Effect of pulsing solution for improving vase life of gerbera (Gerbera jamesonii Bolus ex. Hook) cv. Rucha

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Abstract

The present experiment on effect of pulsing solution for improving vase life of gerbera was carried out during November, 2019 at Floriculture and Landscaping Laboratory, College of Horticulture, VCSG, Uttarakhand University of Horticulture and Forestry, Bharsar, Pauri Garhwal, Uttarakhand. The experiment consists of ten treatments which were replicated three times in Completely Randomized Design. The results of investigation revealed that the treatment applied with 15% Sucrose + 300 ppm 8-HQC (T7) recorded maximum amount of pulsing solution uptake (3.28 ml), per cent weight increase of cut stems after pulsing (10.09), vase life (12.91 days), per cent increase in flower diameter (14.32 cm), amount of distilled water consume (19.89 ml), minimum per cent decrease in weight of the cut stem (17.67), per cent stem bending (38.30) and minimum number of CFU (42.26x10^-4) for pulsing solution. The results show that sucrose could increase vase life in combination with 8-HQC.

Keywords: pulsing, holding, sucrose, 8-HQC, CFU, distilled water

Introduction

Gerbera (Gerbera jamesonii Bolus ex. Hook.) is ranked among the top ten commercial cut flowers in the world flower market. It belongs to the family Asteraceae and originated from South Africa and Asia. It is also known as Transvaal daisy, Barberton daisy and African daisy. The leaves are radical, petiolated, lanceolate, lobed, narrower at the base and wider at tip and are arranged in a rosette at the base. It is a light weight flower with long and slender flower stalk. The daisy like dazzling and magnificent flower is used for vase decoration and flower arrangement purpose. The flowers have hollow stem therefore it is highly prone to water stress. Beside this stem/scape bending is a major physiological disorder of this crop which causes reduction in vase life of flower. Balestra et al. (2005) [2] reported that blockage of xylem due to bacterial plugging is the main reason of stem break and bending. The postharvest longevity of cut flowers can often be improved by the use of different preservative solution (Prashanth, 2006) [3]. A preservative solution contains three components i.e. sucrose that provide carbohydrate to the flower, biocide which helps in killing the population of microbes and an acidifier which lower down the pH of vase solution which helps in improving vase life of flower. For improving the vase life of gerbera pulsing solutions plays an important role. Therefore, the work embodied in this paper aimed to increase flower vase life and other related characters of cut gerbera flowers.

Materials and Methods

The present investigation entitled “Effect of pulsing solution for improving vase life of gerbera (Gerbera jamesonii Bolus ex. Hook) cv. Rucha” was carried out under Floriculture laboratory, College of Horticulture, VCSG Uttarakhand University of Horticulture and Forestry, Bharsar, Pauri Garhwal in 2019. The investigation was done for pulsing solution. The experiment consists of ten treatments viz., T1 Control (distilled water); T2 (10% Sucrose + 200 ppm 8HQC); T3 (10% Sucrose + 250 ppm 8HQC); T4 (10% Sucrose + 300 ppm 8HQC); T5 (15% Sucrose + 200 ppm 8HQC); T6 (15% Sucrose + 250 ppm 8HQC); T7 (15% Sucrose + 300 ppm 8HQC); T8 (20% Sucrose + 200 ppm 8HQC); T9 (20% Sucrose + 250 ppm 8HQC); T10 (20% Sucrose + 300 ppm 8HQC). The experiment was laid out in Complete Randomized Design with three replications per treatment. Cut stems were placed for 6 hours in pulsing after that put in distilled water.
Data Collected
Amount of pulsing solution uptake (ml/stem)
Amount of pulsing solution uptake was calculated by using the following formula.
Amount of pulsing solution uptake (ml) = Initial volume of solution (ml) – Final volume of the solution (ml) (after 6 hours pulsing duration).

Per cent weight increase of cut stems after pulsing (%)
Increase in weight of cut stems was worked out by recording the initial and final weight of stems at the time of pulsing them in preservative solutions.

\[
\text{Per cent weight increase of cut stems after pulsing} = \frac{W_f - W_i}{W_i} \times 100
\]

\(W_i\) - Weight of cut stems before pulsing
\(W_f\) - Weight of cut stems after pulsing

Vase life (days)
Vase life was measured in days at the time of keeping the flowers in vase until the flowers show any of the following symptoms: stem bending or neck bending or 50% petal discoloration or wilting.

