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Prolonging vase life of cut rose (*Rosa hybrida* L. cv. red pearl) through chemical preservatives

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ABSTRACT

An experiment was conducted to find out the preservative solution for extending the vase life of cut rose (Red pearl cultivar). Ten chemical preservative solutions were used for vase life analysis and these were T_0: Tap water (Control); T_1: Sugar (50-ppm); T_2: Citric Acid (50-ppm); T_3: Salicylic Acid (50-ppm); T_4: Chitosan (50-ppm); T_5: Silvar Thiosulphate (50-ppm); T_6: Sugar + Citric Acid (50-ppm); T_7: Sugar + Salicylic Acid (50-ppm); T_8: Sugar + Chitosan (50-ppm) and T_9: Sugar + Silvar Thiosulphate (50-ppm). From the experiment, maximum stem diameter (4.60 mm), period for first petal spreading (6.1 days), petal water content (65.4%) and vase life (15.7 days) was found from T_7. On the other hand, minimum flower head diameter (31.8 mm), petal discoloration score (1.5) and flower freshness score (3.0) were also found from T_7. Combined application of sugar and salicylic acid was the best among the chemicals used for extending vase life of cut rose cv. Red pearl.

Key words: *Rose, chemical preservatives and vase life*

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I. Introduction

Rose (*Rosa hybrida* L.) is the most popular cut flower in the world. It's longevity in the flower vase can be increased by using the vase life extending solutions. Addition of sugar to the vase solution counteracted the adverse effects of defoliation on petal color and overcome the increased bud blasting (Susan, 2003). The use of 125 mgL^{-1} salicylic acid the vase life was significantly extended (Feigel-Terek *et al.*, 2010; Fariba *et al.*, 2012). Citric acid and sucrose combined had significant effect on the vase life of cut flowers (Darandeh *et al.*, 2010) specifically cut rose (Shirin and Mohsen, 2011). Silver Thiosulphate with sucrose increased fresh weight, water uptake, flower diameter and flower vase life (Shirin and Mohsen, 2011). Considering the above facts the current study was undertaken to find out the appropriate preservative solution for extending the vase life of the cut rose.

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II. Materials and Methods

Location and period of the study: Experiment was conducted at 2abiotech, Department of Horticulture of the Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during June 2014 to July 2014 to find out the preservative solution for extending the vase life of cut rose (cv. Red pearl).

Treatments and experimental design: Ten chemical preservative solutions were used for vase life analysis and these were T_0: Tap water (Control); T_1: Sugar (50-ppm); T_2: Citric Acid (50-ppm); T_3: Salicylic Acid (50-ppm); T_4: Chitosan (50-ppm); T_5: Silvar Thiosulphate (50-ppm); T_6: Sugar + Citric Acid (50-ppm); T_7: Sugar + Salicylic Acid (50-ppm); T_8: Sugar + Chitosan (50-ppm) and T_9: Sugar + Silvar Thiosulphate (50-ppm) using Completely Randomized Design (CRD) with three replications.

Data collection: Data were collected on stem diameter, flower head diameter, petal discoloration score, flower freshness score, days taken for first petal spreading, solution uptake, petal water content and vase life. Flower petal color change or discoloration (fading) was assessed according to the procedures described by Macnish *et al.* (1999) with rating scale of 1 = none/slight fading, 2 = moderate fading and 3 = advanced fading. Freshness of flower was scored on 1-5 scale (1 = fresh flower, 2 = very slight petal enrolling, 3 = noticeable in-rolling, 4 = petal shriveling and 5 = maximum petal shriveling). Solution uptake was measured by subtracting the solution at the last days in flower vase from the initial solution of the flower vase. Petals water content (% WP) was determined with the below equation (Kalate Jari *et al.*, 2008):

$$\%WP = \{(FW-DW) \div DW\} \times 100$$

Statistical analysis: Collected data were analyzed statistically using MSTAT-C computer package program and significance of the difference among the treatment means was estimated by the Least Significant Difference (LSD) test at 5% level of significance (Gomez and Gomez, 1984).

III. Results and Discussion

Stem diameter

Stem diameter of rose showed significant variation among different vase solutions at different days after treating. Maximum stem diameter was found from T_7 (4.6 mm) followed by T_9 (3.9 mm) whereas minimum from T_0 (1.0 mm) at 7^{th} days after treating (Figure 01a). Study showed that largest stem diameter for rose was found in a combination of sugar and silver thiosulphate. Exogenous sugar functions as an integral component for retaining the structure of the cell membranes in the rose cells (Kaltaler and Steponkus, 1976). This is the reason why the sugar in the combination treatment helped maintain healthy cells and thus give rise to a large stem diameter. The silver thiosulphate in the treatment worked as a deterrent to the autocatalytic production of ethylene (Ichimura and Hiraya, 1999; Mor *et al.*, 1984; Sexton *et al.*, 1995).

Flower head diameter

Flower head diameter varied significantly due to the variation of vase solution. However, minimum flower head diameter was found from T_7 (31.8 mm) which was statistically identical with T_9 (34.4 mm) while maximum from T_0 (52.0 mm) at 7^{th} days after treating (Figure 01b). Silver Thiosulphate with sucrose increased flower diameter (Shirin and Mohsen, 2011).

