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Research Article

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Effect of Sucrose and Citric Acid in Vase Life of Rose

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Abstract

Vase life is the foremost vital parameter to decide the quality of cut blooms, in any case, due to its profoundly perishable nature, it is continuously challenging to vase life. The experiment was conducted at SAI Institute of Paramedical and Allied Sciences from April 20th to 31st April 2022 to find out the most excellent concentration of sucrose and citric acid that improves and draws out the blossom quality and longevity. The explore was laid out in a Complete randomized design (CRD) with nine treatments and six replications. The treatment combination used in research were control, 2 % sucrose + 15 ppm citric acid, 4 % sucrose + 30 ppm citric acid, 6 % sucrose + 45 ppm citric acid, 8 % sucrose + 60 ppm citric acid, 10 % sucrose + 75 ppm citric acid, 12 % sucrose + 90 ppm citric acid, 14 % sucrose + 105 ppm citric acid and 16 % sucrose + 120 ppm citric acid. Information were collected on parameters such as water take-up, transpiration loss, weight pick up or misfortune, blossom breadth, days taken for to begin with petal spreading, days taken for bloom shriveling, days taken for color change, days taken for to begin with petal discoloration, days for neck bending and vase life. Rose sticks were collected at the bloom bud stage and two sticks were kept in each vase.2% sucrose with 15 ppm citric acid were found to have the longest days for color alter at 5.66 days, days for neck bending at 8.66 days, and days for bloom shriveling at 9.33 days. The vase life of 10.66 days, and this combination has the potential to be utilized as a commercial cut blossom additive to delay blossom senescence, improve post-harvest quality, and draw out the vase life of cut rose blossoms.

Keywords: Rose, Sucrose, Citric Acid, Vase Life, ppm

1. Introduction

Blossom shapes a necessarily portion of our wealthy legacy and culture as we have convention in floriculture. Rose, a generally celebrated blossom, has been utilized as a cultivate plant since the first light of civilization. Rose could be a image of flawlessness, class, sentiment and adore. It was called queen of flower firstly by Greek Poetess in her Ode of rose. Roses (Rosa hybrida) belong to family Rosaceae and Genus Rosa which contains more than 150 species and 1400 cultivars. It belongs to family Rosaceae and genus Rosa, which contains 200 species and with more than 20,000 cultivars . Rosaceaefamily contain more than 2000 varieties throughout the world.

From restorative and wholesome viewpoint roses are of incredible significance. Within the built up diverse items of restorative and dietary significance roses play an imperative part. Similarly rose plant generation is additionally an extraordinary activity to advance cut blossom trade as well as floriculture industry [1]. Rose appreciates predominance over all other blossoms being broadly utilized for enhancing purposes and is prized for its fragile nature, magnificence, charm and smell. Rose is recognized for their tall financial esteem, which are utilized in agro-based industry particularly in makeup and aromas. Rose hips are sometimes made into stick, jam, jelly, syrup and soup or are brewed for tea, basically for their tall vitamin C substance. Rose petals or blossom buds are some of the time utilized to flavor ordinary tea, or combined with other herbs to create home grown teas. But the rose is basically developed for the commercial generation of its cut blooms, which constitutes a significant parcel within the floriculture commerce. Ordinary, employments are in vase displays, wreaths and wreaths. In a few societies, a major utilize of cut roses is for worship; this could be seen particularly in south and Southeast Asia. Also, roses play a vital part within the fabricating of different items of restorative and dietary significance. In any case, the most thought of rose plant development is to induce the cut blooms, which incredibly bargains with the floricultural trade [2]. Rose is called as the 'Queen of Flowers' as well as 'King of Flowers' This indicates that both kingliness (Magesty, Status and Power) and queenliness (Beauty, Grace and Cultural refinement) are its inherent qualities.

No other blossom outperforms it for its magnificence, color and scent. That's the reason why it is considered as generally top choice blossom. Without roses gardens are not considered as total. Gardens elite for roses have been made in different parts of pass on world for appearing die respect to this blossom. Incredible differences within the plant development, color of blooms, bloom shape, scent, moderate opening of blooms and great Keeping quality made roses to so well known that it is developed commercially to meet the demand of cut blossoms. It is best positioning cut blossom within the blossom exchange on the premise of grounds, generation and utilization.

In India roses are developed for cut blooms, making fundamental oil, rose water and Gulkand. Various strategies have found to boost the postharvest life of blossom particularly cut blossom to keep them new for longer period of time [3]. About 20% of new blossoms lose their quality whereas passing through the advertise (collect, bundling, transportation, and deal) and a expansive bargain of remaining blossoms are sold at poor quality conditions disappointing the shopper due to physiological and pathological issues amid the postharvest handlings [4, 5].

Carbohydrate within the form of sugar and disinfectant within the shape of germicide are two fundamental constituents utilized as vase . Sugar makes a difference the blossoms in breath and germicide makes a difference to avoid bacterial assault on conducting tissue of the blossoms [6]. Beating with diverse concentration of sugar is exceptionally compelling strategy in boosting up the postharvest life of diverse blossoms [3]. Considers appeared that expansion of sugar within the shape of sucrose improve lastingness of numerous cut blooms since sucrose give a solid slim down to the blossom tissues starvation, blossom sprouting and ensuing water take-up [7]. Diverse chemical combinations with sucrose increment the postharvest life of cut blossoms and their physiological characteristics counting blossom estimate and vascular tissues [8].

To keep the blossom in new condition for longer period a few strategies have been created and it was found that the utilize of additive is accommodating for postponing senescence and expanding the postharvest life of cut blossom which too controls ethylene production and pathogen development. Distinctive variables influence the vase life of cut blossoms are chemical and physiological variables such as the substance of put away nourishments of blossom, mugginess, light, and temperature of the put where vase is kept. Vase life is additionally decided by numerous variables like decreased carbohydrate level diminished water assimilation and ethylene impacts [9-11].

2. Material and Methods

2.1 Site Selection

The site for conducting research work was chosen at Department of horticulture, Sai institute of paramedical and allied sciences in Dehradun from April 2022. The experiment site is located at Latitude of 30^0 20' 3.44'' North and longitude of 78^0 3' 11.34'' East.

2.2 Research Design

The experiment will be conducted in a completely randomized design (CRD) with nine treatments and six replications.

2.3. Treatment Combinations

Treatment Number	Preservatives
1	Distilled water (control)
2	2% sucrose solution + 15 ppm citric acid
3	4% sucrose solution + 30 ppm Citric acid
4	6% sucrose solution + 45 ppm Citric acid
5	8% sucrose solution + 60 ppm Citric acid
6	10% sucrose solution + 75 ppm Citric acid
7	12% sucrose solution + 90 ppm Citric acid
8	14% sucrose solution + 105 ppm Citric acid
9	16% sucrose solution + 120 ppm Citric acid

Table 1: Treatment Combination of Different Preservatives.

2.4. Other Experimental Setup

The thermometer and hygrometer will be set on the wall of experimental room for measuring the temperature and relative humidity of laboratory during study period. Flowers will be kept in 350 mL conical flask containing respective treatment solution of 250 ml. Each flask contained 2 stick of rose flower with uniform stem length (25 cm). Slanting cut to each cut flower was given with aiming better uptake of water. Rose sticks of variety happiness were harvested at flower bud stage and two sticks were kept in each vase solution.

2.5. Biometric Observation

• Water uptake: The difference between consecutive weights of the bottle with the solution (without the flowers) represents the water uptake in grams for that period.

