Int. J. Curr. Res. Biosci. Plant Biol. 2015, 2(7): 129-134

EXCELLENT PUBLISHERS

International Journal of Current Research in Biosciences and Plant Biology

ISSN: 2349-8080 Volume 2 Number 7 (July-2015) pp. 129-134

www.ijcrbp.com

Original Research Article

Effects of Hydration Time on Quality of 'Pretty Woman' Roses

Charles Saruchera[1], Tsvakai Mushayabasa[1], James Chitamba[2,3]* and Wendy Mutsa Chiota[1]

[1]Department of Horticulture, Faculty of Natural Resources Management and Agriculture, Midlands State University, Gweru, Zimbabwe
[2]Publishing Department, Zimbabwe Publishing House (ZPH), Greendale, Harare, Zimbabwe
[3]Department of Educational Foundations, Faculty of Science Education, Bindura University of Science Education, Bindura, Zimbabwe

**Corresponding author.*

A b s t r a c t

The main objective of this study was to investigate the effect of hydration time on quality of Pretty Woman rose cut flower. The experiment was laid out as a 2×2 Factorial in Completely Randomized Design with 4 treatments (Southern Roses standard for 1h in greenhouse and 2h in holding room; Southern Roses standard for 1h in greenhouse and 4h in holding room; Borehole water for 1h in greenhouse and 2h in holding room; Borehole water for 1h in greenhouse and 4h in holding room). Each treatment was replicated four times and randomly assigned to plots. Results showed that there was interaction between hydration time and preservatives on rose openness and quality. Where Southern Roses standard was used in 2h, better quality flowers were obtained compared to those from a 4h period. The same trend was noticed with borehole water which performed better in 2h than 4h holding time hence hydration time and flower preservatives are effective in quality maintenance in rose cut flowers if well combined. The results showed that Southern Roses standard solution of 1h in green house and 2h in holding room at 20ppm concentration had positive effects on rose openness, stem straightness and control of *Botrytis* incidence whilst borehole water had positive effects on water uptake and quality of cut rose flowers. From the findings of the study, it can be concluded that keeping the flowers for 1h in the greenhouse and 2h in the holding room give the best quality of rose cut flowers.

K e y w o r d s

Botrytis
Flower quality
Hydration time
Rose cut flower

Introduction

The high commercial value and widespread cultivation have made roses (*Rosa hybrida* L.) an important commodity of ornamental crops (Korban et al., 2007). In Zimbabwe roses are grown for export, the main market being Europe particularly Holland (Maguvu et al., 2013). In order to restore the turgidity of cut flowers after they have suffered from water stress (during handling, storage and shipping), hydrating cut flower stems is often recommended by saturating them with water (Halevy and Mayak, 1981). The use of hydration solutions remains a current industry protocol when processing cut flowers (Postma and Molenaar, 1999).

Cut flowers vary in their postharvest longevity reaction depending on their species, cultivar, harvesting stage, cultivation conditions (Asghari et al., 2014). Quality in flowers is a very important parameter as in fruits and vegetables. In flowers, vase life is one of the criteria used to assess their quality (Asghari et al., 2014). Factors such as chemicals added to the vase or pulsing solution and inherent factors in the flowers themselves affect the longevity of cut flowers postharvest (Bushen and Abebie, 2014). In addition, the appearance, quality and longevity of cut flowers are influenced by conditions of cultivation, proper harvest time, product transport conditions and postharvest handling practices (Bushen and Abebie, 2014). It is of paramount importance to extend the natural appearance of flowers by delaying the rate at which their quality deteriorates (Chapman and Austin-Brown, 2007). Cut flowers with a long lasting period will attract consumers for their natural appearance thus enhancing the socio-economic value of flowers (Asghari et al., 2014). Therefore, there is need to maximize the vase life of cut flowers by providing conditions that promote their longevity making them appealing to the market.

Considering the economic value of roses in the country as well as the importance of hydration of cut flowers postharvest, the present study was carried out with the main objective of investigating the effects of hydration time on the quality of rose cut flowers.

Materials and methods

Study site

The study was conducted at Southern Roses, situated 16 km east of Harare, Zimbabwe. The area is located at a latitude of 31º08' E and 17º55' S and an altitude of 1479 m above sea level. The area falls under Natural Farming Region II of Zimbabwe's Agro-ecological zones, with a minimum temperature of 18^{o}C and a maximum temperature of 32^{o}C.

