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EXTENDING POST HARVEST LIFE AND KEEPING QUALITY OF GERBERA (*GERBERA JAMESONII*) USING 8-HQS AND CALCIUM CHLORIDE WITH SUCROSE

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Abstract

Gerbera is one of ten popular cut flowers in the world which occupies the fourth place according to the global trends in floriculture. Parameters of fresh weight, stem bending, petal discoloration and vase-life were evaluated. Presently, the experiments are set up to investigate the effect of some chemical preservatives such as 8-HQS (8-hydroxyquinoline sulphate; 20,40 mg/l), $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ (Calcium chloride, 10,20 mg/l) alone or in combination with 4% sucrose. Among all treatments, 8-HQS treatment showed the best effects on preventing stem bending, increasing fresh weight and prolong the vase-life. Using solution of 8-HQS (20 mg/l) alone or in combination with 4% sucrose, significantly increased water uptake, vase life and decreased stem bending during all shelf life periods (3rd, 6th, 9th and 12th) as compared to other treatments. The chemical solutions CaCl_2 (10mg/l) when supplemented with 4% increased fresh weight and considerably reduces the bending deviation respectively on 9th and 12th day.

Keywords: Cut flower, Gerbera, post harvest, preservative solution, vase life

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INTRODUCTION

Gerbera jamesonii Hook., an herbaceous South African annual, popularly known as Transvaal (Barberton) daisy occupies the fourth position in global floriculture trade and the trend is now fast shifting in favour of *Gerbera* for their long-lasting colourful flowers of exquisite shape, size, and bewitching colour [1]. *Gerbera* flowers are in considerable demand in both domestic and export markets. In recent years, the cut flowers trade increased many folds in domestic as well as in the international markets but still account 0.35% of the International trade. Nearly 20-40 per cent of the cut flowers are lost due to improper post-harvest handling. The post-harvest loss of cut flowers is induced by several factors like water stress [2], ethylene effects [3,4]. Besides Bent neck, Ethylene & post-harvest bacterial infections are primary physio-chemical disorders that decreases the quality of *Gerbera* flowers [5]. Bactericides are the most important components in preservative solutions used to control bacteria and to prevent bacterial embolism. The 8-hydroxyquinoline salts are among the most commonly used chemical compounds for floral preservative in roses [6,7]. The objective of the present study was to evaluate the effects of different combination of Calcium chloride, 8-HQS (Hydroxyquinoline sulphate), and sucrose on vase life, angle deviation & fresh weight in *Gerbera jamesonii* varieties 'Red Sky', 'Blizzard' and 'Alppraz'.

MATERIAL AND METHODS

The present study was conducted at Department of Botany, Post Graduate Govt. College for Girls, Sector-11, Chandigarh (Panjab University). The experiment was carried out on *Gerbera jamesonii* varieties 'Red Sky', 'Blizzard' and 'Alppraz' variety with three replications with nine flowers per treatment. Then the flowers were rapidly precooled by placing them in cool water for 3 hours. The experiment design was a completely randomized with three replications with nine flowers per treatment. The flowers were placed in glass bottles containing 250 ml of previous mentioned chemical preservative solutions as well as distilled water as control treatment and kept in the laboratory at room temperature ($25 \pm 2^{\circ}\text{C}$) for 12 days. Firstly, the flowers were harvested in the morning hours by pulling the scapes of 60cm from the crowns. Instantly after harvest, cut flowers were transferred vertically under dry condition to the laboratory and the lower 2cm was cut off under tap water to avoid air embolism. Subsequently, half of the flowers were placed in distilled water and the others were placed in pulse treatments. Then the flowers were rapidly pre-cooled by placing them in cool water for 3 hours. The effects of different combination of Calcium chloride

(10,20mg/l), 8-HQS (Hydroxyquinoline sulphate; 20, 40mg/l) and sucrose (4%) on vase life, angle & fresh weight in *Gerbera jamesonii*. The flowers are kept in laboratory at room temperature at $25\pm 2^{\circ}\text{C}$ with 30-35% RH. However the results are best documented in the following combinations i.e T_1 -Distilled water, T_2 -DW+ 4%Sucrose, T_3 -DW+CaCl₂ (10mg/l)+4%Sucrose, T_4 -DW + HQS (20mg/l), T_5 - DW+HQS(20mg)+4%Sucrose, in Gerbera varieties 'Red Sky', 'Blizzard' and 'Alppraz'.

(i) Uptake of water:

Initially the volume of vase solution/water was kept 100ml uniformly for all the treatments. The volume of vase solution/water was measured by using a measuring cylinder on every the 3rd day (3rd, 6th, 9th, 12th). The uptake of water from the cut flower spike was obtained by the difference between the consecutive weights of the bottle with the preservative solution (without flowers), and it is expressed in gram/cut flower for that period.

$$\text{Water uptake} = [B+S] \text{ Day1} - [B+S] \text{ Day2}$$

B – Weight of the bottle/flask, S – Weight of the solution.

