Environment & Ecology 35 (4) : 2764—2768, October—December 2017
Website: environmentandecology.com ISSN 0970-0420

Enhancing the Vase Life of Rose (*Rosa hybrida* L.) cv First red Through Different Holding Solutions

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Received 22 December 2016; Accepted 24 January 2017; Published online 15 February 2017

Abstract In an experiment, cut flower of rose (*Rosa hybrida* L.) cv First red with uniform length of 25 cm, harvested in January 2011, were pulsed in distilled water for an hour and were transferred in eight holding solutions viz-3% sucrose (T_1), 15% sucrose (T_2), 200 ppm 8-HQS (T_3), 50 ppm 8-HQS (T_4), 3% sucrose + 200 ppm 8-HQS (T_5), 1.5% sucrose + 200 ppm 8-HQS (T_6), 3% sucrose + 50 ppm 8-HQS (T_7) and 1.5% sucrose + 50 ppm 8-HQS (T_8) at 5°C temperature in order to study the effect of the holding solutions in enhancing the vase life. Holding solution 3% sucrose + 50 ppm 8-HQS (T_7) was significantly superior in enhancing the vase life along with effect of storage solutions on flower diameter of rose bud, weight losses/increase in rose bud in different holding solution and volume of solution consumed (ml) attributes studied. This was followed by T_5 (3% sucrose + 50 ppm 8-HQS solution) and T_8 (1.5% sucrose + 50 ppm 8-HQS solution) respectively, which were observed to improve maximum diameter of rose cut flower was found 48.4 cm among all the reatments.

Keywords *Rosa hybrida* L., Chlorinated water, Sucrose, 8-HQS (Hydroxyquinoline Sulfate), Holding solutions.

Introduction

Rose is a symbol of beauty and fragrance. On the basis of average production and consumption in flower trade, rose ranks first among the top ten cut flowers in the global cut flower trade. Rose makes one of the best cut flowers and as such it is in great demand in the domestic as well as foreign market [1]. The Federal Republic of Germany is the biggest consumer and importer of cut flowers, cut roses have relatively short vase life and need careful handling to improve their post-harvest quality. The flower growers and whole salers face considerable problems in marketing of cut flowers especially during glut period when production is surplus and demand is low. Additionally, roses play major role in manufacturing of

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Table 1. Effect of storage solutions on flower diameter of cut rose cv First red at different days after harvest.

Day/treatment	1st Day	2nd Day	3rd Day	4th Day	5th Day	6th Day	Mean
T_1	18.3900	20.9133	38.3133	37.1400	30.4067	25.1600	28.3872
T_2	19.0333	21.1833	39.0467	39.0700	30.9833	29.7633	28.3466
T_3	18.2500	22.3967	32.8700	39.5933	32.1933	30.2600	29.2605
T_4	18.2567	20.4600	38.2633	38.1467	36.3267	32.0933	30.5911
T_5	18.5633	22.2337	40.2500	48.4133	40.3967	38.2767	33.3556
T_6	19.8200	21.3333	35.4600	38.2233	30.4733	22.0733	27.9305
T_7	19.0957	22.5933	34.6133	39.7433	37.6667	32.8200	31.0870
T_8	18.8167	20.9337	23.8667	40.0433	32.1733	25.7767	26.8017
SED	0.800370	0.96755	2.8696	3.64633	2.93021	1.46335	
CD	1.69671	1.20315	8.09158	5.60996	4.09181	52.22206	

many medicinal products and it is also got nutritional importance [2]. In order to regulate flower market and price stability, storage of cut flowers is a better option [3]. The cut flowers can be made to with stand post-harvest stressful condition by treatments with suitable pulsing and holding solutions. The treatment with preservatives containing sucrose, bacterial compounds, 8-Hydroxyquinoline sulfate (8-HQS) has become an established practice to increase the vase life of cut flowers. Such treatments not only prolong the vase life but also improve the opening of immature buds, flower size, shape and color. Therefore present study was carried out with the objective to standardize the wet storage of rose cut flowers cv First red.

Materials and Methods

The present study entitled enhancing the vase life of rose (*Rosa hybrida* L.) cv First red through different holding solutions was conducted during the year 2010-11 in the laboratory of Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University Vidyavihar Lucknow. Lucknow is climatically characterized as semi and sub-tropical climate. The annual rainfall is 54 mm during the experimentation average temperature, rainfall and relative humidity was recorded.

