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Influence of different pulsing and holding solutions on vase life of tuberose

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ABSTRACT

Extended of the vase life is a crucial point of view for commercial cut flower. To improve the vase life of tuberose some preservative solution viz. 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) were used as vase solution. Maximum floret opening (42.7%), first floret wilting (4.3 days), first petal dropping (5.3 days), solution uptake (74.0 ml), petal water content (54.3%) and vase life (9.7 days) was found from T_7 which was followed by T_6. Findings of the study indicated that carbohydrate and acidic mixture as vase solution greatly influence the shelf life of the cut tuberose.

Key words: *Polianthes tuberosa L.*, chemical preservatives and vase life

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I. Introduction

Tuberose (*Polianthes tuberosa* L.) is a very popular sweet scented cut flower. It is commonly used in bouquets for presenting and in vases for interior decoration. There are many floral preservatives to improve the vase-life of cut flowers. Vase life of cut flowers is mainly affected by two main factors, namely ethylene which accelerates the senescence of many flowers and microorganisms which cause vascular blockage and thus reduce the vase life of cut flowers (Van Doorn, 1994; Zencirkiran, 2005; Zencirkiran, 2010). Investigations pertaining to extend the vase-life of tuberose flowers by chemical treatments after harvest have been made with varying success. A floral preservative usually is a complex mixture of sucrose (sugar), acidifier, an inhibitor of microorganisms and also an ethylene action or synthesis inhibitor. Several preservatives/chemicals, i.e., silver nitrate, silvar thiosulphate, aluminium sulphate, cobalt sulphate, 8-hydroxyquinoline sulphate, boric acid, salicylic acid, citric acid, ascorbic acid, sucrose etc. have been used in different formulations and combinations to enhance the vase life of tuberose (Saini *et al.*, 1994; Reddy and Singh, 1996; Reddy *et al.*, 1997; De and Barman, 1998). Tuberose cut flowers had two major reducing agents in its

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postharvest life; ethylene sensitivity and vascular blockage (Meman and Dabhi, 2006). Also, to address the problem of bacterial vascular occlusion, distilled water can be used to make vase solutions, or it is useful to disinfect vases and use the white ones, they will show pollutions. Germicides, especially sodium and calcium hypochlorite, hydroxylquinoline derivatives, aluminum sulfate, cobalt chloride, silver nitrate, citric acid and also treatment with new agents such as herbal essences and silver nano-particles are advised to use (Oraee *et al.*, 2011). The purpose of this study was to find out the influence of different pulsing and holding solutions on flower quality and vase life of tuberose.

II. Materials and Methods

Experiment was conducted at 2abiotech, Department of Horticulture, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh from October 2012 to March 2013 to find out the appropriate chemical preservative solution for extending the vase life of tuberose. Equally maintained flowers were collected from Horticulture farm, Sher-e-Bangla Agricultural University. 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 were collected on floret opening, floret wilting, days to floret wilting, days to first petal dropping, solution uptake, petal water content, vase life and fungal infection. 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):

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

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

Floret opening and wilting: Floret opening of tuberose showed significant variation among different vase solutions at different days after treating. Maximum floret opening was found from T_7 (42.7%) followed by T_6 (38.5%) whereas minimum from T_0 and T_1 (19.8%) at 7^{th} days after placement in the vase solution (Figure 01a).

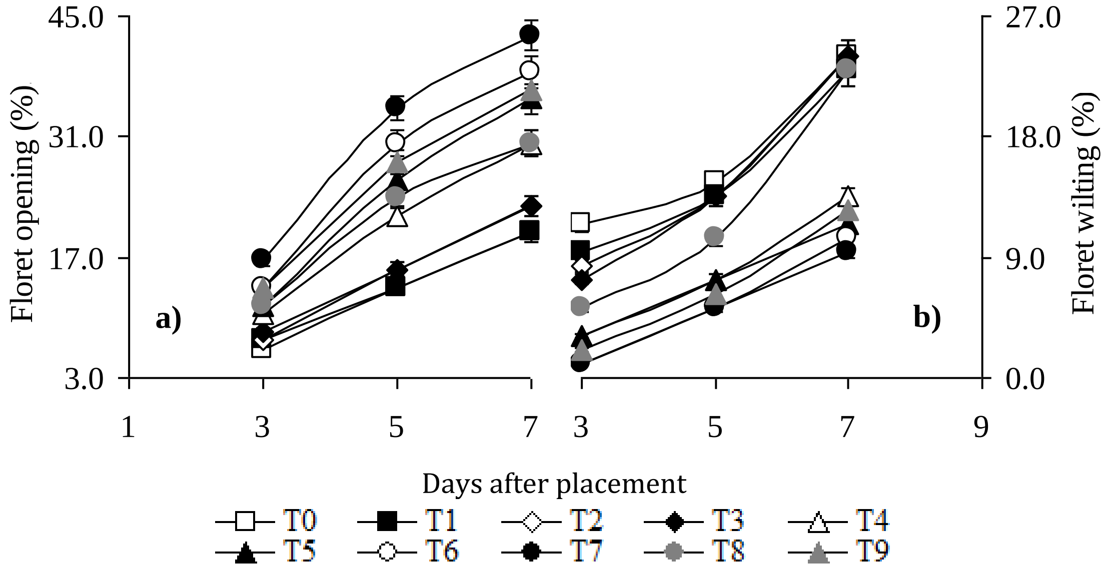

Figure 01. Response of tuberose to vase solutions on a) floret opening and b) floret wilting.