Experimental design

The experiment was laid out as a 2×2 Factorial in a Completely Randomized Design (CRD) with four treatments replicated 4 times.The treatments were as follows: Southern Roses (SR) standard for 1h in greenhouse and 2h in holding room; SR standard for 1h in greenhouse and 4h in holding room; Borehole water for 1h in greenhouse and 2h in holding room; and Borehole water for 1h in greenhouse and 4h in holding room.

Plant material

Pretty Woman roses, (a purple sweetheart rose) grown under normal field conditions were harvested using sterilized secateurs at the normal harvest maturity stage (stage 2), as described by Ueyama and Ichimura (1998), when petals started to unfold. Cut flowers measuring 60 cm length were used for the experiment.

Anti-microbial chemicals

The chemicals used in this trial included 3g HTH (calcium hypochlorite) plus 25g aluminium sulphate, Chrylklar (flower food) and 10ml wetter (Sanawett). Other materials include syringe, vases (6), 10 litre buckets for holding flowers after harvest (6), rose cut stems, 500ml measuring cylindrical jar and 100 litres of water.

Preparation of solutions

The SR post-harvest standard solution comprising of 3g HTH + 25g Aluminum sulphate + 10ml Sanawett per 100 litres of water were mixed together. Precipitate was removed from the tank before refilling. The post-harvest solution was prepared a day before as the HTH is relatively insoluble.

Experimental procedure

Three buckets containing Southern Roses standard treatments (3g HTH + 25g Aluminum sulphate + 10ml Sanawett 90 and 100 litres of water) were prepared. Borehole water was put in the 4th bucket. Thirty stems of Pretty Woman roses were harvested at the correct cut stage. Ten stems were put in each bucket. The bucket with borehole water and one with SR standard solution were stressed to determine the solution that had longer lasting flowers under hot conditions within the green house. These two buckets were later placed into the hydration room for two hours at a temperature of 15°C. The other bucket was left in the green house for two hours and later transferred to the holding room after 2h. After 2h hydration time, 5 stems were selected from each bucket from the first two buckets, leaving 5 stems in each bucket for 4h in the holding room. The stems were laid out on a table previously sterilized with chlorine. The cut stems were stripped off their leaves, bunched to size and labeled according to their treatments. Two vases

which were previously disinfected with chlorine were each filled with 1 litre of borehole water. Five stems were put in each vase. They were then placed in the cold room (3^{o}C) for 24h before vase life assessment.

Buckets containing postharvest solution in the green house were filled with harvested rose stems. After stipulated time of treatments, they were removed and placed in the holding room (at 12°C) to hydrate before being bunched, cut to size and put in vases. Each vase had 5 stems as the Chrysalklar (flower food) was added into the water. They were then randomly laid out in the laboratory.

Data analysis

Numbers of fully open rose cut stems, half open stems, stems with *Botrytis* and bent necks, were taken on daily basis. The data was analysed using GenStat statistical package, 14th Edition. Least significant difference (LSD) was used to separate means at 5% significance level.

Results and discussion

Effect of hydration time on rose petal openness

There were significant differences (p<0.001) in number of fully opened petals due to varying hydration times during postharvest handling of the flowers. Flowers treated with SR standard (1h) and hydrated for 2h had the highest number (3.08) of fully open rose petals followed by flowers treated with SR standard (1h) and hydrated for 4h. Flowers treated with borehole water and hydrated for 4h had the least number (0.837) of open petals followed by flowers treated with borehole water and hydrated for 4h (1.772). However, there were no significant differences (p=0.127) in half petal openness of rose flowers among the different treatments (Table 1).

Table 1. Effect of hydration time on rose petal openness.

