Influence of various preservative chemicals on postharvest life of cut roses (*Rosa hybrida* L.) cv. happiness

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Abstract

An investigation was conducted to extend the vase life of cut rose cv. Happiness harvested at the three different stages by using various preservative chemicals. At the half open stage, 8-HQC 100 ppm + AgNO₃ 100 ppm, AgNO₃ 100 ppm + sucrose 2% and DMSO 100 ppm + sucrose 2% extended the vase life to the maximum (12 day) while at full open stage, 8-HQC 100 ppm + AgNO₃ 100 ppm + sucrose 1%, Al₂(SO₄)₃ 200 ppm + boric acid 100 ppm maximum (12 day) the vase life of cut roses. None of the chemicals could significantly influence the post harvest life of flower at bud stage. Most of the chemicals improved water loss and water uptake ratio over control.

Keywords: Preservative chemicals, post harvest life, rose.

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Introduction

Cut roses are symbol of beauty, fragrance and are to convey the message of love. Great diversity in slow opening of flowers and good keeping quality made cut rose so popular that it is grown commercially to meet the demand of cut flower. The postharvest life and quality of cut flowers to a great extent is related with the turgidity (Rogers, 1973). Higher level of turgidity influences development of flower buds to full-open maturity and normal metabolic activity in the cut flower. The turgidity in plants and flowers is dependent on the balance between water utilization or loss and water supply (Rogers, 1962). The short post harvest life of rose is determined by neck bending (Burdett, 1970), wilting of leaves and flowers and incomplete bud open, rapid loss of fresh weight (Aarts, 1957), water deficit (Rogers, 1973) and low turgidity (Mayak *et al.*, 1974). The addition of chemicals including some trace elements to holding solutions were tried with varied success to extend the vase life of

rose (De and Bhattacharjee, 1999). Aarts (1957) reported that uninterrupted water supply is major requirement for increased vase life. Standardization of methods for opening of tight bud stage in roses by use of nutrients and other chemicals are necessary to improve quality and longevity. Blockage is regarded as the major cause for wilting and reduction of longevity of cut flowers (Burdett, 1970; Rogers, 1973). Presently, research is being persuaded for opening of buds at different stages of maturity with chemicals in rose. The present investigation was carried out to study the effect of chemicals on extending the vase life of Happiness cut roses.

Materials and Methods

The investigation was carried out in the Department of Horticulture, C.C.S. Univ. Campus, Meerut during the 2005-06. The flowers were harvested when a flower buds were loose tipped but without unfurling petals and unfurled sepals remained at right angle to the axis of flowers - stage I, half open flowers - stage II and full open flowers - stage III.

Uniform size of flowers were harvested and kept in tap water for 3-4 h at room temperature. The stems were cut at a uniform length of 45 cm and stripped of all except upper two leaflet leaves. Fresh weight of individual flower was recorded and kept into conical flask containing 250 ml of aqueous solution of various chemicals and distilled water (control). There were six treatments including control viz., T₁- 8-HQC 100ppm + AgNO₃ 100ppm, T₂ - AgNO₃ 100ppm + sucrose 2%, T₃ - DMSO 100 ppm + sucrose 2%, T₄ - Al₂SO₄ 200ppm + sucrose 2%, T₅ - Al₂(SO₄)₃ 200ppm + Boric acid 100 ppm, T₆ - Distilled water (control). Three flowers were used for each concentration under each treatment and each flower represented one replication. At fixed time, the weight of each cylinder plus solution with or without flower was measured. The difference between consecutive measurements of the cylinder + solution without flower represents the water uptake, while the difference between consecutive measurements of cylinder + solution + flower represents the transpiration loss. In each flask, cotton plug was put to avoid evaporation loss. Bluish or darkening of petals was considered as the end of usual vase life of the flowers (Venkatarayappa *et al.*, 1980). During the period of experiment, maximum temperature (average) was 24.6°C while minimum (average) was 18.7°C. The average relative humidity was 65.8 %. The experiment was laid out in a completely randomized design and data were statistical analysed.