• Transpiration loss: The difference between the consecutive weights of bottle + solution + flower represents the transpiration loss of water in gram for that period.

• Weight gain or loss: The difference between the weight of the bottle + solution + flower and the weight of the bottle + solution on the same day represent the fresh weight of the flower on that

particular day in grams.
• Flower diameter: Every day flower diameter was measured with the help of measuring scale.
• Days taken for first petal spreading: Number of days was counted for first petal spreading.
• Days taken for flower shriveling: Number of days was counted for flower shriveling.
• Days taken for color change: Number of days was counted for color change of flower.
• Days to first petal discoloration: Number of days was counted for determining days to first petal discoloration.
• Days for neck bending: Number of days was counted for neck bending.
• Vase Life: The point of termination of vase life varies from the first sign of wilting or fading to the death of all flowers with all the intermediate values between these points. Generally, in roses, appearances of bent neck, wilting of flower petals and drooping of leaves was considered to be the end of useful vase life of the flower and was recorded in number of days.

The weather data and observational data were recorded and entered into MS-Excel 2013. The analysis of variance was done using Gen Stat. The treatment means were compared by the Least Significant Difference (LSD) test at 5% level [12].

3. Result and Discussion

The results of research entitled "Effect of sucrose and citric acid in vase life of rose" is presented in this chapter. The exertion has been made to recognize the finest treatment combination for dragging out the shelf life of rose. The information recorded were analyzed and displayed in figures wherever necessary and an endeavors has been made to assess the result so obtain to supply the clarification with accessible confirmations wherever possible for observed variation in necessary traits.

3.1. Water Uptake

• In day 1 treatment 2 showed significantly higher water uptake of 13.33g, while treatment 9 showed minimum water uptake of 10 g. The result showed 4, 5 & 9; 5,4 & 8; 4,8,1, & 6; 8,1,6 & 3; 1,6,3 & 7 not significant difference among each other.
• In day 2, treatment 3 showed significantly higher water uptake of 33.67 g, while the treatment 5 showed minimum water uptake of 26.33 g. Treatment 1, 2 and 6 were significantly different than all the treatments. Treatments 4, 7, 8 and 9 showed not a significant difference in water uptake.
• In day 3, treatment 3 showed significantly higher water uptake of 34 g, while the treatment 9 showed minimum water uptake of 25.33 g which was not significantly different than 5. Treatments 6 and 2; 4, 7 and 8 showed not a significant difference in water uptake.
• In day 4, treatment 3 showed significantly higher water uptake of 32 g, while the treatment 9 showed minimum water uptake of 24 g. Treatment 1 and 9 were significantly different than all the treatments. Treatment 3 and 8; 2 & 8; 2 & 4; 5 and 6 showed not significant difference in water uptake.
• In day 5, treatment 8 showed significantly higher water uptake of 31.67 g, while the treatment 1 showed minimum water uptake of 22.83 g. Treatment 9 was significantly different than all the treatments. Treatments 4, 5 and 6; 2 & 6; 3 & 7 showed not a significant difference in water uptake.
• In day 6, treatment 2 showed significantly higher water uptake of 27.67 g, while the treatment 8 showed minimum water uptake of 13.67 g .Treatments 1, 5 and 9; 1, 5 & 6; 4 & 6; 3 & 9 and 3 & 8 showed not a significant difference in water uptake.
• In day 7, treatment 2 showed significant higher water uptake of 26.33 g, while the treatment 8 showed minimum water uptake of 11.33 g. Treatment 1, 5 and 9 were significantly different than all the treatments. Treatments 3 & 6; 4 & 7 showed not a significant difference in water uptake.
• In day 8, treatment 2 showed significant higher water uptake of 17.33 g, while the treatment 8 showed minimum water uptake of 9 g which was not significantly different than treatment 9. Treatment 7 was significantly different than all the treatments. Treatments 3 & 4; 5 & 6; 1, 6 & 9 showed not a significant difference in water uptake.
• In day 9, treatment 2 showed significant water uptake of 16.67 g, which was insignificant with treatment 7, while the treatment 8 showed minimum water uptake of 9 g. Treatment 5 was significantly different than all the treatments. Treatments 1, 6 & 9; 3 & 4 showed not a significant difference in water uptake.
• In day 10, treatment 2 showed significant water uptake of 16.67 g, which was insignificant with treatment 7, while the treatment 8 showed minimum water uptake of 9 g. Treatment 5 was significantly different than all the treatments. Treatments 1, 6 & 9; 3 & 4; showed not a significant difference in water uptake.
• In treatment 1, day 2 showed significantly higher water uptake of 30.5 g, while the day 8, 9 & 10 showed minimum water uptake 0f 10.33 g. Day 3, 4 and 5 were significantly different than all the days. Day 6 & 7 and 1, 8, 9 & 10 showed not a significant difference in water uptake.
• In treatment 2, day 3 showed significant water uptake of 32.33 g, which was insignificant with treatment 3 and 4 while the day 1 showed minimum water uptake of 13.33 g. Day 6 & 7; 8, 9 & 10; 5 & 6 showed not a significant difference in water uptake.
• In treatment 3, day 3 showed significant water uptake 34 g while the day 6, 8, 9 & 10 showed minimum water uptake of 14 g while the treatment 7 showed not a significant difference among others. Day 4 and 5 were significantly different than all the days. Day 2 & 3 showed not a significant difference in water uptake.
• In treatment 4, day 3 showed significantly higher water uptake of 31.67 g, while the day 1 showed minimum water uptake of 10.67 g. Day 5 was significantly different than all the days. Day 2 & 4; 6 & 7 and 8, 9 & 10 showed not a significant difference in water uptake.
• In treatment 5, day 4 showed significantly higher water uptake of 28 g, while the day 1 showed minimum water uptake of 10.33 g. Day 6 and 7 were significantly different than all the days. Day 2, 4 & 5 and 1, 8, 9 & 10 showed not a significant difference in water uptake.
• In treatment 6, day 3 showed significantly higher water uptake

29.67 g, while the day 8, 9 & 10 showed minimum water uptake of 10.67 g. Day 6 and 7 were significantly different than all the days. Day 2, 4 & 5 and 1, 8, 9 & 10 showed not a significant difference in water uptake.

• In treatment 7, day 3 showed significantly higher water uptake of 31.33 g, while the day 1 showed minimum water uptake of 12 g. Day 6 and 7 were significantly different than all the days. Day 2, 4 & 5 and 8, 9 & 10 showed not a significant difference in water uptake.

• In treatment 8, day 4 & 5 showed significantly higher water uptake of 31.67 g, while the day 8, 9 & 10 showed minimum water uptake of 9 g. Day 2 and 6 were significantly different than all the days. Day 1 & 7 and 3, 4 & 5 showed not a significant difference in water uptake.

• In treatment 9 day 2 showed significantly higher water uptake 29.33, while the day 1, 8, 9 & 10 showed minimum water uptake of 10 g. Day 3, 6 and 7 were significantly different than all the days. Day 4 & 5 showed not a significant difference in water uptake which was shown in figure 1

• Our result was in line with Roger 1973 who reported that sucrose helps in maintaining the water balance and turgidity. Hence, addition of sucrose to holding solution might have led to increased uptake of the holding solution.