Petal discoloration score

Score for the petal discoloration was varied significantly among the vase solution. Minimum petal discoloration score was found from T_7 (1.5) followed by T_9 (1.8) while maximum petal discoloration score was found from T_0 (2.8) at 7^{th} days after treating (Figure 02a). Rose flower provided petal discoloration score about 2.0 using sucrose and lemon juice solution (Mehraj *et al.*, 2013). In current experiment it was found petal discoloration score less than 2.0 which may be due to the use of salicylic acid in vase solution. In this case sucrose may act as the CHO supplier and salicylic acid acted as the

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germicides. Addition of sugar to the vase solution counteracted the adverse effects of defoliation on petal color and overcome the increased bud blasting (Susan, 2003).

Flower freshness score

Flower freshness score showed significant variation among the vase solutions. Minimum score was recorded from T_7 (3.0) followed by T_9 (3.7) while maximum from T_0 (5.0) at 7th days after treating (Figure 02b). Mehraj *et al.* (2013) was also found the freshness score about 2.50 which presented the resemblance of the present study. Effect of long life pulsing in keeping flower stems fresh seems to be mainly associated with its effect on ethylene action since ready foods of flowers contain anti ethylene compounds, which is beneficial for maintenance of flowers as fresh as possible for a longer period. Effects of ethylene can however be prevented by citric acid and sucrose acted as ready foods for cut flowers (Mehraj *et al.*, 2013). But present study showed that salicylic acid performed better than citric acid.

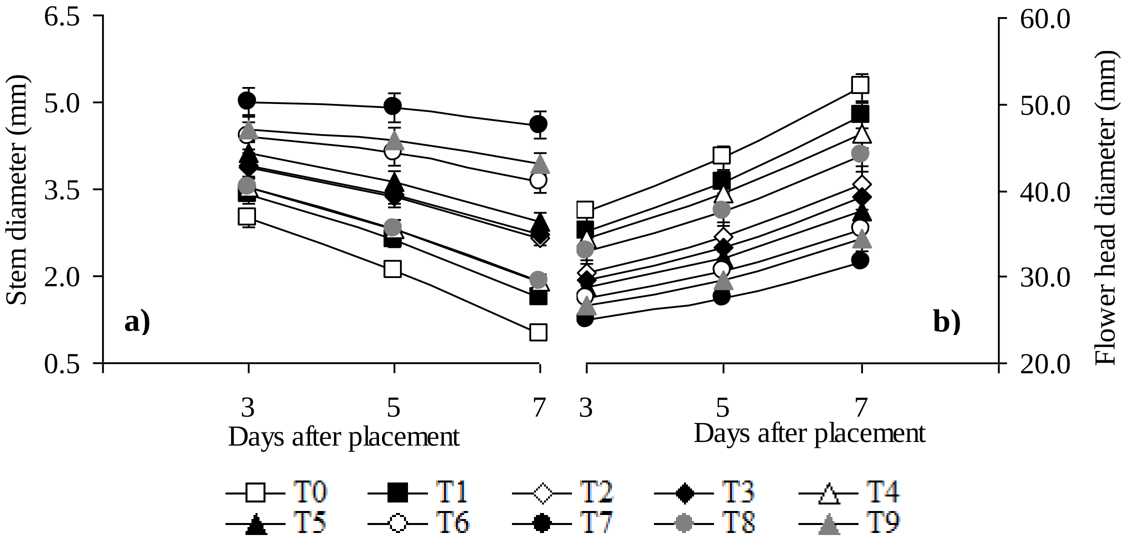

Figure 01. Response of cut rose to different vase solution on a) stem diameter and b) flower head diameter

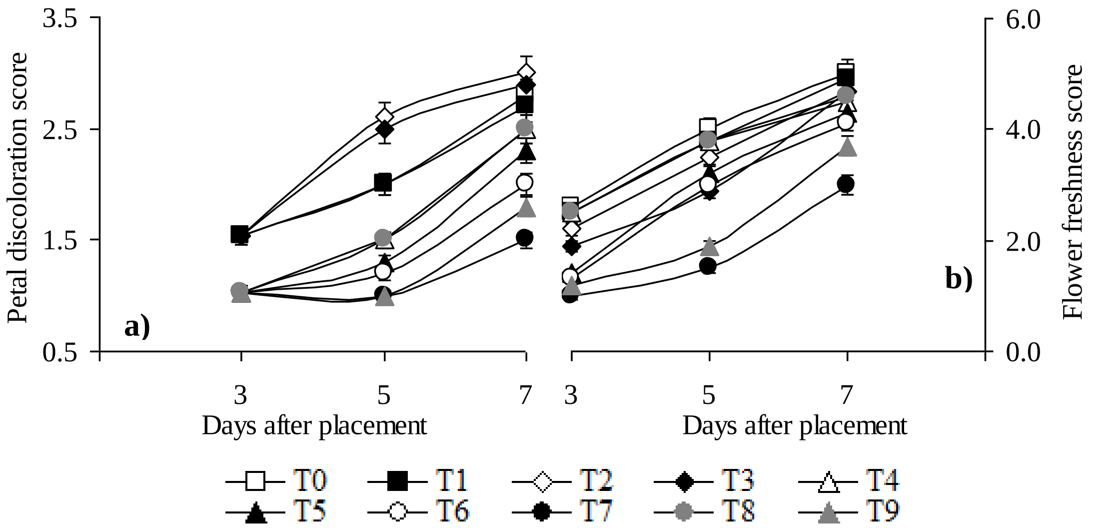

Figure 02. Response of cut rose to different vase solution on a) petal discoloration score and b) flower freshness score