The cut rose buds were harvested in January 2011 at a stage when the calyx was fully refluxed and outer petals unfurled and were precooled at 2°C for one hour. Cut stems were than dressed by removing the lower leaves and cutting them to uniform length of 25 cm. After harvesting the cut ends of the stem were immersed in tap water and the flower bud were stored at 5°C. Next the flower whose cut ends were placed in tap water were transported to laboratory and placed in test tubes with holding solutions with in 2 h for the experiment. Afterwards antimicrobial 8-HQS and sucrose solutions prepared in different concentrations were used as holding solutions. The stem were stored in eight holding solutions viz-3% sucrose (S_1T_1), 1.5% sucrose (S_2T_2), 200 ppm 8-HQS (S_3T_3), 50 ppm 8-HQS (S_4T_4), 3% sucrose + 200 ppm 8-HQS (S_5T_5), 1.5% sucrose + 200 ppm 8-HQS (S_6T_6), 3% sucrose + 50 ppm 8-HQS (S_7T_7) and 1.5% sucrose + 500 ppm 8-HQS (S_8T_8) at a temperature of 5°C with 80% relative humidity for 1st (D_1), 2nd (D_2), 3rd (D_3), 4th (D_4), 5th (D_5), and 6th (D_6) days. The experiment was replicated thrice with single stem per replication. Data were recorded on vase life, volume of solution consumed, flower diameter, weight increase and losses and TSS in flower petals and subject to analysis of variance using factorial completely randomized block design (CRD). The following observation on vase life of cut rose were recorded to make a critical analysis of the performance of the flower buds as affected by different treatments. The size of each flower was recorded by measuring the diameter across the unfurled flower with the help of digital vernier calipers (Mitutoyo make, Japan). Fresh weight of the flowers selected for the experiment was recorded with the help of electronic balance. The volume of solution consumed by rose buds on each treatment was recorded with the help of 10 ml measuring cylinder. Flower TSS for each treatment were randomly selected at each of following, TSS for each flower sale was recorded with the help

Table 2. Weight loss/increase (g) in rose (*Rosa hybrid* L.) bud in different holding solutions at different days after harvest.

Day/treatment	1st Day	2nd Day	3rd Day	4th Day	5th Day	6th Day	Mean
T_1	5.000	6.3333	7.3333	7.0000	4.000	3.000	5.4444
T_2	6.000	7.3333	8.000	7.6667	5.3333	3.3333	6.2777
T_3	5.000	6.6667	7.6667	8.6667	5.6667	2.3333	6.000
T_4	5.6667	6.6667	8.3333	8.0000	4.3333	4.0000	6.1666
T_5	5.000	6.000	7.000	6.3333	5.000	3.3333	5.4444
T_6	3.6667	7.000	7.6667	8.3333	6.6667	4.6667	6.3333
T_7	5.6667	7.3333	8.000	8.3333	7.3333	5.8333	6.9999
T_8	5.6667	6.6667	7.000	7.3333	7.3333	5.8333	6.6388
SED	0.66667	0.35355	0.3333	0.38188	0.57735	0.57735	
CD	1.413227	0.74950	0.70667	0.80955	1.22393	1.22393	

of hand refract meter and reported in B°.

Results and Discussion

The diameter of flower was measured at the end of the experiment with the help of vernier calipers (Mitutoyo make, Japan). Average data are presented in (Table 1). The flower diameter was recorded maximum on fourth day for all the treatments i.e. from T_1 to T_8 subsequently the diameter decreased (Table 1). The diameter of rose bud was affected significantly by the treatments under study. The maximum diameter (48.4113 cm) was recorded for T_5 (3% sucrose + 200 ppm 8-HQS) on fourth day of observation which was followed by T_8 (1.5% sucrose + 50 ppm 8-HQS) on D_4 (40.0433 cm), T_7 (3% sucrose + 50 ppm 8-HQS) on D_4 (39.7433 cm), T_3 (200 ppm 8-HQS) on D_4 (39.5933), T_2 (1.5% sucrose) on D_4 (39.0700), T_6 (1.5% sucrose + 200 ppm 8-HQS) at D_4 (38.2233) and T_1 (3% sucrose) on D_4 (37.1400) diameter respectively. However, for treatment T_5 (3% sucrose + 200 ppm 8-HQS solution) the maximum flower diameter (48.4133 cm) was recorded on the fourth day. The minimum diameter of rose buds was obtained under the T_1 (3% sucrose) on D_4 (37.1400). The weight of rose buds was recorded during the course of experiment and the average data are summarized in (Table 2). Which clearly reveals that the weight of rose buds varied significantly between the different treatments. The maximum weight was recorded with T_3 (200 ppm 8-HQS solution) on fourth day (8.666 gm), followed by T_6 (1.5% sucrose + 200 ppm 8-HQS solution), T_7 (3% sucrose + 50 ppm 8-HQS solution), T_8 (1.5% sucrose + 50 ppm 8-HQS solution), fourth day, T_2 (1.5% sucrose solution), T_1 (3% sucros solution) and T_5 (3% sucrose + 200 ppm 8-HQS solution) on third day respectively. The maximum weight decrease was obtain under the T_3 (200 ppm 8-HQS solution) (2.333 gm) and minimum decrease T_8 (1.5% sucrose + 50 ppm 8-HQS solution) (5.333 gm) on sixth day.