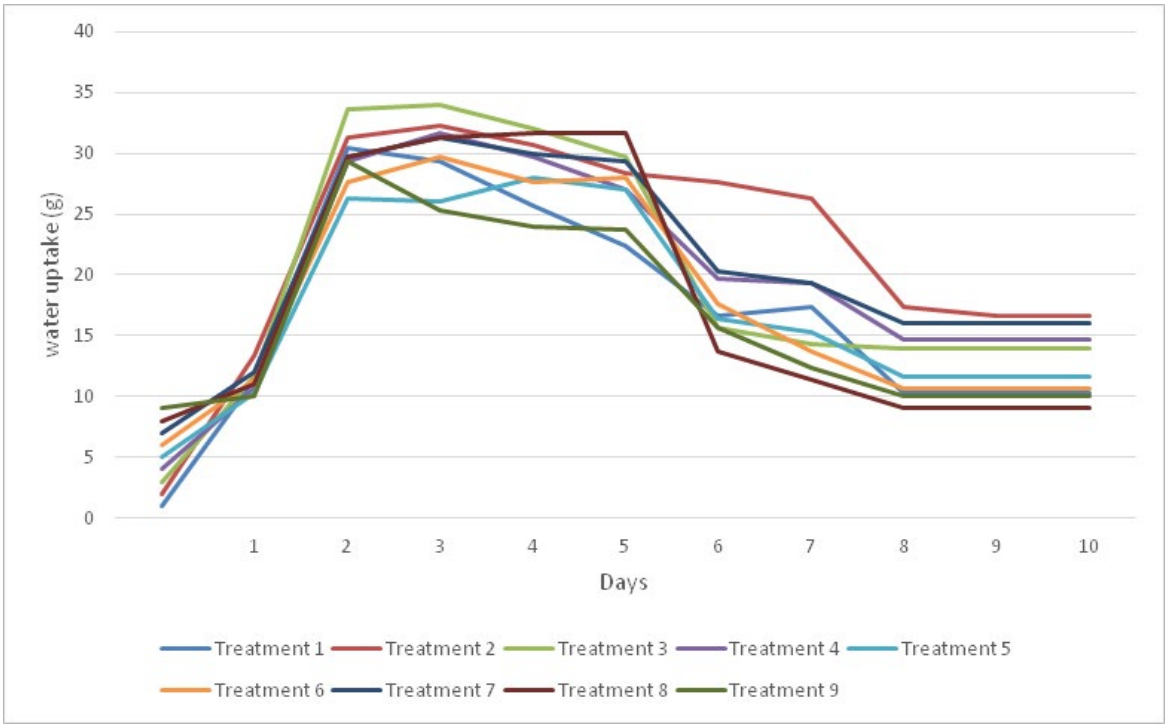

Figure 1: Water uptake by cut roses in different days

3.2. Weight Gain

• In day 1, weight gain was significantly high in treatment 2 (13.67 g) as compared to other treatments, while the treatment 5 (10 g) showed minimum weight gain. Treatment 4 was significantly different than all the treatments. Treatments 3, 7 & 9 and 1, 6 & 8 showed not a significant difference in weight gain.

• In day 2, weight gain was significantly high in treatment 4 (37.67 g) as compared to other treatments, while the treatment 2 (17.83 g) showed minimum weight gain. Treatment 1, 8 & 9 were significantly different than all the treatments. Treatments 3 & 5 and 6 & 7 showed not a significant difference in weight gain.

• In day 3, weight gain was significantly high in treatment 3 (37.67 g) as compared to other treatments, while the treatment 9 (28.33 g) showed minimum weight gain. Treatment 5 was significantly different than all the treatments. Treatments 2, 4, 7 & 8; 1, 4 & 7 and 1 & 6 showed not a significant difference in weight gain.

• In day 4, weight gain was significantly high in treatment 4 (44.67 g), while the treatment 9 (27.67 g) showed minimum weight gain. Treatment 1, 5, 6 & 9 were significantly different than all the treatments. Treatments 2 & 7 showed not a significant difference in weight gain.

• In day 5, weight gain was significantly high in treatment 8 (33.33 g), while the treatment 1& 9 (24 g) showed minimum weight gain. Treatments 4, 5 & 6 and 2, 3 & 7 showed not a significant difference in weight gain.

• In day 6 weight gain was significantly high in treatment 4 & 6 (25 g), while the treatment 1 & 9 (15.67 g) showed minimum weight gain. Treatment 7 was significantly different than all the treatments. Treatments 2 & 3; 5 & 8 and 2, 4 & 6 showed not a significant difference in weight gain.

• In day 7 weight gain was significantly high in treatment 3 (26.67 g), while the treatment 9 (12.33 g) showed minimum weight gain which was insignificant with treatment 8. Treatment 2 was significantly different than all the treatments. Treatments 6 & 8; 1

& 5 and 4 & 7 showed not a significant difference in weight gain.

• In day 8 weight gain was significantly high in treatment 2 (23 g), while the treatment 9 (8 g) showed minimum weight gain. Treatment 3 & 8 was significantly different than all the treatments. Treatments 5 & 6; 1 & 6 and 4 & 7 showed not a significant difference in weight gain.

• In day 9 weight gain was significantly high in treatment 2 (22.33 g), while the treatment 9 (8 g) showed minimum weight gain. Treatment 1, 5, 6 & 8 was significantly different than all the treatments. Treatments 3 & 7 and 4 & 7 showed not a significant difference in weight gain.

• In day 10 weight gain was significantly high in treatment 2 (22.33 g) as compared to other treatments, while the treatment 9 (8 g) showed minimum weight gain. Treatment 1, 5, 6 & 8 was significantly different than all the treatments. Treatments 3 & 7 and 4 & 7 showed not a significant difference in weight gain.

• In treatment 1, the weight gain was significantly high in day 3 (30 g), while the day 9 & 10 (11.67 g) showed minimum weight gain while treatment 1 showed insignificant difference. Day 2, 4, 5 and 8 were significantly different than all the days. Day 6 & 7 showed not a significant difference in weight gain.

• In treatment 2, the weight gain was significantly high in day 4 (34.67 g), while the day 1 (13.67 g) showed minimum weight gain. Day 2, 3, 5 and 6 were significantly different than all the days. Day 7, 8, 9 & 10 showed not a significant difference in weight gain.

• In treatment 3, the weight gain was significantly high in day 4 (33 g), while the day 1 (11 g) showed minimum weight gain. Day 2, 3, 5, 6 and 7 were significantly different than all the days. Day 8, 9 & 10 showed not a significant difference in weight gain.

• In treatment 4, the weight gain was significantly high in day 3 (32 g), while the day 10 (11.67 g) showed minimum weight gain. Day 1, 5, 6 and 7 were significantly different than all the days. Day 2, 8 & 9 and 3 & 4 showed not a significant difference in weight gain.

• In treatment 5, the weight gain was significantly high in day 4 (33 g), while the day 1 (10 g) showed minimum weight gain. Day 3, 5 and 7 were significantly different than all the days. Day 2 & 6 and 8, 9 & 10 showed not a significant difference in weight gain.

• In treatment 6, the weight gain was significantly high in day 4 (34.33 g), while the day 1 (12 g) showed minimum weight gain. Day 2, 3, 5, 6 & 7 significantly different than all the days. Day 1, 8, 9 & 10 showed not a significant difference in weight gain.

• In treatment 7, the weight gain was significantly high in day 4 (34.33 g), while the day 1 (11 g) showed minimum weight gain. Day 6 was significantly different than all the days. Day 3 & 5 and 2, 7, 8, 9 & 10 showed not a significant difference in weight gain.

