

In all experiment, flowers were arranged using a completely randomised design in a controlled environment vase life room. The treatment were replicated three times and each replicate consisting of five flowers. All data were analysed using Minitab version 10.1 for windows. Separation of means was done by Duncan multiple range tests at the 0.05 level.

RESULTS AND DISCUSSION

When we investigate the range of fresh weight, it can be seen that, different applications had different effects on the values of fresh weight. The increase in fresh weight (%) occurred rapidly during the first two days of vase life in all applications. The maximum increase in the value of the fresh weight (%) was observed in the flowers that are exposed to the application of 2nL.L^{-1} + 3 h 1-MCP (Figures 1 and 2).

Typically, cut flowers in the vase initially gain weight and then subsequently lose fresh weight (Joyce et al., 2000). From this point of view, the increase of the fresh weight (%) during the first two days of vase life was consistent with the results of Çelikel and Reid (2002) and Darras et al. (2005). In contrast to the beginning of the vase life, the fresh weight loss was observed after the two days of vase life. We conclude that fresh weight loss can be decreased with applications (STS and 1-MCP) and during the eight days of vase life, the minimum weight loss occurred in the applications of the 2 mM STS (9.46%) and 4nL.L^{-1} + 3 h (16%) 1-MCP (Figures 1 and 2).

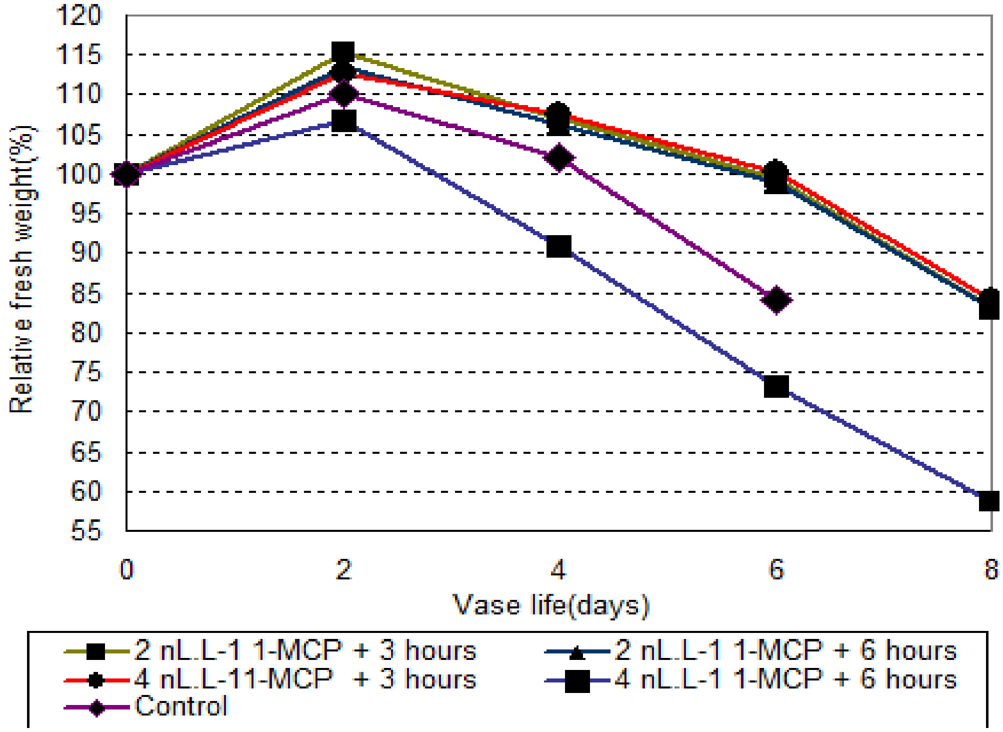

Figure 2. Effects of 1-MCP treatment on relative fresh weight in cut - *Freesia* "Cordula" flowers.

Table 1. Effects of 1-MCP and STS on the vase life of cut *Freesia* "Cordula" flowers.

Treatment	**Vase life (days)**	
	Floret	**Spike**
Control	4.66d*	6.33c*
1 mM STS	6.73c	8.11b
2 mM STS	7.06b	8.36b
2 nL.L-1 1-MCP + 3 h	7.06b	8.60b
2 nL.L-1 1-MCP + 6 h	7.40b	8.23b
4 nL.L-11-MCP + 3 h	7.60a	9.06a
4 nL.L-1 1-MCP + 6 h	7.00bc	8.15b

*Mean seperation in columns by Duncan multiple range test, P = 0.05.

As a result of these applications, the decrease in fresh weight (%) leads to increase of the vase life. This result is also in agreement with the results explained by Çelikel and Reid (2002).

Treatments with 1–MCP and STS extended the vase life of florets and spikes of cut -*Freesia* "Cordula" (Table 1). While vase life of control group florets was 4.66 days, it had increased from 2 - 2.94 days in the STS and 1–MCP treatments. The longest spike vase life was also obtained in the 1–MCP (4 nL.L^{-1} + 3 h) treatment as 9.06 days, spike vase life of control group flowers was 6.33 days (Table 1). The researches made in the cut – flowers as Carnation, *Matthiola*, *Consolida*, *Anthirrinum*, *Delphinum* by Ichimura et al. (2002), Çelikel and Reid (2002), Serek et al. (1995) and Sisler et al. (1996 a, b) reported that 1–MCP and STS treatments had positively effect on vase life. On the other hand, according to Spikman (1989), STS did not affect the ageing of blooming Freesia florets. However, in this research 1–MCP treatments had similar result with STS; even though they had better results (4 nL.L^{-1} 1-MCP + 3 h) than STS.

Although STS extends the vase life of cut *Freesia* flowers, it contains silver that is a potent environmental pollutant. There has been some restriction on its commercial use (Serek and Reid, 1993; Ichimura et al., 1998). Therefore, it needs to be replaced by other non-toxic chemical with the aim of protection of environmental pollution. On the other hand, 1–MCP treatments enhanced satisfactorily, vase life in cut-*Freesia* “Cordula” flowers when compared with control (Table 1). As a result of this research, 1-MCP can be used as alternative treatment in order to extend the vase life of cut - *Freesia* flowers as non-toxic chemical with the aim of protection of environmental pollution.

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