POST HARVEST TREATMENTS OF CUT FLOWERS (*Gerbera*)

By

HANAN AHMED EL-SAYED MOHAMED HASSAN
B.Sc.Agric.Sci. (Ornamental Horticulture), Fac. Agric.,
Cairo Univ., 2007

THESIS
Submitted in Partial Fulfillment of the Requirements for the Degree of

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In

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Department of Ornamental Horticulture
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APPROVAL SHEET

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Date 31/ 12 / 2018

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Abstract

This experiment was carried out in two successive seasons (2013 and 2014) at the Post-Harvest Lab. of Ornamental Plants and Landscape Gardening Research Dept., Hort. Res. Inst.; Giza, Egypt on Gerbera (*Gerbera jamesonii* cv. Rosalin) cut flowers to study the effect of some preservative solutions, viz. distilled water (control), silver nitrate ($AgNO_3$) (20 mg/l), silver nitrate ($AgNO_3$) (20 mg/l) + sucrose (suc)(4%), 8- Hydroxyqunoline citrate (8- HQC) (100 mg/l), 8-hydroxyqunoline citrate (8- HQC) (100 mg/l) + sucrose (suc) (4%), sucrose (suc)(4%), 8-hydroxyqunoline citrate (8- HQC) (200 mg/l), 8-hydroxyqunoline citrate (8- HQC) (200 mg/l) + sucrose (suc) (4%), calcium chloride ($CaCl_2$) (1000 mg/l), calcium chloride ($CaCl_2$) (1000 mg/l) + sucrose (suc) (4%), silver nitrate ($AgNO_3$) (20 mg/l) + sucrose (suc) (4%)+ 8-hydroxyqunoline citrate (8-HQC) (100 mg/l) + calcium chloride ($CaCl_2$) (1000 mg/l), calcium chloride ($CaCl_2$) (2000 mg/l), calcium chloride ($CaCl_2$) (2000 mg/l) + sucrose (suc) (4%) and silver nitrate ($AgNO_3$) (20 mg/l) + sucrose (suc) (4%)+ 8-hydroxyqunoline citrate (8-HQC) (200 mg/l) + calcium chloride ($CaCl_2$) (2000 mg/l); and different storage temperatures (cold storage at 2°C for 7 days, under room temperature at (21 ± 1° C) (unstored flowers), and their interaction to identify the best treatment to increase vase life and other related characters . The obtained data exhibited that all preservative solutions caused a marked increment in the studied characters compared to that registered from distilled water (control). In this respect, treating cut flowers treated with $AgNO_3$ (20 mg/l) increased vase life, number of days taken for flower head drooping and water uptake, while decreased stem curvature and improved anthocyanin content and total carbohydrates in flower petals, followed by the combined treatment of $AgNO_3$ (20 mg/l) plus sucrose (4%). Cut flowers stored under room temperature at (21± 1° C) gave the best results for studied characters compared to those stored at 2°C for 7 days. The results of interaction showed that all holding solutions under room temperature at (21± 1° C) (unsorted flowers) had the highest effect on extending vase life, number of days taken for flower head drooping and water uptake, while decreased stem curvature and improved anthocyanin content and total carbohydrates in flower petals compared to those stored at 2°C for 7 days.

Key words: gerbera cut flowers, silver nitrate, sucrose, 8-Hydroxyquinoline citrate, calcium chloride,

DEDICATION

Thank fullness and gratefulness to ALLAH who always helping me through my life and enabled me to fulfill my thesis.

I dedicate this work to my family and my husband for all the support they lovely offered during my post-graduate studies.

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INTRODUCTION

Cut flowers refer to flowers starting to blossom or flower buds that are cut with branches, stems, and leaves to be used for bouquets and decorations. Cut flowers can be divided in to two categories of "fresh cut flowers" and "non – fresh cut flowers" (Japan External Trade Organization, 2011).