• In treatment 8, the weight gain was significantly high in day 5 (33.33 g), while the day 8, 9 & 10 (10.67 g) showed minimum weight gain. Day 2, 3 and 6 were significantly different than all the days. Day 1 & 7; 4 & 5 and 8, 9 & 10 showed not a significant difference in weight gain.

• In treatment 9, the weight gain was significantly high in day 4 (27.67 g) as compared to other days, while the day 8, 9 & 10 (8 g) showed minimum weight gain. Day 1 & 7; 2 & 6 and 3 & 5 showed not a significant difference in weight gain which were shown in figure 2.

• Our research was in line with Bhattacharjee (1998) reported who that use of sucrose in the vase solution influenced water uptake, transpiration loss of water, maintained better water relations thereby improved fresh weight of the flower. Similar finding was reported by Luo et al. (2003) in cut carnation flowers.

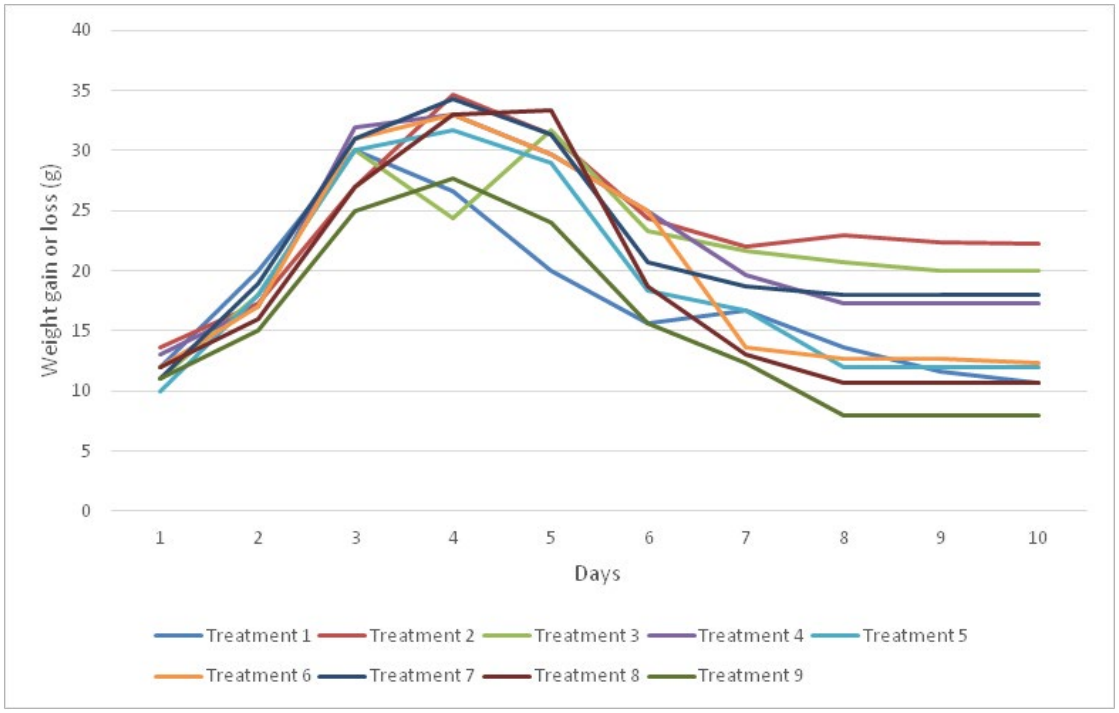

Figure 2: Weight gain or loss by cut roses in different days

3.3. Transpiration Loss

• In day 1, the transpiration loss was significantly high in treatment 8 (18 g), while the treatment 9 (5.67 g) showed minimum transpiration loss. Treatment 6 was significantly different than all the treatments. Treatments 1, 3 & 5; 7 & 8; 1 & 3 and 2 & 9 showed not a significant difference in transpiration loss.

• In day 2, the transpiration loss was significantly high in treatment 7 & 8 (18 g), while the treatment 1 & 2 (12 g) showed minimum transpiration loss. Treatment 9 was significantly different than all the treatments. Treatments 1, 2, 4, 5 & 6; 3, 4 & 6 and 7 & 8 showed not a significant difference in transpiration loss.

• In day 3, the transpiration loss was high in treatment 7 (11.33 g) which was insignificant with treatment 8, while the treatment 9 (6.67 g) showed minimum transpiration loss. Treatment 2, 3, 4, 5, 6 & 8; 1, 3 & 4; 1, 3 & 9 showed not significant difference in transpiration loss.

• In day 4, the transpiration loss was high in treatment 2, 5 and 7 (7.67 g), while the treatment 1 and 6 (3.33 g) showed minimum transpiration loss. Treatments 1, 3, 6 & 9; 3, 4, 8 & 9 and 2, 4, 5, 7 & 8 showed not a significant difference in transpiration loss.

• In day 5, the transpiration loss was significantly high in treatment 2 (7.33 g), while the treatment 3 & 6 (1.67 g) showed minimum transpiration loss. Treatment 1, 3, 6 & 9; 1, 5, 8 & 9; 7 & 8 and 2, 4 & 7 showed not significant difference in transpiration loss.

• In day 6, the transpiration loss was significantly high in treatment 4 (6.63 g), while the treatment 9 (1 g)showed minimum transpiration loss. Treatments 1, 3, 8 & 9; 2, 3, 5, 7 & 8 and 4 & 6 showed not a significant difference in transpiration loss.

• In day 7, the transpiration loss was significantly high in treatment 4 & 7 (3.33 g, while the treatment 1 (1 g) showed minimum transpiration loss. Treatment 1, 3, 8 & 9; 5, 8 & 9; 2, 5, 6 & 8 and 2, 4, 5, 6 & 7 showed not a significant difference in transpiration loss.

• In day 8, the transpiration loss was significantly high in treatment 2 (2.67 g), while the treatment 1, 3 and 5 (0 g) showed minimum transpiration loss while other treatments showed not significant difference in transpiration loss.

• In day 9, the transpiration loss was significantly high in treatment 2 (1.67 g), while the other treatments showed not a significant difference in transpiration loss.

• In treatment 1, the transpiration loss was significantly high in day 2 (12 g), while the day8, 9 & 10 (0 g) showed minimum transpiration loss. Day 1 and 3 were significantly different than all the days. Day 4 & 5; 6 & 7 and 8, 9 & 10 showed not a significant difference in transpiration loss.

• In treatment 2, the transpiration loss was significantly high in day 2 (12 g), while the day 10 (1 g) showed minimum transpiration loss. Day 3 was significantly different than all the days. Day 1 & 5; 4 & 5, 6, 7 & 8; 7, 8 & 9 and 9 & 10 showed not a significant difference in transpiration loss.

• In treatment 3, the transpiration loss was significantly high in day 2 (13.33 g), while the day 8, 9 & 10 (0 g) showed minimum transpiration loss. Day 4 was significantly different than all the days. Day 1 & 3; 5, 6 & 7; 7, 8, 9 & 10 and 8, 9 & 10 showed not a significant difference in transpiration loss.

• In treatment 4, the transpiration loss was significantly high in day 2 (13 g), while the day 9 & 10 (0 g) showed minimum transpiration loss. Day 3, 7 and 8 were significantly different than all the days. Day 1 & 2; 4, 5 & 6 and 8, 9 & 10 showed not a significant difference in transpiration loss.