(ii) Stem bending (degree*day-1):

The stem bending in Gerberas was determined and classified based on 4 degrees of bending. Scape curvature was measured using a protractor and expressed with respect to the angle. The gerberas stem bending were rated as follows: 0 for bending up to 2° , 1 bending between 3° and 4° , 2 for bending between 5° and 6° , 3 for bending between 6° and 7° , 4 for bending 180° .

(iii) Petal Discolouration:

Flower fading petal color or discoloration was assessed according to the procedures described by Macnish *et. al.*, 2000 with rating scale of 1 = none/slight fading, 2 = moderate fading and 3 = advanced fading

(vi) Vase life (days after harvesting time):

The flowers were continuously held in the treatment solution till the end of the vase life period. Flower stalks were discarded when one-third of the petals were brown or wilted. This stage was considered to be the end of potential useful longevity of gerbera flower stalks and the number of days taken for this was recorded as vase of the cut flowers.

Data recorded:

The following parameters data is recorded: water uptake (g/flower), the changing of flower fresh weight (gms), stem bending every 3, 6, 9 and 12 days during the shelf life period.

RESULTS

The preservatives are used in the vase solutions to improve flower shape, size & colour as cut flowers are complex organs and loss of quality flowers leads to rejection of flowers. The results showed significant difference between all chemical vase solutions and control from the vase life point of view and other parameters documented in Table 1

(i) Uptake of water (g/cut flower):

Water uptake of gerbera cultivars was varied significantly among different preservative solutions. The uptake of water differed significantly between all treatments starting from first day till 12th day of vase life. The uptake of water ranged from 5.26 to 29.4 g/cut flower. Starting from first day of vase life, Maximum water uptake was observed in T₅ (22.9g) whereas minimum in T₁(5.4 g) in all cultivars (Table1).

(ii) Stem Bending:

Stem break, a sudden bending of the stem, occurs in many gerbera-cultivars and is a practical problem affecting the sale of the flowers and the maximum bending(180⁰) days for flower dropping was observed in T₁ &T₂ while maximum days was required for the minimum bending(3⁰and 4⁰)respectively by T₄ and T₅ (DW+HQS(20mg/l)+4%Sucrose) (Table1).

(iii) Petal Discolouration:

Petal discolouration, a key indicator of flower freshness was recorded maximum (6±1 days) in control (T₁) while minimum (19±1) in T₅ (DW+HQS(20mg/l)+4%Sucrose)in yellow cultivars in comparison to others i.e 18±1 days in red and 17 ±1 days in white cultivars)

(iv) **Fresh weight:** Chemical preservative solutions supplemented with 4% sucrose increased the fresh weight percentage of cut flowers up to 6th day as compared to distilled water,however,T₃(DW+CaCl₂ (10mg/l)+4%Sucrose) performed shade better than T₂. But their effect was masked by T₄ and T₅ in their respective fresh weights.

(v) **Vase life:** The vase life of these three gerbera cultivars ranged from 6±1 to 19 ±1 days. Maximum vase life was in T₅ (19±1) followed by T₄ (15±1 days) in yellow cultivar while minimum by T₁ (6±1 days) On the other hand, maximum vase life was in 18±1 days in red cultivar and 17 ±1 days in white cultivars in T₅ (DW+HQS(20mg/l)+4%Sucrose)

DISCUSSION

Vase life and stem bending are the main factors for evaluation of postharvest quality of cut gerbera flowers. The 8-HQS factor significantly increased the vase life, water uptake and decrease stem bending. A synergistic effect on these parameters was observed in interaction of 8-HQS and sucrose (4%) in compliance with earlier reports [8-10]. The germ static effect of 8- HQS results in higher water uptake, vase life and decreased stem bending & petal

Table 1: Effect of chemical preservatives on the different parameters in post harvest handling of *Gerbera*

Vase Solution	Fresh Weight (gms)	Water Uptake (g/flower)				Angle Deviation				Vase Life
		3 rd day	6 th day	9 th day	12 th day	3 rd day	6 th day	9 th day	12 th day	
T ₁	16.64	5.26	4.1	4.0	3.2	1 ⁰	5 ⁰	7 ⁰	180 ⁰	6±1
T ₂	21.00	12	14	10.2	12	5 ⁰	7 ⁰	7 ⁰	100 ⁰	11±1
T ₃	20.13	7	12	18	17.6	1 ⁰	1 ⁰	1 ⁰	7 ⁰	12±1
T ₄	27.26	12	14	18	17.6	1 ⁰	1 ⁰	1 ⁰	3 ⁰	19±1
T ₅	24.54	12	14	22.9	20.7	1 ⁰	1 ⁰	1 ⁰	4 ⁰	15±1

