EFFECT OF DIFFERENT FLORAL PRESERVATIVES SOLUTIONS ON POST HARVEST QUALITY OF TUBEROSE (*POLIANTHES TUBEROSA* L.) CV. DOUBLE

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Abstract: The present study was conducted during 2013-14 to prolong the post-harvest life of tuberose using single or combined holding solutions. Tweleve holding solutions, viz. T_1: 300ppm Al_2SO_4 T_2: 100ppm $CoCl_2$ T_3: 5%Sucrose + 300ppm Al_2SO_4, T_4: 5%Sucrose + 250ppm Citric Acid T_5: 5%Sucrose + 25 ppm $KMnO_4$, T_6: 5%Sucrose +100ppm $CoCl_2$ T_7: 200ppm Citric Acid T_8: 5%Sucrose +200ppm Citric Acid, T_9: 5%Sucrose + Calcium hypochlorite(Ca(ClO)2), T_{10}: 5%Sucrose + 200ppm 8HQC, T_{11}: 5%Sucrose + 200ppm 8HQC + GA_3 100ppm and T_{12}: Control (Deionized water) were used in a completely randomized block design with 3 replications. The results showed that holding solutions in single or in combined form significantly affected the post harvest quality of tuberose. The maximum vase life, floret size, vase life of individual flower, floret opening percentage and solution absorption by spikes were obtained with T_4 (5%Sucrose + 250ppm Citric Acid) while maximum days to opening of basal florets and number of florets open at senescence of basal floret were obtained when spikes were held in containing the solutions (5%Sucrose + 300ppm Al_2SO_4) under the treatment T_3.

Keywords: Pulsing solution, Holding solution, Floral preservatives solutions, Tuberose, Vase life

INTRODUCTION

Tuberose botanically known as (*Polianthes tuberosa* L.) is a very popular bulbous flowering plant grown for cut flowers as well as for loose flowers in India. It is native of Mexico and belongs to the family Amaryllidaceae. The white and sweet scented flowers are valued as cut flower, used in bouquets for making garlands, venis and also as a source of essential oils for perfumery industries. Tuberose flowers are highly perishable and therefore need to be treated with suitable chemicals, to enhance their vase life and improve quality. It has been proved that post harvest treatments with chemicals prevent vascular infections and inhibit ethylene production and thereby result in prolong storage period and higher quality flowers with increased vase life (Vidhya Sankar and Bhattacharjee 2002). Among the chemicals, silver nitrate, aluminium sulphate, cobalt sulphate, 8-hydroxyquinoline sulphate, boric acid, citric acid, ascorbic acid, sucrose etc. have been used in different formulations and combinations to enhance the vase life of tuberose (Reddy *et al*. 1995). Therefore, the present investigation was undertaken to study the combined influence of holding solutions on post harvest quality of tuberose spikes

MATERIAL AND METHOD

The experiment was conducted at Post harvest laboratory, Department of Horticulture, SVPUAT, Meerut during July to August, 2014 at ambient temperature of 30-35ºC in completely randomized block design. Each flower spike was harvested with uniform length between 7.00 am to 7.30 am at a stage when the first 1-2 florets start opening. Immediately after harvest, the flowers are put in deionized water for 20 minutes and then they were stored in different holding solutions. Treatment details of holding solutions used in the experiment consists of : T_1: 300ppm Al_2SO_4 T_2: 100ppm $CoCl_2$ T_3: 5%Sucrose + 300ppm Al_2SO_4, T_4: 5%Sucrose + 250ppm Citric Acid T_5: 5%Sucrose + 25 ppm $KMnO_4$, T_6: 5%Sucrose +100ppm $CoCl_2$ T_7: 200ppm Citric Acid T_8: 5%Sucrose +200ppm Citric Acid, T_9: 5%Sucrose + Calcium hypochlorite(Ca(ClO)2), T_{10}: 5%Sucrose + 200ppm 8HQC, T_{11}: 5%Sucrose + 200ppm 8HQC + GA_3 100ppm and T_{12}: Control (Deionized water). Observations were recorded on vase life of spikes, floret size, days to opening of basal florets, vase life of individual flower, number of florets open at time, floret opening percent and solution absorption by spikes.

RESULT AND DISCUSSION

A perusal of data (Table 1) revealed that all the holding solutions in different treatments were significantly affected the vase life of spikes. Vase life of spikes was recorded by calculating the number of days taken for 50% withering of flowers on the spike as suggested by Padaganur *et al*. (2005). Vase life of individual florets was recorded by taking the number of florets wilted every day divided by the total number of florets per spike. The results showed that the maximum vase life (7.99 days) was observed in treatment T_4 followed by, in the treatment T_3 (7.55 days) and it was minimum (4.85 days) in control. The increased vase life in days under the treatment T_4 and T_3 might be due to better water relations, delay in protein degradation, maintenance of membrane integrity, leading to delay in petal senescence (Vijaylakshmi and Rao, 2014). The present results were in accordance with Jature *et al.,* (2009) and Kumar *et al.* (2010). Improvement in