• In treatment 5, the transpiration loss was significantly high in day 2 (12 g), while the day 9 & 10 (0 g) showed minimum transpiration loss. Day 3 and 4 were significantly different than all the days. Day 1, 2 & 3; 5, 6 & 7 and 8, 9 & 10 showed not a significant difference in transpiration loss.

• In treatment 6, the transpiration loss was significantly high in day 2 (13 g), while the day 9 & 10 (0 g) showed minimum transpiration loss. Day 6 was significantly different than all the days. Day 1 & 3; 4 & 7; 5 & 8 and 8, 9 & 10 showed not a significant difference in transpiration loss.

• In treatment 7, the transpiration loss was significantly high in day 3 (11.33 g), while the day 9 & 10 (0 g) showed minimum transpiration loss. Day 2 & 5 was significantly different than all the days. Day 1 & 4; 6 & 7 and 8, 9 & 10 showed not a significant difference in transpiration loss.

• In treatment 8, the transpiration loss was significantly high in day 3 (10.33 g), while the day 9 & 10 showed minimum transpiration loss. Day 2 & 5 was significantly different than all the days. Day 1 & 4; 6 & 7 and 8, 9 & 10 showed not a significant difference in transpiration loss.

• In treatment 9, the transpiration loss was significantly high in day 3 (10 g), while the day 9 & 10 (0 g) showed minimum transpiration loss. Day 2 & 5 was significantly different than all the days. Day 1 & 4; 6 & 7 and 8, 9 & 10 showed not a significant difference in transpiration loss which were shown in figure 3.

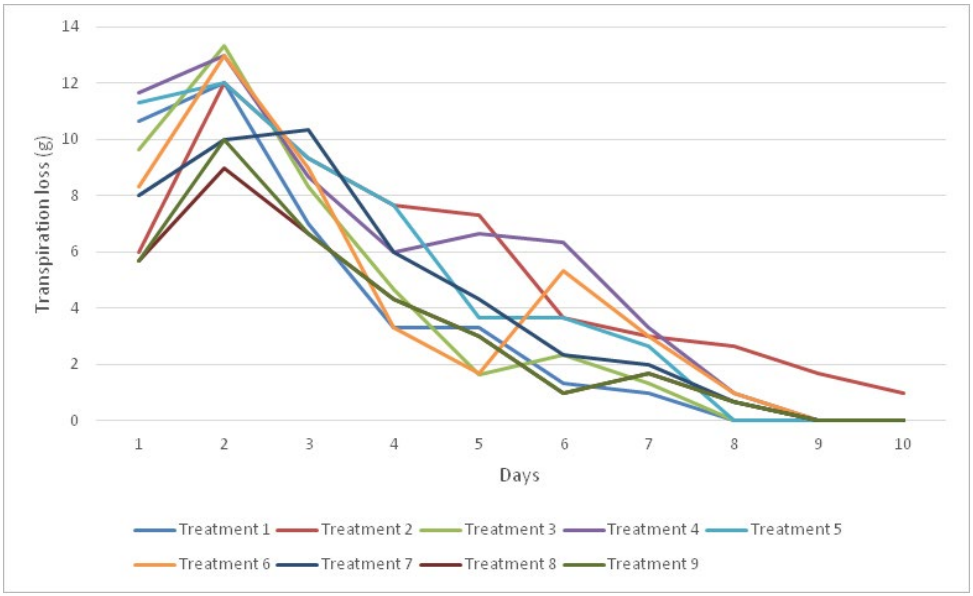

Figure 3: Transpiration loss in g by cut roses in different days

3.4. Flower Diameter

• In first day same size of flower diameter were chosen.

• In day 2, the flower diameter was significantly high in treatment 9 (6 cm), while the treatment 1 (3.33 cm) showed minimum flower diameter. Treatments 1 & 5, 2, 3, 4 & 5 2, 3, 4, 6, 7 & 8 and 6, 7, 8 & 9 showed not a significant difference in flower diameter.

• In day 3, the flower diameter was significantly high in treatment 9 (6.83 cm), while the treatment 1 (4 cm) showed minimum flower diameter. Treatments 2, 3, 5, 6 & 8; 4, 6 & 8 and 4, 7, 8 and 9 showed not a significant difference in flower diameter.

• In day 4, the flower diameter was significantly high in treatment 7 (7.67 cm), while the treatment 1 (5 cm) showed minimum flower diameter. Treatments 1 & 5; 2, 3, 4, 5, 6 & 8; 2, 3, 4, 8 & 9; 4, 7, 8 & 9 showed not significant difference in flower diameter.

• In day 5, the flower diameter was significantly high in treatment 7 (8.50 cm), while the treatment 1 (5 cm) showed minimum flower diameter. Treatments 2, 3, 5, 6 & 8; 2, 3, 4, 5, 8 & 9 and 7 & 9 showed not a significant difference in flower diameter.

• In day 6, the flower diameter was significantly high in treatment 7 (8.50 cm), while the treatment 1 (5 cm) showed minimum flower diameter. Treatments 2, 3, 4, 6 & 8; 2, 3, 4, 5, 8 & 9 and 5, 7, & 9 showed not a significant difference in flower diameter.

• In day 7, the flower diameter was significantly high in treatment 7 (8.50 cm), while the treatment 1 (5 cm) showed minimum flower diameter. Treatments 3, 4, 6, 8 & 9; 2, 5 & 9 and 2 & 5 showed not a significant difference in flower diameter.

• In day 8, the flower diameter was significantly high in treatment 2 (6.6 cm), while the treatment 1 (4.67 cm) showed minimum flower diameter. Treatments 3, 4, 6, 8 & 9; 3, 4, 5 & 9 and 2, 5 & 7 showed not a significant difference in flower diameter.

• In day 9, the flower diameter was significantly high in treatment 2 (8.53 cm), while the treatment 1 (3.3 cm) showed minimum flower diameter. Treatments 6, 8 & 9 and 3, 4, 5, 7 & 9 showed not a significant difference in flower diameter.

• In day 10, the flower diameter was significantly high in treatment 2 (4.67 cm), while the treatment 9 (3 cm) showed minimum flower diameter. Treatments 3, 4, 5, 6, 7 & 9; 1, 2, 3, 4, 5, 6, 7 & 8 showed not a significant difference in flower diameter.

• In treatment 1, the flower diameter was significantly high in day 4, 5, 6 & 7 (5 cm), while the day 1 (2 cm) showed minimum flower diameter. Day 2, 3 & 9; 3, 4, 5, 6, 7, 8 & 10 and 4, 5, 6 & 7 showed not a significant difference in flower diameter.

• In treatment 2, the flower diameter was significantly high in day 8 as compared to other days, while the day 1 (2 cm) showed minimum flower diameter. Day 2, 3 & 10; 4, 5 & 6; 6, 7 & 8 and 7, 8 & 9 showed not significant difference in flower diameter.

• In treatment 3, the flower diameter was significantly high in day 8 (7.33 cm), while the day 1 (2 cm) showed minimum flower diameter. Day 10 was significant different than other treatments. Day 2 & 3; 3 & 9; 4 & 9; 5, 6, 7 & 8 and 4, 5, 6 & 7 showed not significant difference in flower diameter.

• In treatment 4, the flower diameter was significantly high in day 5, 6, 7 & 8 (7.33 cm) as compared to other days, while the day 1 (2 cm) showed minimum flower diameter. Day 2 & 10; 3, 4 & 9; 5, 6, 7 & 8 and 4, 5, 6, 7 & 8 showed not significant difference in flower diameter.