Treatment	Fully open	Half open
SR standard (1h) 2h	3.080[a]	1.814[a]
SR standard (1h) 4h	2.177[b]	1.789[a]
Borehole water (1h) 2h	1.772[c]	1.726[a]
Borehole water (1h) 4h	0.837[d]	1.654[a]
F. Prob	**<0.001**	**0.127**
LSD	**0.2691**	**0.2703**
CV%	**12.6**	**15.6**

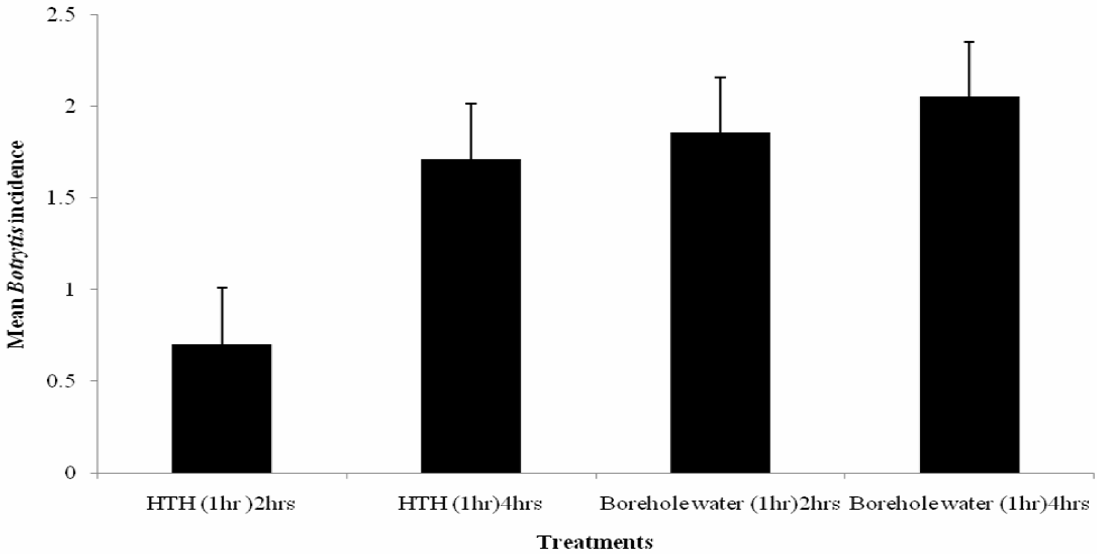
Means followed by a different superscript letter were significantly different at p<0.05.

These findings are similar to those reported by Mupandanyama et al. (2014) where hydration time of 2h increased petal openness under calcium hypochlorite (HTH), chlorine dioxide (Biox 5000) and tap water. The findings are also similar to Bahrehmand et al. (2014) who observed that flower opening was highest in stems under chemical postharvest treatments compared to untreated water. Less number of rose cut flowers in the half petal openness was noted. Hussen and Yassin (2013) reported that cut flowers can be greatly affected by the chemical composition of the vase solution. Failure of the stems to bloom can also be attributed to genetic traits of that flower (Mupandanyama et al., 2014). Moreover, Bayleyegn et al. (2012) reported that maximum flower bud opening of 'rose cut flowers' depends on the type of pulsing solutions and hydration period.