Results and discussion

Change in fresh weight: The investigation revealed that fresh weight of flowers on 3rd day increased irrespective of stage of harvest and treatments (Table 1). The gain in fresh weight of flower was significantly different among the various treatments at stage III, but it could not show any significant variation among the treatments at the stages I and II though the fresh weight increased over control at both the stages. The fresh weight at stage III (4.24 g) increased at the application of AgNO₃

100ppm + sucrose 2%. Better water conductance through stem due to germicidal properties of silver nitrate in addition to the ethylene inhibition might have helped in maximum uptake of water by the flower which resulted in gain in fresh weight. (De Stinger, 1980) also recorded that glucose, aluminium sulphate and 8-HQC had a positive role in increasing fresh weight and water conductance of rose. The fresh weight of flowers at senescence also decreased profoundly and varied significantly among the treatments irrespective of the stage of harvest.

Sivasamy and Bhattacharjee (2000) reported that the fresh weight generally increased in first few days thereafter it decreased gradually till senescence. At senescence, 8-HQC 100 ppm + AgNO₃ 100 ppm recorded minimum weight loss (2.48 g, 2.03 g, 2.38 g, respectively) at all the stages. 8-HQC and silver nitrate play vital role in checking microbial growth in the holding solution thereby decreasing the loss in fresh weight of flower. The results are in close proximity with the findings of (Singh and Bhattacharjee, 2000). Earlier workers (Accati and Jona, 1989; Wu *et al.*, 1991) predicted that higher amount of ethylene producing enzymes and ethylene is responsible for water loss. It appears that chemicals used for enhancing vase life improved the water uptake of cut flower by reducing the vascular blockage and ultimately changed the fresh weight of flowers.

Water uptake, water loss and water loss/uptake ratio: The water uptake was significantly influenced by various chemicals at all stages of harvest of flowers (Table 2). At stage I, maximum quantity of water (8.65 g) was absorbed at 8-HQC 100 ppm + AgNO₃ 100 ppm which might be due to the same reasons stated earlier. Application of solution further improved the water uptake at stage II and stage III. It is interesting to note that at both the stages, water uptake was maximum (23.92 g and 24.37 g, respectively) for 8-HQC 100 ppm + AgNO₃ 100 ppm. Murr *et al.*, (1979) reported that CoCl₂.6H₂O & AgNO₃ could increase the water uptake by stems

thereby increasing the vase life of the flower. Microorganisms are considered to be one of the main causes of reduced water uptake by cut flowers, as germicides like 8-HQC and silver nitrate control microbial growth and partially reduced resistance to water flow (Aarts, 1957; Burdett, 1970).

The transpiration loss was also significantly influenced by the various solutions and followed the same pattern as that of water uptake. Although the water uptake and loss were higher in chemical treatments, the water loss and uptake ratio, an indicator of water balance was significantly lowered by all the concentrations of chemicals when compared with the control at all the stages of harvest of flowers. The water balance is a major factor influencing the quality and longevity of cut flowers of roses as recognized by so many workers (Aarts, 1957; Mayak *et al.*, 1974; Roger, 1973). Water deficit of cut stem has a direct relationship with turgidity of cut flowers and will accelerate the senescence (Mayak and Halevy, 1972).

Water loss and uptake ratio were quite lower at all the treatments than in case of control at all the stages of harvest thereby maximizing the vase life.

In the present investigation, it has been demonstrated that chemicals effectively increased water uptake in all treatments than control. A significant decrease in water loss/uptake ratio indicated better water retention by the treated cut flower. Venkatarayappa *et al.*, (1980) reported that CO_2^{2+} improved the water retention as compared to untreated cut flower of rose and increased the water uptake. Chemicals strikingly affected the declining of fresh weight of cut roses and were found to be associated with reduced water loss/uptake ratio and an increased water uptake. Sacalis (1974) also reported similar observations.