• In treatment 5, the flower diameter was significantly high in day 7 & 8 (8.33 cm), while the day 1 (2 cm) showed minimum flower diameter. Day 2 & 10; 3, 4 & 9; 5 & 6; 4, 9 & 5 and 3, 4 & 9 showed not significant difference in flower diameter

• In treatment 6, the flower diameter was significantly high in day 7 & 8 (6.67 cm), while the day 1 (2 cm) showed minimum flower diameter. Day 2 & 9; 2, 3, 4, 5 & 6; 4, 5, 6, 7 & 8 and 9 & 10 showed not significant difference in flower diameter

• In treatment 7, the flower diameter was significantly high in day 5, 6, 7 & 8 (8.50 cm), while the day 1 (2 cm) showed minimum flower diameter. Day 3, 4 & 10 were significant different among other days. Day 2 & 9 and 5, 6, 7 & 8 showed not a significant difference in flower diameter

• In treatment 8, the flower diameter was significantly high in day

5, 6, 7 & 8 (7 cm), while the day 1 (2 cm) showed minimum flower diameter. Day 2 & 3; 4, 5, 6, 7 & 8, 5, 6, 7 & 8 and 9 & 10 showed not a significant difference in flower diameter.

• In treatment 9, the flower diameter was significantly high in day 5, 6, 7 & 8 (7.50 cm) while the day 1 (2 cm) showed minimum flower diameter. Day 2, 9 & 10 were significant different among other days. Day 3 & 4; 5, 6, 7 & 8 and 5, 6, 7, 8 & 9 showed not a significant difference in flower diameter which were shown in figure 4.

• Our research finding was in line with Pun and *Ichimura*, 2003 who reported that Development of flower bud requires carbohydrate and sucrose otherwise could not open naturally. According to *Mayaket* al., 1973 reported that sucrose provides essential substrate for respiration, structural material and carbon skeletons for bud opening. Similarly Van ***Doorn*** and Van *Meeteren*, 2003 reported that conversion of polysaccharide to monosaccharide is also responsible for flower opening or closure.

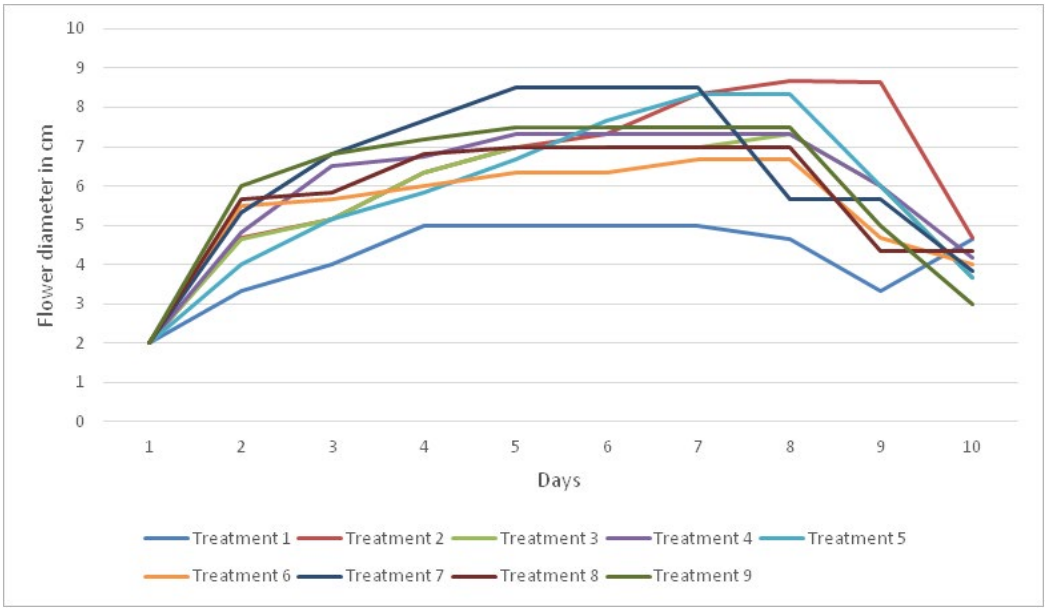

Figure 4: Flower diameter in cm of cut roses in different days

3.5. Days for Neck Bending

Days for neck bending were significantly high in treatment 2 as compared to other treatments, while the treatment 1 showed minimum days for neck bending. Treatment 8 was significantly different than all the treatments. Treatments 3, 4, 5, 6 & 7 showed not a significant difference in neck bending which were shown in figure 5.

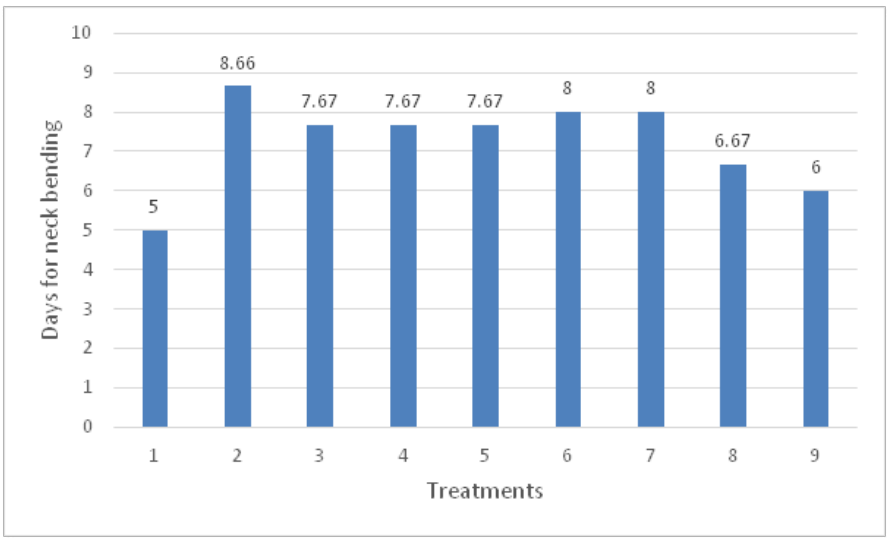

Figure 5: Days for Neck Bending of Cut Roses in Different Treatments.

3.6. Days for Flower Shriveling

Days for flower shriveling were significantly high in treatment 2 as compared to other treatments, while the treatment 1 showed minimum days for flower shriveling. Treatments 3, 4, 6 & 7; 3, 4, 5, 6 & 7 and 8 & 9 showed not a significant difference in flower shriveling which were shown in figure 6.

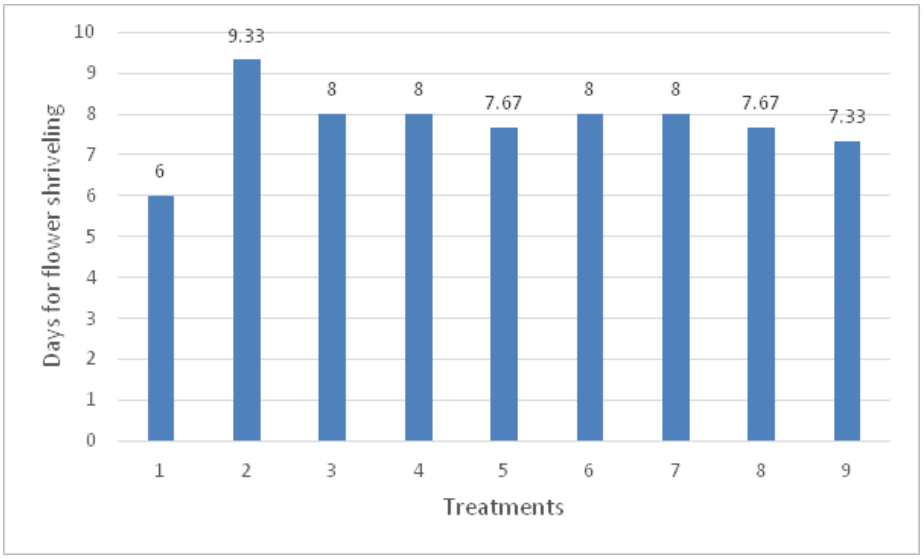

Figure 6: Days for flower shriveling of cut roses in different treatments.

