STUDIES ON PROLONGING THE VASE LIFE OF ROSE FLOWERS WITH CITRIC ACID AND SUCROSE SOLUTION

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ABSTRACT

Rose is a woody perennial flowering plant belongs to the family Rosaceae is known for their high economic value, which is used for decorative purposes, cosmetics and perfumes. An experiment was conducted at Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu during 2015 to 2016 to find out best concentration of citric acid and sucrose solution that enhances and prolongs the better flower quality. Experiment was laid out in completely randomize design with eleven treatments and three replication. Among all these treatments, Citric acid 125 ppm + 8% sucrose (T_8) recorded maximum days the flower remains fresh with a vase life of 13.41 days, rose flowers took 14.12 Days taken for color change, 10.62 Days taken for flower shriveling, recorded water uptake of 17.43 and flower diameter of 12.93.

Keywords: Rose, Sucrose, citric acid.

INTRODUCTION

A rose is a woody perennial flowering plant of the genus *Rosa*, in the family Rosaceae. There are over three hundred species and ten thousands of cultivars. Rose plants that can be erect shrubs, climbing, or trailing, with stems that are often armed with sharp prickles. Flowers vary in size and shape are usually large, showy, colours ranging from white, pink, yellows, red and more. Rose is known for their high economic value, which is used for decorative purposes, cosmetics and perfumes. Rose are being use as cut flowers, which greatly deals with the floricultural business (Butt, 2003). But, fresh cut flowers are highly perishable due to limited water uptake, low available energy and susceptibility towards ethylene (Gerailoo & Ghasemnezhad, 2011). Senescence of cut flower is due to low water uptake due to xylem vessel blockage by air and microorganism (Elgimabi & Ahmed, 2009). Bending of the floral axis just below the flower head, which is called bend neck, wilting of petals and leaves and incomplete bud opening are the major symptoms that indicate the end of vase life of roses (Asen *et al*., 1971). Water lost through transpiration from the leaves is replaced by water moving from petal and neck, which results in wilting of petals, bent neck and drooping of leaves (Evans & Reid, 1988).

Different factors affect the vase life of cut flowers are chemical and physiological factors such as the content of stored foods of flower, humidity, light, and temperature of the place where vase is kept. Vase life is also determined by many factors like reduced carbohydrate level (Ketsa, 1989), reduced water absorption (Sankat & Mujaffar, 1994) and ethylene effects (Wu, *et al*., 1991). Cut flowers are forced to continue living with reserved carbohydrates, proteins and fat for their longevity. Another important factor which helps the vase life is its content of stored foods. Sucrose act as a source of energy required for the continuation of the vase life of the cut flowers and also helped for the improvement in the keeping quality value of Anthurium cut flowers. Among all the different types of sugars, sucrose has been found to be the most commonly used sugar in prolonging vase life of cut flowers. Sugar has an important role in the longevity of flowers, especially cut flowers, because after harvest they receive no nutritional and hormonal support from the mother plant (Van Doorn and Meer teren, 2003). Citric acid reduced bacterial population in vase solution and increased the water

conductance in xylem of cut flowers (van Doorn, 1997). Hence, this experiment was to assess the effects of different concentrations of sucrose and citric acid on the vase life of rose and to find out optimum concentration for prolonging vase life.

MATERIALS AND METHODS

The present experiment was carried out in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu during 2015 to 2016. The experiment was carried out in Completely Randomized Design with three replications. Citric acid and sucrose were used in different combinations. Each treatment have three flowers with each flower as one replication. Rose flowers were harvested at flower bud stage and kept in each vase solution. The treatment combination used in the experiment are T_1 Citric acid 50 ppm, T_2 Citric acid 50 ppm + 8% sucrose, T_3 Citric acid 75 ppm, T_4 Citric acid 75 ppm + 8% sucrose, T_5 Citric acid 100 ppm, T_6 Citric acid 100 ppm + 8% sucrose and T_7 Citric acid 125 ppm, T_8 Citric acid 125 ppm + 8% sucrose, T_9 – Citric acid 150 ppm, T_{10} - Citric acid 150 ppm + 8% sucrose, T_{11} – Distilled water (control). The following data were recorded on flower diameter, water uptake (g), days taken for flower shriveling, days taken for color change and vase life (days).