Gerbera (*Gerbera jamesonii*) popularly known as Transvaal daisy, is one of the ten most popular commercial cut flowers in the world according to the global trends in floriculture. Gerbera is an important commercial cut flower, it belongs to the Family Asteraceae. It occupies the fourth place among cut flowers (Choudhary and Prasad, 2000). It is in considerable demand in both domestic and export markets. The blooms are attractive, suitable for any type of floral arrangements and are available in different shades and hues. Besides floral arrangements, gerbera is widely used in bouquets and in dry flower crafts. The cut flowers have a long vase-life, which fetches premium market prices. The flowers are hardy and stand the rigors of transportation admirably (InterNet site 1, 2018).

Gerbera habitat extends to South America, Africa and tropical Asia. Most of the present cultivated varieties originate from the artificial crossing progenies of *G. jamesonii* and *G. viridifolia*, both South African species, since natural hybrids of the two species have not been found (Bremer K, 1994 and Hansen, 1985).

The vase life of gerbera cut flower depends on the stem plugging and the scape bending as it has hollow stem. Research on

improvement of postharvest life of gerbera flowers is mearge (Prashanth and Chandrasekhar, 2007; Celikel and Reid, 2002).

One of the most effective problems in exporting gerbera cut flower is stem bending, which occurs ten centimeters down the capitulum (Wilberg, 1973). The important factors affecting gerbera after harvest are: genetic factors, some phytohormones, and water relations before harvest (Mencarelli *et al*. 1993, Botondi *et al*. 1998, Gerasopoulos and Chebli, 1999).

Reasons of bending of the stem are still not clearly understood, but there are many studies which investigated this problem; Perik *et al*. (2012) reported that the stem bending in gerbera cut flowers might be due to the turgor loss. The net water loss occurs in the floral head, but found in the stem especially in the 10-15 cm below the floral head. They compared the flowers that showed stem bending with those that did not, on day 7 of vase life. They found that fresh weight loss of 5 cm stem segments was higher in the stems that had bent. Additionally, stem bending might be related to stem elongation. At the harvest, the stem contained a large central cavity, which is starting at about 5cm from the root-shoot junction, and ending about 10cm below the floral head. The cavity extended upwards and laterally during vase life, but no relationship was found between cavity formation and stem bending.

The postharvest longevity of cut flowers having economic value can be improved by using different chemicals and sugar in vase solution (Halevy *et al.* 1987 and Prashanth, 2006).

Many agents have been used in cut flowers vase solutions to reduce the microbe contamination, which can extend the vase life. The

bactericides are the most important components in the preservative solutions to control harmful bacteria and help to prevent the bacteria embolism (Halevy and Mayak, 1981).

All holding solutions must contain essentially two components; sugars which prolong the vase life of cut flowers, and germicides which reduce the harmful microorganisms (Pun and Ichimura, 2003 and Faragher *et al.* 2002). Sucrose has been found to be the best type of sugar which is used in prolonging vase life (Pun and Ichimura, 2003), 8-Hydroxyqunoline (8-HQC) is the most powerful germicide (Hettiarachchi and Balas, 2005). Moreover, Han, (1998) mentioned that sugar with 8-HQC is more effective in comparison with control. Joshi (2012) showed high results in vase life, flower size and flower quality of *Gerbera* cv. Stanza when treated with sugar combined with 8-HQC at different concentrations. The effect of (8-HQS) and sucrose treatment in storage solution and temperature for effective storage of cut gerbera flowers inhibited scape bending after storage and significantly prolonged vase life, (Yoo and Kim 2003). It has been suggested that silver nitrate ($AgNO_3$) together with sucrose and (8-HQC) improved bud opening, increased diameter of individual flowers and prolonged the life of cut *Lilium*, (Joanna and Mynett 1985). The short-term with 4% sucrose or 250mg/l silver nitrate for 24 hours increase maintaining life of gerbera flowers compared to the controls (Nagaraja *et al*. 2000). In the experiment on cut gerbera flowers, the effect of short term treatments (pulsing) with distilled-water or calcium chloride 4% + sucrose 3% showed that the lowest fresh weight and diameter were for the control using calcium chloride + sucrose (Shima