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Floret wilting: Floret wilting varied significantly due to the variation of vase solution. However, minimum floret wilting was found from T_7 (9.4%) followed T_6 (10.4%) and T_5 (11.5%) while maximum from T_0 (24.0%) at 7th days after placement in the vase solution (Figure 01b).

Days to first floret wilting: Days to first floret wilting was varied significantly among the vase solution. Late floret wilting was found from T_7 (4.3 days) which was statistically identical with T_6 (4.0 days) followed by T_9 (3.7 days) while early floret wilting was found from T_0 (1.3 days) (Table 01).

Days to first petal dropping: Days to first petal dropping varied significantly among the vase solutions. Late petal dropping was found in T_7 (5.3 days) which was statistically similar with T_6 (5.0 days); followed by T_9 and T_5 (4.3 days) whereas early from T_0 (2.0 days) which was statistically identical with T_1, T_2, T_3 and T_4 (2.7 days) (Table 01).

Solution uptake: Solution uptake by flower varied significantly among the vase solutions. Maximum vase solution was up taken by T_7 (74.0 ml) which was statistically similar with T6 (73.0 ml); followed by T_9 (71.3 ml) and T_5 (70.3 ml) whereas minimum from T_0 (49.0 ml) (Table 01). After detaching the flower from plant water loses has been started. Pulsing and holding which allows water absorption in flower tissues (Salunkhe *et al.*, 1990) is treated as an ideal flower preservative. Water absorption from the preservative solution maintains a better water balance and flower freshness (Reddy and Singh 1996) and saves from early wilting resulting in enhanced vase-life. The addition of SA to vase water has previously been shown to extend the longevity of cut *Rosa* flowers (Lee *et al.*, 2004; Guy *et al.*, 2003). Salicylic acid increases in water uptake due to it's the acidifying and stress alleviating properties (Lee *et al.*, 2004).

Petal water content: Petal water content of tuberose varied significantly among the vase solutions. Maximum petal water content was found from T_7 (54.3%) followed by T_6 (52.0%) whereas minimum from T_0 (28.3%) (Table 01). Salicylic acid increased mean absorbed preservative solution (Banaee *et al.*, 2013).

Table 01. Response of tuberose to different vase solution on different attributes[X]

Vase solution[Y]	Days to first floret wilting	Days to first petal dropping	Solution uptake (ml)	Petal water content (%)	Vase life (days)	Fungal infection
T_0	1.3 g	2.0 f	49.0 h	28.3 j	7.3 e	+
T_1	1.7 fg	2.7 ef	51.3 g	35.4 i	7.7 de	+
T_2	2.0 ef	2.7 ef	53.3 f	39.3 h	7.7 de	-
T_3	2.0 ef	2.7 ef	57.7 e	40.0 g	7.7 de	-
T_4	2.7 d	3.7 cd	65.7 c	43.3 e	8.3 cd	+
T_5	3.3 c	4.3 bc	70.3 b	45.0 d	8.7 bc	-
T_6	4.0 ab	5.0 ab	73.0 a	52.0 b	9.3 ab	-
T_7	4.3 a	5.3 a	74.0 a	54.3 a	9.7 a	-
T_8	2.3 de	3.3 de	62.0 d	41.3 f	8.0 cde	+
T_9	3.7 bc	4.3 bc	71.3 b	48.7 c	8.7 bc	-
LSD 0.05	*0.6*	*0.7*	*1.1*	*0.5*	*0.9*	
CV%	*9.8*	*6.6*	*1.0*	*0.7*	*6.1*	

[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

Vase life: Vase life of tuberose varied significantly among the vase solutions. Maximum vase life was found from T_7 (9.7 days) which was statistically identical with T_6 (9.3. days); followed by T_5 and T_9 (8.7 days) while minimum from T_0 (7.3 days) which was statistically similar with T_1, T_2 and T_3 (7.7 days) (Table 01). Salicylic acid and citric acid along with sugar increases the vase life of rose (Khan *et al.*, 2015). SA has a pH of 2.4 and the acidic solution inhibits bacteria growth and proliferation (Raskin, 1992). SA extended vase life in association with inhibition of ethylene

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production (Srivastava, 2000). Pathogens also affect vase life due to vascular blockage (Van Dome, 1994).

Fungal infection: From the experiment, T_0, T_1, T_4 and T_8 solutions were infected by fungus and rest of the solutions were not to be found by fungal infection (Table 01). Adding a suitable germicide in vase water can prevent the growth of microbes and increase water uptake (Anjum *et al.,* 2001).

IV. Conclusion

Sugar and Salicylic Acid (50-ppm) was the best chemical treatments for tuberose flower quality and vase life which was followed by Sugar and Citric Acid (50 ppm). Based on the findings of this study it can be recommended to use sugar and acid mixture for the improvement of the vase life of tuberose.

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