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EFFECT OF BIOCIDES AND SUCROSE ON VASE LIFE AND QUALITY OF CUT GERBERA (*Gerbera jamesonii*) CV. MARON DEMENTINE

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ABSTRACT: An experiment was carried out in the Department of Horticulture laboratory, SHIATS, Allahabad.The experiment was conducted in completely randomized design (CRD) with nine treatments replicated thrice. There were nine treatments of different concentrations of sucrose (3% and 4%), silver nitrate (20 ppm and 40 ppm), Aluminium sulphate (200 ppm and 400ppm) and 8- Hydroxy quinoline citrate (200ppm and 400 ppm) in combination and one control. It was observed that treatment T_4 (Sucrose 4% + $AgNO_3$ 400 ppm) and T_8 (Sucrose 4% + 8-HQC 400ppm) gave better results and T_8 (Sucrose 4% + 8-HQC 400 ppm) had least cost of maintenance. Therefore T_4 and T_8 may be recommended as commercial use for enhancing the vase life and quality of cut Gerbera cv. Maron Dementine.

Keywords: *Gerbera, cut flower, vase life, sucrose, silver nitrate, 8-HQC.*

Floriculture has become a profitable industry in many parts of the globe. Floriculture has tremendous potential for export beside home consumption. Cut flower is one of the main components of floriculture trade. Everybody like flowers and the demands of cut flowers are increasing day by day and their selling price have considerably shot up. Gerbera (*Gerbera jamesonii*), popularly known as Transvaal daisy, is one of the ten most popular commercial cut flowers in the world and according to the global trends in floriculture, it occupies the fourth place among cut flowers. It is in considerable demand in both domestic and export markets. 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. Gerbera comes up well under a wide range of climatic conditions and topographies. Keeping quality is an important parameter for evaluation of cut flower quality for both domestic and export markets. It is essential to maintain flower freshness and original colour for a longer period by increasing the shelf life and reducing the post harvest losses. Addition of chemical preservatives to the holding solution is recommended to prolong the vase-life of cut flowers. All holding solutions must essentially contain two components viz., sugar and germicides. The sugars provide a respiratory substrate, while the germicides control harmful bacteria and prevent plugging of the conducting tissues. Therefore, the techniques of prolonging the vase-life of flowers will be a great asset to the growers and users. Keeping this in view, the present investigation was conducted to study the "Effect of biocides and sucrose on vase life and quality of cut gerbera cv. Maron Dementine.

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MATERIALS AND METHODS

The study was carried out in the laboratory of Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad during 2005-2006. Gerbera flowers were harvested when all the florets opened fully and were perpendicular to the stalk. The flowers were harvested early in the morning and were immediately placed in water for pre-cooling. The stalks were cut again prior to placing them in holding solution to study the keeping quality. Graduated glass conical flask were used to hold the floral preservatives and a uniform volume of 50 ml

of holding solution was prepared freshly and dispensed into the tubes. The tubes were kept at room temperature (28°C), RH of 75% and with adequate aeration. The flowers were placed away from direct sunlight. Nine treatments of holding solutions viz. T_0-control (distilled water), T_1-Sucrose 3%, T_2-Sucrose 4%, T_3-Sucrose 3% + silver nitrate @ 20 ppm, T_4- Sucrose 4% + silver nitrate @ 40ppm, T_5-Sucrose 3% + aluminium sulphate @ 200 ppm, T_6-Sucrose 4% + aluminium sulphate @ 400 ppm, T_7-Sucrose 3% + 8-Hydroxyquinoline citrate @ 200 ppm, and T_8-Sucrose 4% + 8-Hydroxyquionien citrate @ 400ppm were used and the experiment was conducted in completely randomized design with three replications. Observations on days taken for full flower diameter (cm), vase life (days), vase solution uptake per stem (cm), increase in stem length (cm), flower fresh weight (g), pigmentation extent (days), freshness (days), attractiveness (days) and cost of maintenance per day were recorded daily and analyzed statistically.

RESULTS AND DISCUSSION

Data collected and analyzed (Table 1) indicate that maximum flower diameter (11.2 cm) was found with Sucrose 4% + silver nitrate @ 40 ppm followed by Sucrose 3% + 8-HQC @ 200 ppm (11.0 cm), Sucrose 4% + 8-HQC @ 400 ppm (10.4 cm), whereas, the minimum flower diameter (9.5 cm) was recorded with control. Similar finding have also been reported by Rekha *et al.* (7) in gladiolus.

