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ORIGINAL ARTICLE

# Effects of Daffodil Flowers and Cobalt Chloride on Vase Life of Cut Rose

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**KEYWORDS**

Copper

Rose

Vase life

**ABSTRACT:** The effects of postharvest application of cobalt chloride were investigated on vase life of rose stood individually in vials and the other ones placing daffodil flowers in a vase with a rose flower. Therefore, roses were treated with: $CoCl_2$ (100, 200, 300 mg $L^{-1}$, respectively) or distilled water (control). The results showed that the decreased vase life of rose flowers, after daffodil was placed in their vase water, is due to daffodil mucilage, which blocks water up take, mainly as a result of increased bacterial growth. Cobalt chloride inhibited vascular blockage in the stem of rose and maintained a high water flow rate through stems, leading to significantly water uptake by cut flowers.



## INTRODUCTION

Short post-harvest vase life is one of the most important problems on the cut flowers, senescence of cut flowers is induced by several factors; e.g. water stress, carbohydrate depletion, microorganism and ethylene effects [1, 29]. Among the above mentioned water relation and balance play a major role in postharvest quality of cut flowers, water relation interruption is mostly due to microorganism proliferation in vase solution and occlusion in the basal end of the cut flower stem by microbes [9]. Daffodil flowers are known to adversely affect the vase life of other cut flowers [1, 25]. Placing 10 Carlton daffodil flowers in vase with 10 cut rose for only 4h at $2^0$C resulted in desiccation and leaf abscission in the rose. Furthermore, the rose petals changed from red to bluish red. Tulips similarly exposed to daffodil flowers showed stem bending, leaf shriveling, and precocious tepal bluing. In Iris, freesia and anemones, flowers opening were inhibited after the short exposure to daffodil flowers [1]. Although Co is not known to be definitely essential for higher plants, increment of shelf and vase life of marigold, chrysanthemum, rose and maidenhair fern has been reported after Co application, also this element has a long-lasting effect in preserving apple; the fruits are kept fresh by Co application after ripening [8].

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Co can impede the production and accumulation of ethylene. This feature might be account for vase life augmentation, as it caused delay in senescence of lettuce by arresting the decline of chlorophyll, protein, RNA and to a lesser extend DNA [15, 8]. Mohammadi [17] found that 300 mg $L^{-1}$ of cobalt chloride had the highest effect on longer vase life, water absorption and loss of fresh weight in *Polianthes tuberosa*. Thus, the aim of this study was to investigate the effect of different concentrations of cobalt chloride on enhancing the quality and postharvest life of cut rose flowers that stood individually in vials and the other ones placing daffodil flowers in vase with rose flower.

## MATERIALS AND METHODS

Fresh cut flowers of rose “Red one” were collected from commercial flower growers and transported to the laboratory in water. Stems of flowers were trimmed to uniform length and flowers were placed in glass vials in a climate controlled room at 20 $^{0}$C. Rose flowers stood individually in vials with deionized water, cobalt chloride (100, 200, 300 $mgL^{-1}$) and with or without daffodil flowers. Vase life was determined as the number of days to wilting of flowers. The volume of water uptake was calculated by subtracting the volume of water evaporated from a control bottle without cut flowers from the amount of water decreased in bottles containing flowers. The electrolyte leakage was measured 10 days after the beginning of the experiment by taking five petal discs (1 $cm^2$ each). The petal discs were rinsed well in deionized water, and then were incubated in 10 ml of deionized water for 24h at room temperature. After incubation, the conductivity meter (value A) of the solution was measured with a conductivity meter (644 Conductometer, Metrohm, Herisau, Switzerland). The petal discs were killed by boiling in water for 15 min. after cooling to room temperature, the conductivity (value B) of the solution was again measured. The electrolyte leakage was expressed as percent value according to the formula given below [21].

Electrolyte leakage (%) = (value A/ value B) $^{x}$100.

## STATISTICAL ANALYSIS

The record data were statically analyzed using the SPSS software package (SPSS for WINDOWS, standard version, release 6.1). Differences among treatments were further analyzed with the Duncan’s multiple range tests to determine whether the differences between the variables were significant at $p \leq 0.05$.

## RESULTS AND DISCUSSION

The vase life of cut flowers was significantly increased by Co, higher concentration being more effective than 100 mg $L^{-1}$, which in turn was better than control. Consequently the highest vase life belonged to the cobalt chloride 200 mg $L^{-1}$(Figure1).