Days taken for first petal spreading

Days taken for first petal spreading were varied significantly among the vase solutions. However, maximum days for first petal spreading was required by T_7 (6.1) followed by T_9 (5.1 days) while minimum from T_0 (2.1 days) (Table 01).

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Solution uptake

Solution uptake by flower varied significantly among the vase solutions. Maximum vase solution was up taken by T_2 and T_3 (79.2 ml) followed by T_7 (74.2 ml) and T_9 (73.2 ml) whereas minimum from T_0 (63.2 ml) (Table 01). The more water absorption was occurred due to the application of salicylic acid (Hajireza *et al.*, 2013) and sucrose (Shirin and Mohsen, 2011) in comparison with control. Silver thiosulphate with sucrose also increased water uptake (Shirin and Mohsen, 2011). An important factor contributing to low vase life is the vascular blockage caused by microorganisms clustering at the bottom of the cut stem (Van Dome, 1990). Salicylic acid has a pH of 2.4 and bacteria are unable to thrive in such acidic conditions. As a result, vascular blockage is prevented and solution uptake can be maximal (Raskin, 1992). Citric acid also acts as an acidic agent, which prevents the infestation of bacteria and thus maintains a healthy vascular passage for optimum solution uptake. Here, cut flowers get necessary food from sucrose salicylic acid control the germicidal action into vase solution and prevent the vascular blockage and that may be responsible for the maximum solution uptake. SA at 150 mg L^{-1} increased mean absorbed preservative solution (Banaee *et al.*, 2013).

Petal water content

Petal water content of cut rose varied significantly among the vase solutions. Maximum petal water content was found from T_7 (65.4%) whereas minimum from T_0 (28.6%) (Table 01). SA treatments increased petal water content (%) by 73% compared to the controls in chrysanthemum (Vahdati Mashhadian *et al.*, 2012). Post-harvest application of SA (150 mg/L) maintain higher antioxidant enzyme, stability of membrane and leading to delay in petal senescence (Hatamzadeh *et al.*, 2012).

Vase life

Vase life of cut rose varied significantly among the vase solutions. Maximum vase life was found from T_7 (15.7 days) followed by T_9 (14.0 days) while minimum from T_0, T_2 and T_3 (8.3 days) which was statistically identical with T_1 (8.7 days) (Table 01). Rose flower showed maximum 14.0 days in flower vase (Mehraj *et al.*, 2013). It was observed that sucrose maintained prolonged vase life for 11 days than other treatment (Anserwadekar and Patil, 1986). Salicylic Acid and sucrose increases vase life by improving the antioxidant system and reducing oxidative stress damages during rose flower senescence (Gerailoo and Ghasemnezhad, 2011) and lily flower senescence (Kazemi and Ameri, 2013). The significant increase (300%) in vase life is considered to be due to plant regulating and anti-stress properties of salicylic acid and citric acid (Vahdati Mashhadian *et al.*, 2012). On the other hand, silver thiosulphate with sucrose also increased fresh weight, water uptake, flower diameter and flower vase life (Shirin and Mohsen, 2011).

Table 01. Response of cut rose on some vase life characteristics to different vase solutions[X]

Treatments[Y]	Days taken for first petal spreading	Solution uptake (ml)	Petal water content (%)	Vase life (days)
T_0	2.1 e	63.2 g	28.6 j	8.3 e
T_1	4.1 c	66.2 f	30.6 i	8.7 e
T_2	1.1 f	79.2 a	33.0 f	8.3 e
T_3	1.1 f	79.2 a	33.6 e	8.3 e
T_4	3.1 d	74.2 b	31.0 h	10.7 d
T_5	4.1 c	69.2 e	52.2 c	13.7 b
T_6	5.1 b	72.2 d	54.1 b	14.0 b
T_7	6.1 a	74.2 b	65.4 a	15.7 a
T_8	4.1 c	69.2 e	31.8 g	12.0 c
T_9	5.1 b	73.2 c	48.8 d	14.0 b
LSD 0.05	*0.7*	*0.9*	*0.5*	*0.7*
CV %	*3.2*	*5.7*	*4.6*	*3.6*

[X]In a column means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability, [Y]Different vase solutions

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IV. Conclusion

From the current study it was found that Sugar + Salicylic Acid (50-ppm) was the best chemical treatments for the cut Red pearl rose cultivar. Sugar + Salicylic Acid (50-ppm) can be used to increase the vase life of the cut Red pearl rose for commercial purpose. Further study is suggested assigning all commercially available rose cultivars and diversified chemicals.

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