Effect of hydration time on *Botrytis* incidence of cut rose flowers

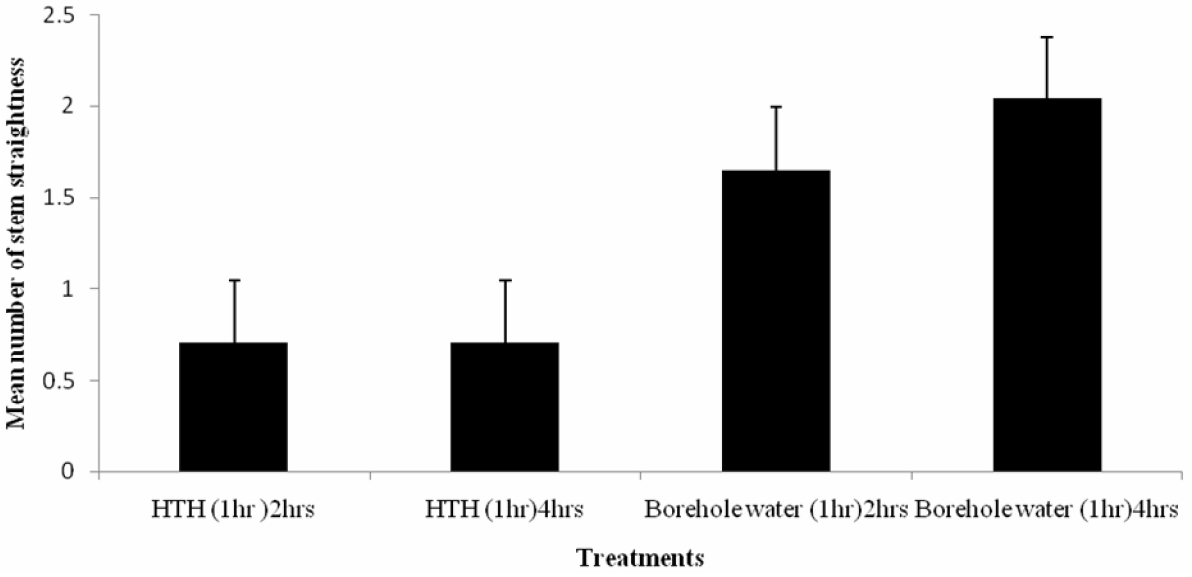
Hydration time had a significant effect (p<0.001) on *Botrytis* incidence of cut rose flowers among flowers treated with different postharvest methods. Borehole water of 1h in greenhouse and 4h in holding room treatment recorded the highest number of flowers affected by *Botrytis*, followed by SR standard 1h in greenhouse and 4h in holding room with a slight difference with borehole water of 1h in greenhouse and 2h in holding room whereas SR standard solution of 1h in greenhouse and 2h in holding room recorded the lowest number of roses affected by *Botrytis* (Fig. 1). There was also significant interaction (p<0.05) between hydration time and hydration solution on mean *Botrytis* incidence.

Fig. 1: Effect of hydration time on Botrytis incidence on cut rose flowers.



Botrytis incidence in the cut rose flowers increased with an increase in the hydration time. These results are consistent and in line with Bayleyegn et al. (2012) and Reid (2005) who noted a similar trend where the *Botrytis* incidence level on roses depended on the storage period and decreased with decreasing storage period. The pulsing solutions had different effect on *Botrytis* incidence level, with HTH having least disease incidence as compared to borehole water. These results are in agreement with Mupandanyama et al. (2014) who observed that tap water at 4h hydration time was the most susceptible treatment as it recorded the higher number of stems with *Botrytis* than those treated with HTH. The results are also similar to what was reported by Hatami et al. (2013) who observed highest bacterial counts on the control treatment, distilled water. This can be attributed to the fact that longer hydration periods in water promote humid conditions which highly favour germination of *Botrytis* spores (Bissett, 2002). This is consistent with OMAFRA (2012) who reported that if cut stems are left inside water solutions, *Botrytis* spores grow rapidly since wet conditions favour and activate germination of spores. A higher incidence of *Botrytis* observed in cut flowers held in borehole water can be attributed to the fact that borehole water has no chemical components to eliminate *Botrytis* spores. *Botrytis* spores observed in cut stems treated with HTH can be due to the fact that HTH dissociates faster (Bissett, 2002) hence encourages fungal sporulation.

Fig. 2: Effect of hydration time on stem straightness of cut rose flowers.



Effect of hydration time on stem straightness of cut rose flowers

There were significant differences (p<0.05) in stem straightness among the different treatments. Borehole water of 1h in greenhouse and 2h in holding room had the highest number of rose cut flowers with straight stems. Both SR standard recorded the least similar number of roses with straight stems of cut rose flowers. There was also an interaction between hydration time and hydration solution on stem straightness of rose cut flowers with stems held in hydration room for 4h having a higher number of straight stems that those held at 2h.

The highest number of straight stems held in borehole water can be attributed to the fact that the water was most likely not to have been contaminated by microorganisms. McIntosh (2012) reported that bent necks are physiological disorders of cut stems caused by air emboli, bacterial plugging and subsequent poor water flow into the bloom. Ranwala (2009) also reported that hydration of cut flowers in solutions results in improved flower quality.

Conclusion

Use of SR standard and borehole water in 2h enhances quality of flowers compared to those from a 4h period. Moreover, SR standard solution of 1h in greenhouse and 2h in holding room at 20 ppm concentration had positive effects on rose openness, stem straightness and control of *Botrytis* incidence compared to borehole water. Keeping the flowers for 1h in the greenhouse and 2h in the holding room helps maintain quality characteristics of rose cut flowers.