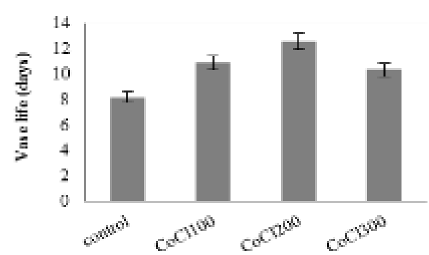


Figure 1.The effect of cobalt choroid on vase life of cut roses. Vertical bars are standard deviations (SD) of means.

The vase life of rose was considerably reduced by placing daffodil in the vase. Vase life of control flowers was limited by leaf and flower wilting and bending of the pedicel. Statistical analysis showed that there were significant differences in flower longevity after Co treatments. The control flowers remained reasonably fresh for 4 or 3 days whereas vase life of the 200 mg $L^{-1}$ was significantly higher (Figure 2).

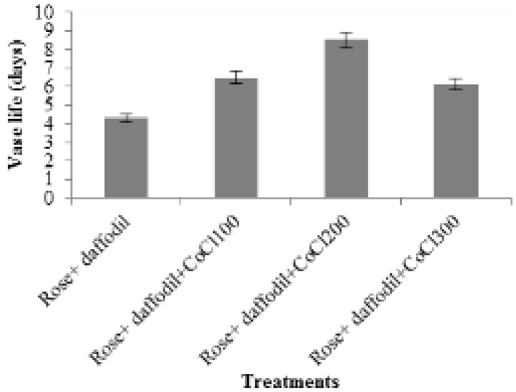


Figure 2.The effects of daffodil flowers and cobalt choroid on vase life of cut roses. Vertical bars are standard deviations (SD) of means.

Post harvest studies on ornamentals occupy a pivotal role in the emerging floricultural business all over the world. Postharvest physiology spans over the time period from harvest or removal of plant from its normal growing environment to the time of utilization [6]. One of the greatest problems in postharvest flower physiology is the blockage of vascular system, due to air or bacterial growth [2, 3 and 4], which reduces water uptake and this blocks xylem vessels leading to water stress [2, 13]. That was expressed in the form of early wilting of leaves or flowers [7], as a result of premature loss of cell turgidity and might appear when water uptake and transpiration are out of balance during a lasting period of time [23]. The results showed that the water up take of the treatments have significant difference ($P \leq 0.05$).Water up take of cut rose held in distilled water decreased while maximum water uptake those held in Co treatments (Figure 3).

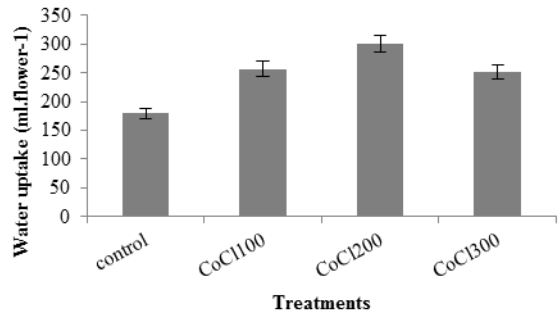


Figure 3.The effect of cobalt choroid on water up take of cut roses. Vertical bars are standard deviations (SD) of means.

The rate of water up take of cut rose flower was much reduced when daffodil was placed in the same vase. Co significantly increased water up take by cut flower over than control (Figure 4).

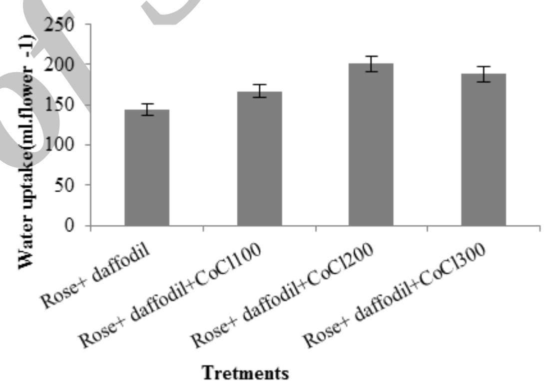


Figure 4.The effects of daffodil flowers and cobalt choroid on water up take of cut roses. Vertical bars are standard deviations (SD) of means.