Data shows that biocides, sucrose and its concentrations used significantly affected gerbera vase life and maximum vase life (15.8 days) was recorded in sucrose 4% + silver nitrate @ 40 ppm followed by sucrose 4% + 8-HQC @ 400 ppm (14.1 days), sucrose 3% + silver nitrate @ 20 ppm (13.3 days), and minimum vase life (5 days) was recorded in control. The useful vase-life of the cut blooms terminated when the flower heads started drooping, which was followed by dis-colouration and fall of petals, which represented the end of effective vase-life of cut flowers. The improvement in vase-life of cut flowers in 40 ppm silver nitrate ($AgNO_3$) solution might be due to the fact that it is a very effective biocide, which completely inhibits the microbial growth. It is in conformity with the findings of Ketsa *et al.* (5) who opined that $AgNO_3$ prevented microbial occlusion of xylem vessels in Dendrobium, thereby enhancing water uptake and increasing longevity of flowers. Awad *et al.* (1) and Chand *et al.* (2) also attributed the beneficial effect of $AgNO_3$ in the vase-water to the production of Ag^+ ions, which might inhibit the rise of ethylene precursor, thereby enhancing the longevity of cut flowers. Sucrose is widely used as floral preservative, which acts as a food source or respiratory substrate and delays the degradation of proteins and improves the water balance of cut flowers. Steinitz (9) opined that addition of sucrose to the solution increased the mechanical rigidity of the stem by inducing cell wall thickening and lignifications of vascular tissues. Sucrose antagonizes the effect of ABA, which promotes senescence (Halevy and Mayak, 4). Sugars alone, however, tends to promote microbial growth. Hence, the combination of sugars and biocides might have extended the vase-life of cut flowers. $AgNO_3$ or sucrose alone was less effective as compared to their combinations with regard to vase-life. Similar results were also reported by Awad *et al.* (1) and Steinitz (9) zinnia and gerbera, respectively.

The perusal of Table 1 revealed that maximum quantity of holding solution (22.40 ml) was absorbed in the treatment sucrose 3% + silver nitrate @ 40 ppm which was at par with sucrose 3% + silver nitrate @ 20 ppm (14.10 ml) and least in control (17.70 ml). Sucrose and its concentration had significant effect on increase in stem length of gerbera over control. The maximum increase in stem length (2.4cm) was recorded in 3% + silver nitrate @ 40 ppm being statistically at par with sucrose 4% + aluminium sulphate @ 400 ppm followed by Sucrose 3% + 8-HQC @ 200ppm (2.3cm) and minimum increase (1.1cm) was recorded in control. This might be due to the

Table 1: Effect of chemical biocides, sucrose and their different concentration on qualitative characters of *Gerbera jamesonii* cv. Maron Dementine.

Treatments	Flower diameter (cm)	Vase life (Days)	Vase solution uptake / stem (cm)	Increase in stem length (cm)	Flower fresh weight (gm)	Pigment-ation extent (Days)	Freshe-ness (Days)	Attrac-tiveness (days)
T_0	9.5	5.0	17.7	1.1	19.6	6.3	5.4	4.6
T_1	10.3	8.0	20.6	1.2	20.9	11.2	6.1	7.0
T_2	9.9	11.4	21.8	1.1	23.1	12.4	8.7	8.9
T_3	10.0	13.3	22.0	1.5	25.4	14.1	9.4	11.0
T_4	11.2	15.8	22.4	2.4	20.4	15.5	15.3	15.3
T_5	10.2	11.6	17.5	1.2	20.8	12.1	8.3	9.9
T_6	10.3	12.2	17.3	2.4	24.1	14.2	6.5	10.3
T_7	11.0	10.9	20.1	2.3	21.5	13.1	10.2	9.6
T_8	10.4	14.1	21.0	1.8	23.3	15.3	12.1	14.4
C.D. (P=0.05)	1.32	1.97	2.85	0.23	1.09	0.84	1.38	1.11

Table 2: Cost of maintenance per day for different treatments in rupees.