Percent increase in flower diameter
The equatorial diameter of flowers at two places was recorded and average of two values was calculated. Increase in flower diameter of cut stem was worked out by recording the initial and maximum flowers diameter attained by the stems.

\[
\text{Per cent increase in flower diameter} = \frac{W_f - W_i}{W_i} \times 100
\]

\(W_i\) - Initial flower diameter of cut stems
\(W_f\) - Maximum flower diameter attained by cut stems

Amount of distilled water consumed (ml/stem)
Amount of distilled water consumed was calculated by using the formula:
Amount of distilled water consumed = Initial volume of distilled water (ml) – Final volume of the distilled water at the termination of vase life of cut stem (ml).

Per cent decrease in weight of the cut stem
Decrease in weight of stems was worked out by recording initial and final weight of cut stems recorded at the time of putting cut stems in distilled water and termination of vase life.

\[
\text{Per cent decrease in weight of the cut stem} = \frac{W_i - W_f}{W_i} \times 100
\]

\(W_i\) - weight of cut stems at the time of putting them in distilled water
\(W_f\) - weight of cut stems at the time of vase life termination

Per cent stem bending (%)
It was measured by using formula

\[
\text{Per cent stem bending} = \frac{\text{Number of cut stem showing bend neck}}{\text{Total number of cut stems used}} \times 100
\]

Number of CFU (Bacterial count)
Dilution plate count technique was adopted to estimate the bacterial population. After completion of vase life, 1 ml solution from each replication of each treatment was taken. Afterwards, serial dilutions were made up to 10⁶ dilutions. Out of these, 3 dilutions (10⁻³, 10⁻⁵ and 10⁻⁷) were selected and plated on nutrient agar. Under each dilution, three plates were used and the number of colonies of bacteria was counted after 48 hours of incubation at 37 °C and their mean value was recorded.

Results and Discussion
Effect of pulsing solution on vase life of gerbera cv. Rucha
The maximum amount of pulsing solution uptake (3.28 ± 0.11 ml) was noticed on T₁ and found statistically at par with T₅ (2.61 ± 0.33 ml), T₆ (2.79 ± 0.10 ml), T₇ (2.91 ± 0.23 ml) and T₈ (2.64 ± 0.14 ml). Marousky (1971) [14] reported that 8-HQC inhibit stem plugging by reducing the pH of the solution. It acts as a germicide which decreases the microbial growth in vascular bundles. Similar findings were reported by Silva De et al. (2013) [18], Vaidamitra (2017) [17] and Helaly (2019) [19] in gerbera, and Lakmali et al. (2016) [13] in gerbera and alstroemeria.

The highest percent weight increase of cut stems (10.09 ± 0.41%) was observed from the flowers pulsed with T₅ and found statistically at par with T₆ (8.78 ± 0.62%). Besides this 8-HQC have profound effect to check deleterious microbial (Farnham et al., 1972) [7] and presence of sucrose act as anti-desiccant (Marousky, 1971) [14] which increase the weight of cut stem. Similar results have been reported by Lakmali et al. (2016) [13] in gerbera and alstroemeria and Vaidamitra (2017) [13] in gerbera.

The maximum vase life (12.91 ± 0.44 days) was recorded from the flowers pulsed with T₁ followed by T₅ (11.24 ± 0.14 days). Joshi (2012) [12] reported that sucrose helps in increasing the level of moisture retention, increase osmotic potential of cytoplasm and reduce transpiration losses. The use of 8-HQC reduce stem blockage in sterile tissues (Haley and Mayank, 1981) [8] and citric acid act as acidifier which inhibits the growth of microorganisms (Dole and Wilkins, 1999). The result is corroborated with the findings of Chandrakant (2012) [3], De et al. (1996) [5] in gerbera crop and Jain et al. (2017) [10] in gladiolus.

The maximum percent increase in flower diameter (14.32 ± 0.48%) was recorded in T₁ followed by T₆ (12.69 ± 0.32%). More uptake of solution helped in more opening of disc florets and enlargement of ray florets contributing to increased flower size. The above results were corroborated with the finding of Chandrakant (2012) [3] and Vaidamitra (2017) [13] in gerbera.

The maximum amount of distilled water consumed (19.89 ± 0.41 ml) was recorded in T₁ and found statistically at par with T₅ (19.16 ± 0.64 ml). The increase amount of distilled water consumed in these treatments might be due to sucrose which supplies carbohydrate to the tissues and decrease the H₂O potential and thus improving the water uptake. Use of 8-HQC in pulsing helps in inhibiting stem plugging thereby conductivity of stem for solution uptake (Marousky, 1972). The results are in conformity with the findings of Vaidamitra (2017) [17] and Helaly (2019) [9] in gerbera.