T₁-Distilled water, T₂-DW+4% Sucrose, T₃-DW+CaCl₂ (10mg/l)+4%Sucrose, T₄-DW + 8-HQS(20mg/l) , T₅-DW+HQS(20mg/l)+4%Sucrose

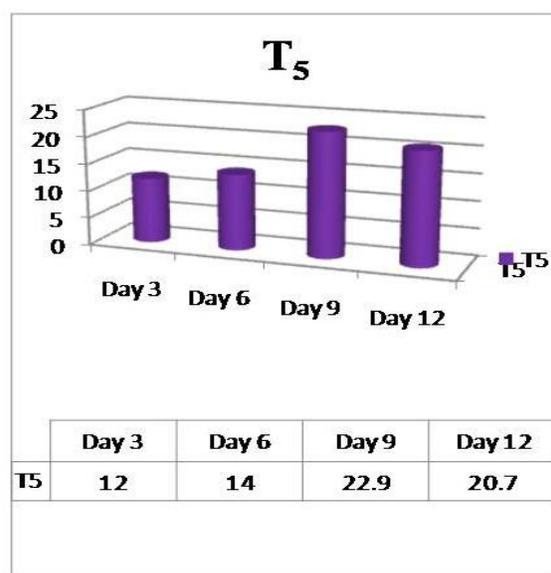
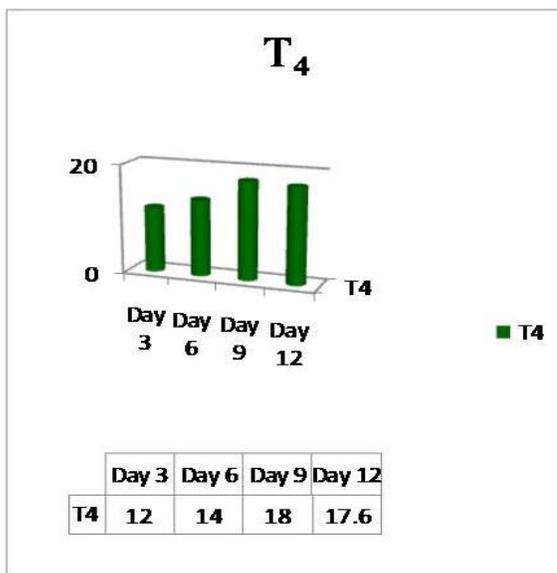
Discolouration [11-13] however, the combinations of 8-HQS & 4% sucrose shows highest mean uptake of preservative solution but when Sucrose is applied alone caused a steep decrease in mean uptake of preservative solution and vase life. This reflects the inhibitory effect of 8-HQS on bacterial colonization and clogging of xylem vessels in cut surface of the flower stem in accord with earlier studies [14]. It is clear from data that adding Sucrose (4%) to preservative solution containing 8-HQS or Calcium Chloride increased flower fresh weight and water uptake. This may attributed to the effect of sucrose in reducing respiration rate, petal senescence and increasing mechanical rigidity of the stem [15,16]. Calcium chloride (10mg/l) treatment extended vase life (10±1 days). The inclusion of 4% Sucrose in vase solution also extended longevity (12±1 days). It is in the accord with the earlier studies in *Alastromeia*, *Gerbera* & *Rose* [16,17]. Salts of calcium influence the vase life of flowers through their mode of action which includes their role in signaling plant metabolism, maintenance of cell wall stability and increasing xylem pectin associated water flow through stems [18-20]. The treatment of flowers with sucrose(4%(improves water uptake and shelf life in comparison to control attributed to role of sucrose in providing-source to prevent sudden bending of the stem, a practical problem affecting sale of flowers in accord to earlier studies [21-23].



Fig.1-3: Gerbera cultivars in Vase solution T₄ in (DW+8-HQS (20mg/l))after 9 days



Fig. 4-6: Flowers in Vase solution T₅ (DW+ 8-HQS (20mg/l) + 4%Sucrose) after 9 days



CONCLUSION

The results of the present study concluded that high postharvest quality, water uptake, stem bending and vase life should be used as a proper strategy to decrease production costs. Pulsing with HQS, Sucrose, and CaCl₂ alone and their combinations extended the vase life of cut gerbera flower. The most effective concentrations of HQS (20mg/l) and CaCl₂ (10mg/l) alone and pulsing with 4% sucrose proves best. The application of HQS, CaCl₂ & sucrose are natural, cheap, safe, and biodegradable compounds to prolong vase life of cut gerbera flower, an alternative to chemical treatments. To conclude, 20mg/l 8-HQS without pulse treatment has the potential to be used as a commercial preservative solution to improve the keeping quality and vase-life of this important cut flower.

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