Treatment	Cost of chemicals (Rs.)	Cost of flower (Rs.)	Total cost (Rs.)	Vase life (Days)	Cost of maintenance per day (Rs.)
T_0	0	42	42	5.0	8.4
T_1	6	42	48	8.0	6
T_2	8	42	50	11.4	438
T_3	324.6	42	366.6	13.3	27.56
T_4	645.3	42	387.3	15.8	43.5
T_5	6.04	42	48.04	11.6	4.14
T_6	8.08	42	50.08	12.2	4.10
T_7	7.45	42	49.45	10.9	4.53
T_8	10.9	42	59.9	14.1	3.75

*Price of chemicals: Sucrose @ Rs. 2 per 10 g, Silver nitrate @ Rs. 59.3 per 10 g, Aluminium sulphate @ Rs. 2.04 per 10 g, Hydroxyl quinoline citrate @ Rs. 72.7 per 10 g.

fact that the $AgNO_3$ present in the holding solution acted as a biocide inhibiting microbial population that might have resulted in blockage of the vascular tissues. The stems of gerbera are highly prone to water stress. The blockage of the base of stem due to bacterial plugging results in decrease of water uptake by stem. A very high level of turgidity is necessary for continuation of normal metabolic activities in the cut flowers. Sucrose helps in maintaining the water balance and turgidity. Hence, addition of sucrose to the holding solution might have lead to increased uptake of the holding solution. This was in conformity with the findings of Rogers (8). The present investigation revealed that the best holding solution for cut gerbera blooms would be a combination of silver nitrate and sucrose.

Treatments had also significant effects on relative fresh weight, but sucrose 3% + silver nitrate @ 20 ppm (25.4 g) and sucrose 4%+ aluminium sulphate @ 400ppm (24.1 g) exhibited two best fresh weights, while minimum fresh weight of flower found in control (19.6 g). One of the most effective parameters on vase life and

quality of cut flowers is their fresh weight. Pre-harvest factors have direct effect on fresh weight of cut flowers. Evaporation and transpiration are two important factors that cause to reduce fresh weight. Reducing of fresh weight play important role to determine vase life. Wilting of petals reduces their ornamental value. Similar results have also reported by Jowkar and Salehi (3).

The higher freshness of flower was significantly affected by different concentration of preservatives. Freshness of flowers was recorded with the maximum (15.3 days) in treatment with Sucrose 4% + silver nitrate @ 40 ppm when compared with the control treatment. The increased reducing sugar in the floret and stem of cut flowers may increase the osmotic potential of the stem and petals, thus improving their ability to absorb nutrients and maintain their turgidity, which may explain the increase of flower longevity in different treatment is observed in this study. Effects of biocide inhibiting microbial population might have resulted in blockage of the vascular tissues and sucrose which delayed petal abscission and colour fading. Similar result was also reported by Veen and Geign (10).

Attractiveness and pigmentation extent of flowers including gerbera significantly depends on the quality of vase water, moisture retaining capacity of cut flower and wind velocity. The data (Table 1) showed that maximum time for attractiveness of flowers (15.3 days) was recorded in sucrose 4% + silver nitrate @ 40 ppm followed by sucrose 4% + 8-HQC @ 400ppm (14.4 days) and minimum was in control (4.6 days), whereas maximum pigmentation extent (15.5 days) was recorded in treatment with Sucrose 4% + silver nitrate @ 40 ppm followed by treatment sucrose 4% + 8-HQC @ 400 ppm (15.3 days) and it was minimum in control (6.3 days). Meeteren (6) reported that water content can cause decrease in water retaining capacity of the petals. The onset of the decline in water content was depended on the cultivar and associated with increase of ion leakage.

A perusal of Table 2 revealed that cost of maintenance per day (Rs. 3.75) was recorded minimum in treatment of sucrose 4% + 8-HQC @ 400 ppm followed by sucrose 4%+ aluminium sulphate @ 400ppm (Rs. 4.10), Sucrose 3% + aluminium sulphate @ 200 ppm (Rs. 4.14), whereas maximum cost per day (Rs. 43.5) was recorded in Sucrose 4% + silver nitrate @ 40ppm due to high cost of chemicals and preservatives.

Considering all above salient findings it may be concluded that treatment combination of sucrose 4% + silver nitrate @ 40ppm and 4% + 8-Hydroxy quinoline citrate @ 400ppm gave better results. However on the basis of economic view, treatment of sucrose 4% + 8-HQC @ 400ppm had the least cost of maintenance. Therefore Sucrose 4% + silver nitrate @ 40ppm and 4% + 8-Hydroxy quinoline citrate @ 400ppm may be recommended as commercial use for enhancing the vase life and quality of cut gerbera cv. Maron Dementine.

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