The minimum percent decrease in weight of the cut stem (17.67 ± 0.77%) was recorded in T₁ and found statistically at par with T₅ (16.68 ± 0.57%) and T₆ (18.89 ± 0.12%). Daan et al. (1995) reported that combination of sucrose and 8HQC markedly inhibit senescence. The reduction in percent weight of cut stem under T₁ might be due to decrease water uptake and increase water loss. The above results are
also corroborated with the findings of Jain et al. (2017) [10] in gladiolus and Vaidamitra (2017) [13] in gerbera. The minimum stem bending [38.30 ± 1.30 (38.21 ± 0.76)%] was observed in the cut stems when pulsed with T7 followed by T6 [43.11 ± 1.39 (41.02 ± 0.80)%]. Minimum stem bending might be due to minimum bacterial count was recorded under this treatment which causes elimination of vascular blockage in xylem and enhanced solution uptake.

Similar results were reported by Javad et al. (2011) [11] and Vaidamitra (2017) [13] in gerbera. The minimum number of bacteria (42.26 ± 0.63 CFU/ml) was recorded in T7 followed by T5 (47.66 ± 1.20 CFU/ml). This might be due to antimicrobial activity of 8-HQC which reduces the pH of solution. Similar findings were also found by Amith (2010) [10], Divya (2013) [10] and Vaidamitra (2017) [13] in gerbera.

Table 1: Effect of pulsing treatments on amount of pulsing solution uptake (ml), per cent weight increase of cut stems after pulsing, vase life (days) and cent increase in flower diameter of gerbera cv. Rucha

<table>
<thead>
<tr>
<th>Treatment codes</th>
<th>Treatments</th>
<th>Amount of pulsing solution uptake (ml) ± S.E(m)</th>
<th>Per cent weight increase of cut stems after pulsing ± S.E(m)</th>
<th>Vase life (days) ± S.E(m)</th>
<th>Per cent increase in flower diameter ± S.E(m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Control (Distilled Water)</td>
<td>1.23 ± 0.12</td>
<td>5.14 ± 0.17</td>
<td>8.16 ± 0.22</td>
<td>4.57 ± 0.18</td>
</tr>
<tr>
<td>T2</td>
<td>10% Sucrose + 200ppm 8-HQC</td>
<td>2.50* ± 0.38</td>
<td>7.64* ± 0.38</td>
<td>10.11* ± 0.26</td>
<td>10.26* ± 0.12</td>
</tr>
<tr>
<td>T3</td>
<td>15% Sucrose + 200ppm 8-HQC</td>
<td>2.94* ± 0.32</td>
<td>7.64* ± 0.66</td>
<td>10.08* ± 0.44</td>
<td>9.44* ± 0.18</td>
</tr>
<tr>
<td>T4</td>
<td>10% Sucrose + 300ppm 8-HQC</td>
<td>2.61* ± 0.33</td>
<td>8.02* ± 0.39</td>
<td>11.00* ± 0.28</td>
<td>10.95* ± 0.38</td>
</tr>
<tr>
<td>T5</td>
<td>15% Sucrose + 300ppm 8-HQC</td>
<td>7.94* ± 0.10</td>
<td>8.68* ± 0.62</td>
<td>11.18* ± 0.30</td>
<td>11.08* ± 0.40</td>
</tr>
<tr>
<td>T6</td>
<td>10% Sucrose + 250ppm 8-HQC</td>
<td>2.91* ± 0.23</td>
<td>8.78* ± 0.62</td>
<td>11.24* ± 0.14</td>
<td>12.69* ± 0.32</td>
</tr>
<tr>
<td>T7</td>
<td>15% Sucrose + 250ppm 8-HQC</td>
<td>3.28* ± 0.11</td>
<td>10.09* ± 0.41</td>
<td>12.91* ± 0.44</td>
<td>14.32* ± 0.48</td>
</tr>
<tr>
<td>T8</td>
<td>20% Sucrose + 200ppm 8-HQC</td>
<td>2.64* ± 0.14</td>
<td>8.03* ± 0.36</td>
<td>11.09* ± 0.28</td>
<td>10.37* ± 0.07</td>
</tr>
<tr>
<td>T9</td>
<td>20% Sucrose + 250ppm 8-HQC</td>
<td>2.43* ± 0.13</td>
<td>7.15* ± 0.16</td>
<td>9.83* ± 0.68</td>
<td>10.01* ± 0.20</td>
</tr>
<tr>
<td>T10</td>
<td>20% Sucrose + 300ppm 8-HQC</td>
<td>2.01* ± 0.34</td>
<td>7.01* ± 0.42</td>
<td>9.25* ± 0.14</td>
<td>8.69* ± 0.42</td>
</tr>
</tbody>
</table>