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vase life of spikes with citric acid was due to acidification of the solution, improvement in water balance and reduction in stem plugging (Durkin, 1979). Significant variation was observed among the treatments in terms of floret size and varied from 2.10-3.17 cm. The maximum floret size (3.17 cm) was observed when spikes were held in the solution containing 5% sucrose + 250 ppm citric acid under the treatment T_4 followed by, treatment T_3(2.62 cm) which was statistically at par with T_1 and T_6 and minimum floret size (2.10 cm) observed under control. Flowers held in citric acid @ 250 ppm along with sucrose 4% influenced flower size by increasing water uptake, maintaining normal levels of transpirational loss of water, improved water balance, there by increased the diameter of flower. Treatment comprising sucrose with citric acid and Al_2SO_4 had shown a significant effect on days to opening of basal floret and it was maximum (3.67 days) noted under the treatment T_3 which was significantly at par with T_1 followed by, (3.43 days) under the treatment T_{11} when spikes were kept with containing the solution 5%Sucrose + 200ppm 8HQC + GA_3 100ppm and treatment T_5, (3.28 days) which was also at par with the treatment T_8 and T_{10} and minimum days to opening of basal floret (2.43 days) was observed under control. Vase life of individual flower also differed due to different treatments and it was maximum under the treatment T_4 (5.83 days) followed by, (4.30 days) under the treatment T_3 and it was statistically at par with the treatment T_2, T_4, T_5, T_7, T_8, T_9, T_{10} and T_{11} while minimum vase life of individual flower (1.11 days) was recorded under control when spikes were kept deionized water. Sucrose in combination with either citric acid or aluminium sulphate maintains endogenous levels of soluble sugars and soluble proteins which in turn provide energy for floret development and increased the longevity of flower (Hussain *et al.*, (2001). These results were in accordance with Varu and Barad (2008) and Kumar *et al.* (2007) in tuberose. Pal and Sirohi (2007) also reported that combination of sucrose + citric acid and sucrose + aluminium sulphate, increased the cut flower longevity by increasing water uptake and maintaining cut flower longevity in gladiolus. Further, significant influence of different chemical solutions as single and in combined form was observed in terms of number of florets open at senescence of basal floret and it was maximum (4.59 floret) observed under the treatment T3 followed by, treatment T_2 (4.12 florets) when spikes were held in 100 ppm CoCl2 solution and it was minimum (3.39 floret) recorded under control. The maximum number of flower open at senescence of basal florets might be due to better water relations, delay in protein degradation, maintenance of membrane integrity, leading to delay in petal senescence. The data indicated that floret opening percentage was also influenced by different chemical solutions and it was maximum observed (80.77%) under the treatment T_3 followed by, (75.61%) when spikes were treated with 5% sucrose + 250 ppm citric acid solutions under the treatment T_4 and minimum opening (51.74%) was recorded under control. $Al_2(SO_4)_3$ has been found to acidify the holding solution to reduce bacterial and fungal growth hence increases the water absorption by spikes and increased the opening of florets percentage. (Halevy and Mayak 1981, Bhattacharjee, 1999) Significant variations in the solutions absorbed by the spikes were also observed with different treatments. The spikes held in solution with 5% sucrose + 300 ppm Al_2SO_4 under the treatment T_3 significantly absorbed maximum (93.69 ml) solutions followed by, the treatment T_5 (88.24 ml) and minimum absorption (57.91 ml) was observed under control. High transpiration loss of water by tuberose spikes held in citric acid 250 ppm might be due to higher water uptake to avoid temporary water stress and minimum loss of water was observed in control due to decreased water uptake, there by the quantity of water. Similar results were also reported by (Vijayalakshmi and Rao, 2014) in tuberose.

Table 1: Effect of different floral preservatives solutions on post harvest quality of tuberose (*Polianthes tuberose* L.) cv. Double

	Treatment	Vase life(days)	Floret size(cm)	Days to opening of basal floret(days)	Vase life of individual flower (days)	No. of florets open at senescence of basal floret	Floret opening %	Solution Absorption/ spike(ml)
T_1	300ppm Al_2SO_4	6.75	2.53	3.62	3.90	3.75	61.94	68.56
T_2	100ppm $CoCl_2$	6.65	2.32	2.91	3.09	4.12	65.27	69.81
T_3	5%Sucrose + 300ppm Al_2SO_4	7.55	2.62	3.67	4.30	4.59	75.61	88.24
T_4	5%Sucrose + 250ppm Citric Acid	7.99	3.17	2.88	5.83	3.59	80.77	93.69
T_5	5%Sucrose + 25 ppm $KMnO_4$	6.52	2.19	3.28	3.31	3.73	65.52	62.06
T_6	5%Sucrose +100ppm	7.11	2.53	3.09	2.81	3.63	60.33	

	$CoCl_2$							64.57
T_7	200ppm Citric Acid	6.50	2.43	3.09	3.74	3.67	68.43	74.29
T_8	5%Sucrose +200ppm Citric Acid	7.14	2.51	3.25	3.55	3.81	63.43	83.67
T_9	5%Sucrose + Calcium hypochlorite(Ca(ClO)2)	6.27	2.41	2.89	3.00	3.59	57.76	66.87
T_{10}	5%Sucrose + 200ppm 8HQC	6.00	2.33	3.20	3.16	3.73	57.82	73.18
T_{11}	5%Sucrose + 200ppm 8HQC + GA_3 100ppm	6.40	2.38	3.43	3.46	4.06	62.83	75.08
T_{12}	Control	4.85	2.10	2.43	1.11	3.39	51.74	57.91
	MSE	**0.015**	**0.031**	**0.029**	**3.813**	**5.627**	**0.081**	**0.846**
	CD at 5%	**0.100**	**0.144**	**0.140**	**1.594**	**1.937**	**0.232**	**0.751**

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