RESULTS AND DISCUSSION

Chemical preservative solutions significantly influenced all the treatments and its helps on prolonging the vase life and quality of rose flowers. Among the different chemical preservative solutions (T_8) Citric acid 125 ppm + 8% sucrose recorded the maximum results and enhanced the postharvest life (Table 1). Citric acid 125 ppm + 8% sucrose delayed flower senescence compared to flowers held in other treatments. Vase life was significantly increased to 13.41 days. Citric acid is also known as an acidifier which inhibits the growth of microorganisms and is commercially advised for a number of cut flowers (Dole *et al*., 1999). Citric acid can alleviate water uptake and extend vase life due to its anti embolism trait. Citric acid treatments extended vase life in association with inhibition of ethylene production. Citric acid to vase solution caused low latex flow from the cut stem surface and delay in the closure of xylem (Imsabai *et al*., 2013). Citric acid to vase solution showed significant delay in browning and abscission of florets and, as a result, delaying senescence of cut flowers. Sucrose improves water balance in cut flowers because it effects on the closure of stomata and reduction of water loss (Marousky, 1971). Water uptake was reduced by the xylem vessel blockage due to presence of microbes and air accumulation in vase solution (Hardenburg, 1968, Hussein, 1994). Similar finding was reported by Luo *et al*. (2003) in cut carnation flowers. Sucrose in the vase solution influenced water uptake, transpiration loss of water, maintained better water relations thereby improved fresh weight of the flower (Bhattacharjee, 1998). It is reported that sucrose enhanced the effect of cytokinin in delaying senescence of flowers and also reduced the effect of ethylene which increasing the vase life of the flowers (Mayak and Dilley, 1976).

Effect of sucrose and citric concentration significantly influenced on water uptake of cut flowers and maximum water uptake was recorded in Citric acid 125 ppm + 8% sucrose. Treatment T_8 found highest flower diameter of 12.93 cm and least diameter was recorded in treatment with distilled water solution. Carbohydrate and sucrose requires for the development of flower bud to open flower (Pun and Ichimura, 2003) which supply essential substrate for respiration, structural material and carbon skeletons for bud opening (Mayak *et al.*, 1973). Similarly, conversion of polysaccharide to monosaccharide is also responsible for flower opening or closure (Van Doorn & Van Meeteren, 2003). Organic acids such as citric acid were reported as the source of carbon and energy for cells and used in the respiratory cycle and some other biochemical pathway (Da Silva, 2003; Darandeh & Hadavi, 2012. Similarly, Citric acid significantly transported iron in plants (Hell & Stephan, 2003, Darandeh & Hadavi, 2012).

Citric acid 125 ppm + 8% sucrose (10.62 days) took maximum days to shriveling the flower and took 14.12 days for colour change and maximum days flowers remain fresh in T_8. According to Ichimura *et al*. (2003) treatment with sucrose promoted unfolding petals, suppresses the decrease in weight of cut flowers and inhibition on the occurrence of petals senescence (Ichimura *et al*., 2003). It is

reported that tuberose cut flowers retained their freshness for longer periods when higher concentrations of sucrose were used (Khondakar & Mojumder, 1985). It is also reported that flower color expression is enhanced by treatment with sugars in carnation and rose (Parups & Molnar, 1972).

Table. 1 – Effect of Citric acid and sucrose solution on the quality and vase life of rose flowers

Treatments	Days taken for color change (days)	Days taken for flower shriveling (days)	Flower diameter (cm)	Water uptake (g)	Vase life (days)
T_1 - Citric acid 50 ppm	9.56	7.21	9.38	14.39	10.02
T_2 - Citric acid 50 ppm + 8% sucrose	10.43	8.43	9.21	14.29	10.46
T_3 - Citric acid 75 ppm	11.68	9.23	9.98	15.93	11.12
T_4 - Citric acid 75 ppm +8% sucrose	11.32	8.58	10.06	15.72	10.89
T_5 - Citric acid 100 ppm	12.54	9.19	9.87	16.58	12.48
T_6 - Citric acid 100 ppm + 8% sucrose	12.43	8.78	11.68	16.04	11.29
T_7 - Citric acid 125 ppm	12.91	8.39	11.38	16.92	12.34
T_8 - Citric acid 125 ppm + 8% sucrose	14.12	10.62	12.93	17.43	13.41
T_9 - Citric acid 150 ppm	13.26	9.12	11.39	16.03	12.28
T_{10} - Citric acid 150 ppm + 8% sucrose	12.92	9.02	11.03	15.96	11.68
T_{11} - Distilled water	6.71	5.03	7.78	10.39	6.27
SE (d)	0.29	0.23	0.26	0.55	0.32
CD (p=0.05)	0.59	0.49	0.55	1.18	0.66

CONCLUSION

It is concluded from the study that for achieving better quality of rose cut flowers with maximum vase life, the rose cut flower may be treated with a combination of Citric acid 125 ppm + 8% sucrose.

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