It is evident that the solution consumed of rose buds was obtained maximum for all the treatment with T_7 (3% sucrose + 50 ppm 8-HQS solution), followed by T_4 (50 ppm 8-HQS solution), T_8 (1.5% sucrose + 50 ppm 8-HQS solution), T_5 (3% sucrose + 200 ppm 8-HQS solution), T_3 (200 ppm 8-HQS solution) , T_6 (1.5% sucrose + 200 ppm 8-HQS solution), T_2 (1.5% sucrose + 200 ppm 8-HQS solution), T_1 (3% sucrose solution) on fourth day. The average maximum and minimum solution consumed by T_7 (3% sucrose + 50 ppm 8-HQS solution), T_2 (1.5% sucrose + 200 ppm 8-HQS solution) respectively (Table 3). These finding support the view that treatment with antimicrobial compounds inhibits bacterial proliferation and suppresses the decreases weight in hydraulic conductance of cut rose [4]. The preservation solution containing 3% sucrose + 50 ppm 8-HQS extended the vase life and inhibited flower senescence and bent neck in rose cut flowers. The study explains the short vase life of untreated control and long vase life when 8-HQS was applied, further 8-HQS minimized losses in chlorophyll as well as carbohydrates, when sucrose was added to 8-HQS extended the vase life of cut rose flower. It was observed that the treatment T_5 (3% sucrose + 200 ppm 8-HQS solution) freshly harvested flower exhibited maximum flower diameter (48.4133 cm)

Table 3. Volume of solution consumed (ml) in rose (*Rosa hybrid* L.) bud in different holding solutions at different days after harvest.

Day/treatment	1st Day	2nd Day	3rd Day	4th Day	5th Day	6th Day	Mean
T_1	2.6667	3.2667	3.000	3.0067	2.900	0.7333	2.5955
T_2	1.6333	2.9333	2.6333	4.1333	2.7333	0.667	2.4500
T_3	1.8667	2.9333	3.3667	4.600	3.4000	0.3333	2.7500
T_4	2.6000	3.7000	3.4667	5.0667	3.2667	0.7333	3.1389
T_5	1.3667	2.8000	3.4667	4.6667	4.0333	3.6667	2.7334
T_6	1.4000	3.100	2.5333	4.5667	3.4000	1.2333	2.7055
T_7	2.6667	3.6333	3.3333	7.7667	3.0667	1.4333	3.6500
T_8	1.6667	2.3000	2.6000	4.7333	3.3667	0.9333	2.5944
SED	0.13644	0.36094	0.30957	0.54773	0.34116	0.04422	
CD	0.28925	0.76516	0.65628	1.16114	0.72322	0.09375	

and vase life on 4th day by consuming maximum vase solution (4.6667 ml). These findings nearly corroborate with findings of Wasea–Abdul and Asrar [5]. They reported that among all these treatments, the 8-HQS + 2% sucrose treatment showed best water uptake, water balance, percentage of maximum increase in fresh weight of the cut flower stem and vase life which was extended up to 18 days. Moreover, this keeping solution treatment recorded the degradation of chlorophyll as well as carbohydrate of the cut flowers during their postharvest life. It was observed that the diameter of flower, weight increased and volume of solution consumed by rose buds were maximized by treatment T_7 (3% sucrose + 50 ppm 8-HQS solution). This result corroborate with results of Ibrahim et al. [6]. They observed that the chemical solutions of 8-HQS at 100 ppm with 4% sucrose lowered the flower weight loss and increased dry weight percentage and longevity of cut flowers to highest values and also resulted in the highest soluble sugars and anthocyanin pigment in petals of flowers.

Conclusion

It is concluded from the results that the enhancing vase life of rose (*Rosa hybrida* L.) cv first red through different holding solution was significantly boosted by recording the data of diameter of flower, weight increased/losses and volume of solution consumed by rose buds were maximized by T_3 (3% source + 50 ppm 80HQS solution). The treatment no. T_7 showed significant superiority among all other treatment in most of the attributes particularly enhancing the vase life of rose. Maximum diameter of rose cut flower was found 48.4 cm among all the treatments with T_5 (3% sucrose + 50 ppm 8-HQS solution) on fourth day (D_4) in combination significantly in Enhancing the vase life of rose cut flowers followed by T_8 (1.5% sucrose + 50 ppm 8-HQS solution) on fourth day.

Result indicates that flowers stored for 4th day (D_4). Consumed maximum volume of total solution (7.766 ml) by T_7 (3% sucrose + 50 ppm 88-HQS solution). The interacting effect of enhancing the vase life of rose cut flower through using the different holding solution was significant, exhibited with respect to the effect of storage solution on flower diameter, weight losses/increase and volume of consumed solution by rose buds. The maximization of diameter of rose, weight losses and volume of solution consumed T_5 (3% sucrose + 200 ppm 8-HQS solution) on 4th day (48.41 cm), T_7 (3% sucrose + 50 ppm 8-HQS solution) on 6th day (2.33 gm) respectively.

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