3.7. Days for Color Change

Days for color change were significantly high in treatment 2 as compared to other treatments, while the treatment 1 showed minimum days for color change. Treatments 3, 4, 5, 6 & 7 and 8 & 9 showed not a significant difference in days for color change which were shown in figure 7.

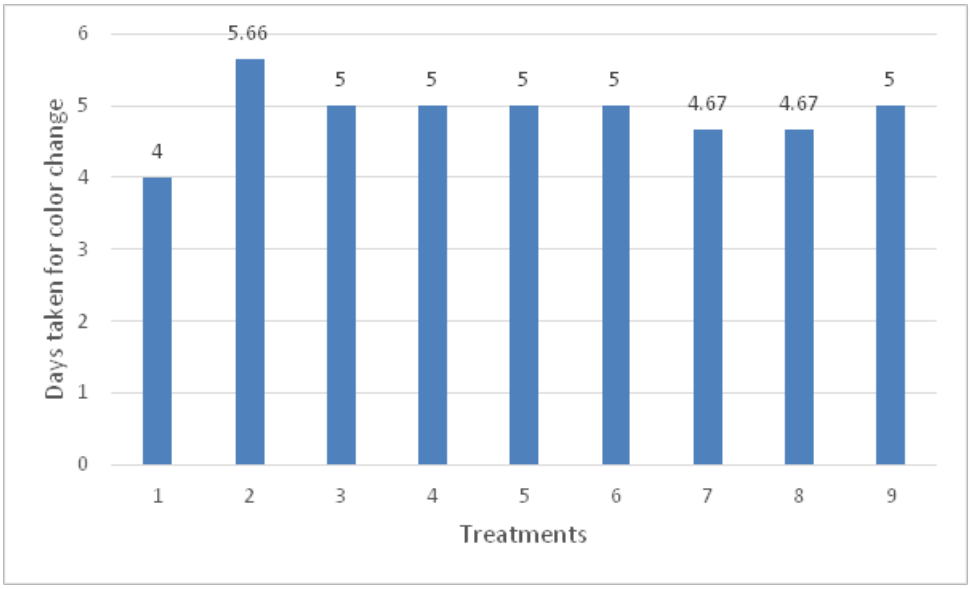

Figure 7: Days taken for color change of cut roses in different treatments.

3.8. Days for Petal Discoloration

Days for petal discoloration were significantly high in treatment 2 as compared to other treatments, while the treatment 1 & 9 showed minimum days for petal discoloration. Treatments 3, 4, 6, 7 & 8; 1, 5 & 9; 4 & 5 and 3, 6, 7 & 8 showed not significant difference in days for petal discoloration.

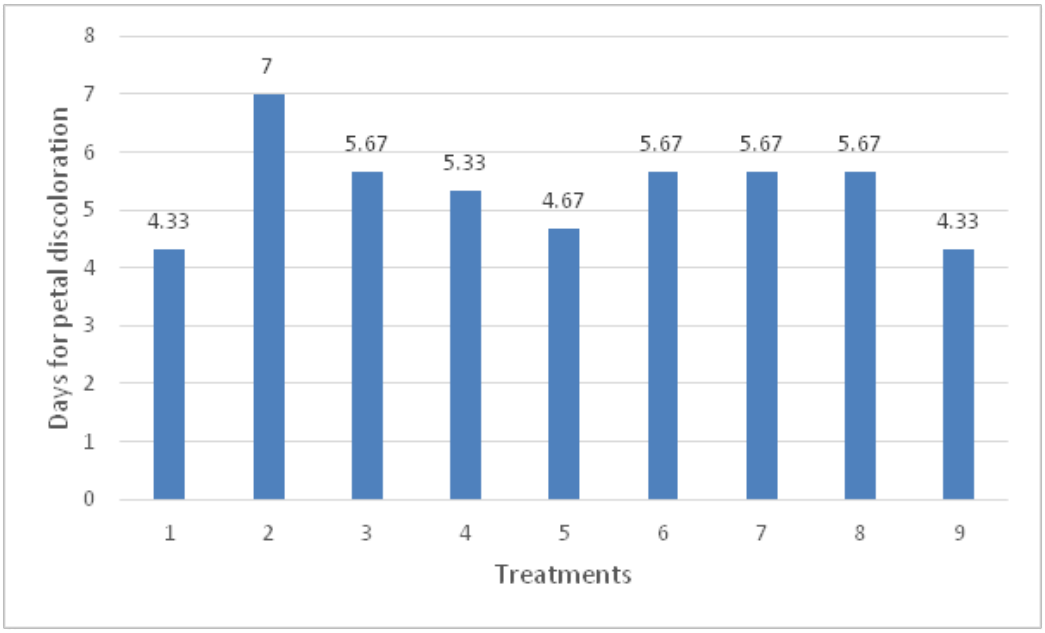

Figure 8: Days for petal discoloration of cut roses in different treatments.

3.9. Days for Petal Spreading

Days for petal spreading were not found significant among the treatments which was shown in figure 9.

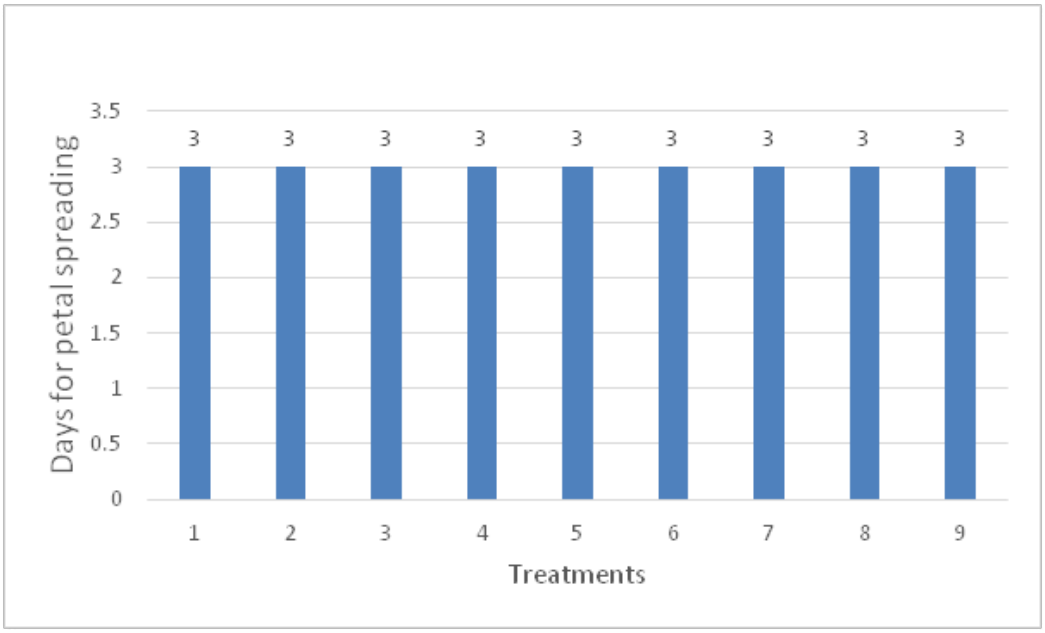

Figure 9: Days for petal spreading of cut roses in different treatments.