* Significant at 5% level of significance as compared to control

Table 2: Effect of pulsing treatments on per amount of distilled water consumed (ml), per cent decrease in weight of the cut stem, per cent stem bending and number of CFU (Bacterial count) of Gerbera cv. Rucha

<table>
<thead>
<tr>
<th>Treatments code</th>
<th>Treatments details</th>
<th>Amount of distilled water consumed (ml) ± S.E(m)</th>
<th>Per cent decrease in weight of the cut stem ± S.E(m)</th>
<th>Percent stem bending transformation angular value ± S.E(m)</th>
<th>Number of CFU (Bacterial count) 10^6 ± S.E(m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Control (Distilled Water)</td>
<td>13.19 ± 0.41</td>
<td>22.97 ± 0.38</td>
<td>73.37 ± 1.87 (58.94 ± 1.21)</td>
<td>85.00 ± 0.57</td>
</tr>
<tr>
<td>T2</td>
<td>10% Sucrose + 200ppm 8-HQC</td>
<td>17.54* ± 0.94</td>
<td>19.72* ± 0.26</td>
<td>55.81* ± 1.01 (48.32 ± 0.58)</td>
<td>56.33* ± 0.88</td>
</tr>
<tr>
<td>T3</td>
<td>10% Sucrose + 250ppm 8-HQC</td>
<td>16.96* ± 1.00</td>
<td>19.74* ± 0.53</td>
<td>54.78* ± 1.52 (47.72 ± 0.87)</td>
<td>52.33* ± 0.88</td>
</tr>
<tr>
<td>T4</td>
<td>15% Sucrose + 200ppm 8-HQC</td>
<td>17.58* ± 0.53</td>
<td>19.22* ± 0.24</td>
<td>51.59* ± 1.29 (45.89 ± 0.73)</td>
<td>49.66* ± 0.88</td>
</tr>
<tr>
<td>T5</td>
<td>15% Sucrose + 250ppm 8-HQC</td>
<td>18.87* ± 0.35</td>
<td>18.68* ± 0.57</td>
<td>45.86* ± 1.17 (42.60 ± 0.67)</td>
<td>47.66* ± 1.20</td>
</tr>
<tr>
<td>T6</td>
<td>15% Sucrose + 200ppm 8-HQC</td>
<td>19.16* ± 0.64</td>
<td>18.89* ± 0.12</td>
<td>43.11* ± 1.39 (41.02 ± 0.80)</td>
<td>47.00* ± 1.15</td>
</tr>
<tr>
<td>T7</td>
<td>15% Sucrose + 250ppm 8-HQC</td>
<td>19.89* ± 0.20</td>
<td>17.67* ± 0.77</td>
<td>38.30* ± 1.30 (38.21 ± 0.76)</td>
<td>42.26* ± 0.63</td>
</tr>
<tr>
<td>T8</td>
<td>20% Sucrose + 200ppm 8-HQC</td>
<td>18.64* ± 0.23</td>
<td>18.98* ± 0.11</td>
<td>51.15* ± 1.18 (45.64 ± 0.67)</td>
<td>50.33* ± 1.20</td>
</tr>
<tr>
<td>T9</td>
<td>20% Sucrose + 250ppm 8-HQC</td>
<td>15.17* ± 0.62</td>
<td>20.52* ± 0.28</td>
<td>64.81* ± 1.54 (53.60 ± 0.92)</td>
<td>61.33* ± 0.88</td>
</tr>
<tr>
<td>T10</td>
<td>20% Sucrose + 300ppm 8-HQC</td>
<td>14.98* ± 0.54</td>
<td>20.69* ± 0.36</td>
<td>66.67* ± 1.12 (54.72 ± 0.68)</td>
<td>61.48* ± 0.51</td>
</tr>
</tbody>
</table>

* Significant at 5% level of significance as compared to control

Conclusion
The results of present investigation revealed that gerbera cv. Rucha pulsed with 15% Sucrose + 300 ppm 8-HQC for 6 hrs and found significantly effective in improving vase life of flower and could satisfactorily be recommended for enhancing vase life of gerbera.

References

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