The vase life of cut rose was significantly influenced by the application of chemicals at stage II as well as stage III, however, chemicals failed to improve the vase life at stage I. The vase-life was nine day at untreated flower in both the cases and all

chemicals with given concentrations increased vase-life of rose cut flowers. At half open stage, 8-HQC 100 ppm + AgNO_3 100 ppm, AgNO_3 100 ppm + sucrose 2% extended the vase life to the maximum (12 day) while at full open stage, 8-HQC 100 ppm + AgNO_3 100 ppm, sucrose 2% + 8-HQC 100 ppm and $\text{Al}_2(\text{SO}_4)_3$ 200 ppm + boric acid 100 ppm maximized (12 day) the vase life of cut roses. For both the stages, the maximum vase life (12 day) was recorded at 8-HQC 100 ppm + AgNO_3 100 ppm. Increase in vase life with 8-HQC + AgNO_3 is because of their bactericidal properties (Mayak *et al.*, 1994). AgNO_3 has also been reported as an inhibitor of ethylene biosynthesis (Beyer, 1976). Cobalt also plays vital role in increasing vase life of cut roses by inhibiting vascular blockage. Similar action of cobalt is also reported by earlier workers (Lau and Yang, 1976). Addition of sucrose might have provided the required amount of energy to at the bloom to remain it fresh for longer period of time. De Stinger (1980) also recorded that glucose, aluminium sulphate and 8-HQC increased fresh weight and water conductance of rose thereby extending senescence. It appears that chemicals used for enhancing vase life improved the water uptake of cut flower by reducing the vascular blockage and ultimately change the fresh weight.

Conclusion

Increasing vase life is the key issue in the post harvest management of cut flowers. Most of the chemicals exhibited positive effect in delaying senescence in cut roses by increasing the water uptake and improving the water balance, leading to increased fresh weight and vase life. Solution containing 8-HQC 100 ppm + AgNO_3 100 ppm improved vase life of cut rose cv. Happiness whether harvested half open stage or fully open stage. Though, other chemicals were also found to be beneficial in relation to extending vase life of rose. $\text{Al}_2(\text{SO}_4)_3$ 200 ppm, boric acid 100 ppm in given combination enhanced vase of life of cut roses at both the stages of harvest.

Table 1: Response of various preservative chemicals on fresh weight of flower in Rose cv. Happiness

Treatments	Gain in fresh weight of flower on 3 rd day (g)			Loss in fresh weight of flower on senescence (g)		
	Stage I	Stage II	Stage III	Stage I	Stage II	Stage III
8-HQC 100 ppm + AgNO ₃ 100 ppm	0.88	1.86	3.95	2.48	2.03	2.38
AgNO ₃ 100 ppm + Sucrose 2%	1.52	2.87	4.24	2.87	2.83	2.57
DMSO 100 ppm + Sucrose 2%	0.79	1.77	2.90	3.19	4.50	3.97
Al ₂ (SO ₄) ₃ 200 ppm + Sucrose 2%	1.53	1.33	3.36	2.81	4.86	3.96
Al ₂ (SO ₄) ₃ 100 ppm + Boric Acid 100 ppm	1.26	1.27	3.02	3.83	3.34	4.07
Distilled Water (control)	0.62	1.07	1.26	5.33	6.43	6.11
C.D. (5%)	NS	NS	1.12	1.91	1.85	1.87

Table 2: Effect of preservative chemicals on water uptake, water loss and water loss/uptake ratio in rose cv. Happiness (Vase life 12 days)

Treatment	Water uptake up to senescence (g)			Water loss up to senescence (g)			Water loss/ water uptake ratio		
	Stage I	Stage II	Stage III	Stage I	Stage II	Stage III	Stage I	Stage II	Stage III
8-HQC 100 ppm + AgNO ₃ 100 ppm	8.65	22.74	23.40	7.60	14.41	17.98	0.92	0.98	0.97
AgNO ₃ 100 ppm + Sucrose 2%	6.12	21.51	22.58	6.06	17.65	20.35	0.95	0.99	0.97
DMSO 100 ppm + Sucrose 2%	5.91	20.50	21.21	4.43	21.23	21.06	0.94	0.96	0.99
Al ₂ (SO ₄) ₃ 200 ppm + Sucrose 2%	3.50	17.88	18.08	3.53	22.08	20.98	0.93	0.99	0.96
Al ₂ (SO ₄) ₃ 100 ppm + Boric Acid 100 ppm	4.54	21.23	21.80	4.08	17.76	16.97	0.93	0.98	0.99
Distilled Water (control)	2.06	13.69	14.20	2.12	14.42	15.35	1.03	1.05	1.08
C.D. (5%)	3.03	2.23	2.96	2.89	2.21	3.00	0.09	0.028	2.92

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