Our results showed that Co effectively inhibited vascular blockage in the flowers. Venkatesh Reddy [26] found that the extended vase life in response to Co was related to (1) an increased amount of water uptake in to flower, (2) maintenance of the water balance during opening, (3) a delay in loss of fresh weight, (4) a prevention of the occurrence of bent neck. It has been reported that Co increased water uptake of cut rose, it may be acted by inhibiting vascular blockage. Co also improved the water balances in the cut flowers, which could be mediated by regulation of the stomatal aperture 27, 20, 13, and 16]. As results, the flowers maintained higher water up take after Co treatment (Figure 3-4). Rose treated with Co had a greater vase life than control ones (Figure 1-2). Murali and Reddy [18] stated that the maximum vase life in cut gladiolus (*Gladiolus grandiflora* cv. 'Friendship') resulted in treatment with 4% sucrose and 0.5 mM cobalt salt which is in agreement with our results. Co utilization caused delay in aging of vetch [15]. Nabigol [19] reported cobalt chloride extended the vase life of cut chrysanthemum flower about 5 to 7 days as compared to the control extending the shelf life of the fruits such as apple has been documented [8]. As it is indicated in figures 1, 2 our results are in accordance with what has just been mentioned. Ethylene is a plant hormone the endogenous of which is associated with the process of senescence [11, 28]. Co is known inhibitor of ethylene synthesis and ethylene action [10], reduced the senescence of the flowers and consequently, the advanced in increase vase life [26, 12]. As seen in Figure5; the least ion leakage belonged to 200 mg $L^{-1}$ cobalt chloride which was significantly lower than the other treatments. But the most stable ion leakage was seen in control flowers. Daffodil flowers recorded higher petal tissue electrolyte leakage and had decreased vase life rose flower. On the other hand, flowers placed in Co treatments showed a significant reduction in petal electrolyte leakage (Figure 6).

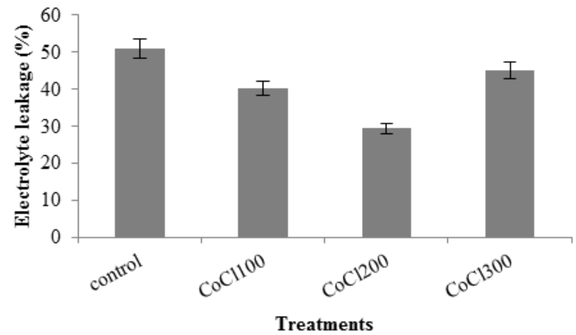


Figure 5.The effect of cobalt choroid on electrolyte leakage of cut roses. Vertical bars are standard deviations (SD) of means.

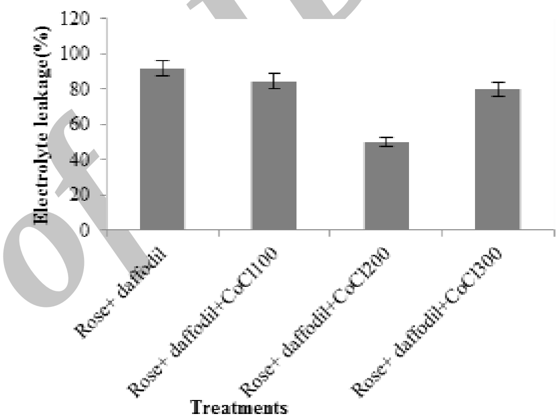


Figure 6. The effects of daffodil flowers and cobalt choroid on electrolyte leakage of cut roses. Vertical bars are standard deviations (SD) of means.

Guiboileau and colleagues [5] have mentioned membrane lipids degradation as leaf senescence progress which results in ion leakage. Maaleku colleagues [14] have considered ion leakage as an index of membrane integrity and damage in plants during senescence. Sultan and Farooq [22] have showed that senesces of cut flower is associated with ion leakage increment. Our results confirm this issue. The present results corroborate the findings of Barendse [1], showing that ‘Carlton’ daffodil has a negative effect on the vase life of roses and tulips. It has been suggested that leaf abscission may hypothetically relate to toxin effect of the daffodil and to ethylene production due to water stress [1, 26]. Mucilage often drips out of a daffodil stems, immediately after cutting of the stem, and probably also leaks out into the vase solution. Mucilage apparently can have two effects: it increases bacterial growth and it is toxic and its main effect is apparently blockage of water uptake due to bacterial growth. Van Doorn [24] suggested that the effect of daffodil mucilage on cut rose was apparently due to its sugars and polysaccharides, as the negative effects on vase life were also produced by the aqueous fraction after separation into an aqueous and n-butanol fraction. The former contained no alkaloids, but did contain sucrose, reducing sugars and polysaccharides. These may well be the main cause of increased bacterial growth.

## CONCLUSION

The results of this study showed that daffodil flowers, can negatively affect the vase life of cut rose flower. Co exerts a dual effect in delaying senescence of cut rose, by increasing the water up take, leading to increased vase life.

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