Acknowledgement

The authors thank the management and staff of Southern Roses for the provision of necessary resources for the experiment.

References

Asghari, R., Salari, A., Gharehdaghi, S., 2014. Effect of pulsing solution and packaging type under exogenous ethylene on physiological characteristics and post harvesting quality of cut roses (*Rosa hybrida*). Amer. Eur. J. Agric. Environ. Sci. 14(4), 329-335.

Bahrehmand, S., Razmjoo, J., Farahmand, H., 2014. Effects of nano-silver sucrose applications on cut flower longevity and quality of tuberose (*Polianthus tuberoses*). Int. J. Hortic. Sci. Technol. 1(1), 67-77.

Bayleyegn, A., Tesfaye, B., Workneh, T. S., 2012. Effects of pulsing solution, packaging material and passive refrigeration storage system on vase life and quality of cut rose flowers. Afr. J. Biotechnol. 11(16), 3800-3809.

Bissett, J.L., 2002. *Botrytis* Control in Roses–Trial 2002/1. Flora Marketing Cyclostyled Report. p.3.

Bushen, E. M., Abebie, B., 2014. Pulsing of carbohydrates, biocides, and ethylene action inhibitor on vase life of cut rose (*Rosa hybrida* L.) flowers. Afr. J. Agric. Sci. Technol. 2(2), 71-83.

Chapman, K. D., Austin-Brown, S. L., 2007. Methods for extending the freshness of cut flowers, ornamental trees and plant cuttings. http://www.freepatentsonline.com accessed 13 June, 2015.

Halevy, A.H., Mayak, S., 1981. Senescence and postharvest physiology of cut flowers. Hort. Rev. 3, 59-143.

Hatami, M., Hatamzadeh, A., Ghasemnezhad, M., Ghorbanpour, M., 2013. The comparison of antimicrobial effects of silver nanoparticles (SNP) and silver nitrate ($AgNO_3$) to extend the vase life of 'Red Ribbon' cut rose flowers. Trakia J. Sci. 11(2), 144-151.

Hussen, S., Yassin, H., 2013. Review on the impact of different vase solutions on the postharvest life of rose flower. Int. J. Agric. Res. Rev. 1(2), 13-17.

Korban, S.S., Gasic, K., Li, X., 2007. Rose (*Rosa hybrida* L.). In: Wang, K (Ed.). Methods Mol. Biol. 344, 351-358.

Maguvu, T., Muzemu, S., Mushayabasa, T., Chitamba, J., 2013. Effects of different pulse solutions on vase life and quality of roses (*Rosa hybrida* L.). Int. J. Agron. Agric. Res. 3(5), 10-13.

McIntosh, J. 2012. Stop bent necks on roses. (http://flowers.about.com/od/Special-Occasion-Flowers/a/Stop-Bent-Neck-On-Roses.htm). Accessed 16/07/2014.

Mupandanyama, G.T., Mushayabasa T., Chitamba, J. 2014. Evaluation of Biox 5000 (chlorine dioxide) and HTH (calcium hypochlorite) on the quality and vase life of *Rosa hybrida* L. cv. Frisco. Ann. Biol. Res. 5(10), 29-34.

OMAFRA, 2012. Guide to Greenhouse Floriculture Production: Chapter 8 - Major Greenhouse Diseases. Publication 370, Ontario. (http://www.omafra.gov.on.ca/english/crops/pub370/pub370ch8.pdf).

Postma, I., Molenaar, P., 1999. Rose refresher course. Floral Manag. 15(10), 62.

Ranwala, A., 2009. The importance of hydration of fresh cut flowers. Floralife 11(6), 1-2.

Reid, M.S., 2005. Temperature and postharvest performance of rose (*Rosa hybrida* L. 'First Red') and Gypsophila (*Gypsophila paniculata* L. 'Bristol Fairy') flowers ISHS. Acta Hort. 682, 1789-1794.

Ueyama, S., Ichimura, K., 1998. Effects of 2-hydroxy-3-ionene chloride polymer on the vase life of cut rose flowers. Postharvest Biol. Technol. 14(1), 65–70.