3.10. Vase Life

Days for vase life were significantly high in treatment 2 as compared to other treatments, while the treatment 1 showed minimum days for vase life. Treatments 3, 6, 7, 8 & 9; 3, 4, 5, 6, 7, 8 & 9 and 4 & 5 showed not a significant difference in days for vase life which were shown in figure 10.

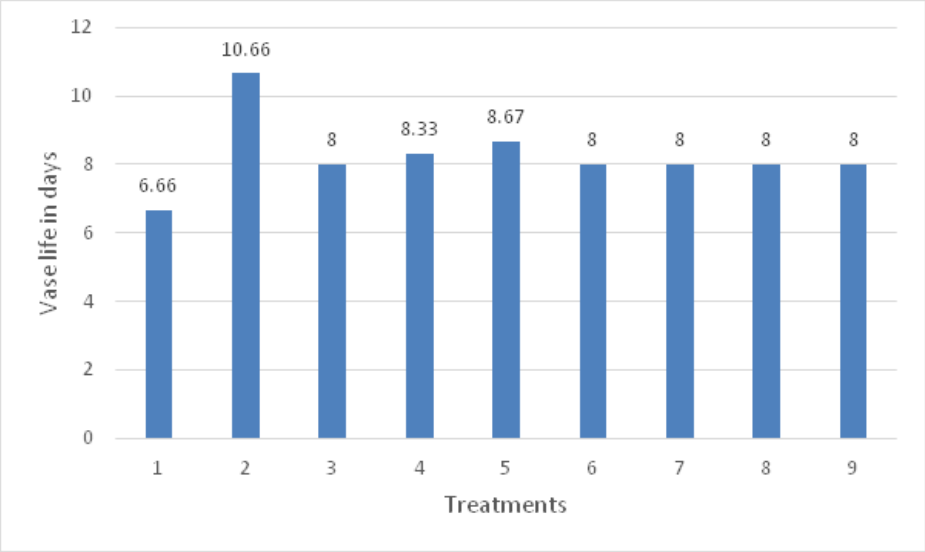

Figure 10: Vase Life of Cut Roses in Different Treatments.

3.11. Temperature and Humidity

The graph shows temperature and relative humidity during entire research period.The cut flowers at a low temperature ranging between 0-12°C depending on the type and variety to inhibit the respiration rate and ensure that the flowers are not damaged. Also, the relative humidity has great importance for preserving flowers, due to reducing water loss; for this reason, preserved the different types of flowers in a humidity ratio ranging between 80-90%. Numerous studies indicated that vase life varies in different varieties of many plant species used flowers for harvesting purposes, as in Clove and Gerbera varieties [13]. This is confirmed by that studying 25 varieties of Rose hybrid; this difference may be attributed to the difference in the genotype c`omposition of the species and environmental effect, which lead to morphological or anatomical differences or both [14, 15]. Also, the results of showed that the vase life of the Akito variety was shorter than the vase life of the first red variety when comparing two varieties of roses, this difference may be due to the flowers being exposed to the binding of the necks after storage [16]. Mentioned that an increase in respiration rate three times in stored flowers at a temperature of 10 compared to zero degrees and stored different types of flowers included cloves, daffodils, chrysanthemums and rose [17]. Study of Swart (1986) on tulips, noted that the lower vase life was associated with increased temperature and the longest life of the vase was obtained when the temperature was 1.15°C compared to 5 and 10°C. Explained that the flowers Gerbera decrease the vase life 13% under 21°C for four days compared to store for two days [18].

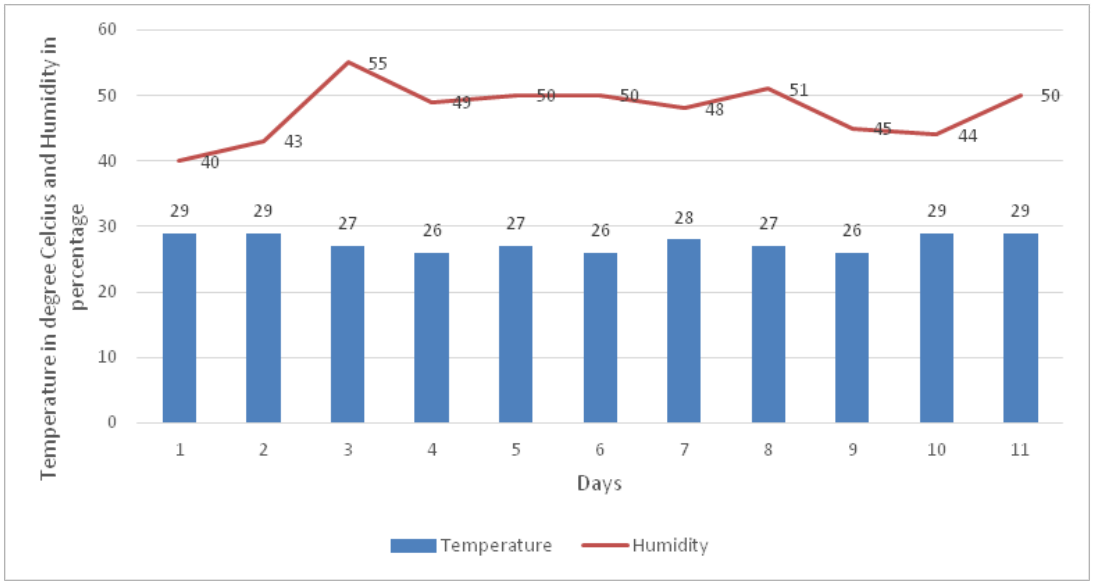

Figure 11: Temperature and Humidity During Entire Research Period.

Similar results were obtained from the research of who reported that 2% sucrose with 15 ppm citric acid solution found longest vase life and this combination has the potential to be used as a commercial cut flower preservative solution to delay flower senescence, enhance post-harvest quality and prolong the vase life of cut rose flowers [19].

Sucrose improves water balance in cut flowers because it effects on the closure of stomata and reduction of water loss [20]. Water uptake was reduced by the xylem vessel blockage due to presence of microbes and air accumulation in vase solution [21]. Similar finding was reported by in cut carnation flowers [22]. Sucrose in the vase solution influenced water uptake, transpiration loss of water, maintained better water relations thereby improved fresh weight of the flower [23]. Carbohydrate and sucrose requires for the development of flower bud to open flower which supply essential substrate for respiration, structural material and carbon skeletons for bud opening [24, 25]. Similarly, conversion of polysaccharide to monosaccharide is also responsible for flower opening or closure [26]. According to treatment with sucrose promoted unfolding petals, suppresses the decrease in fresh dry weight of cut flowers and inhibition on the occurrence of petals senescence [27]. It is reported that tuberose cut flowers retained their freshness for longer periods when higher concentrations of sucrose (3%) were used [28]. It is also reported that flower color expression is enhanced by treatment with sugars in carnation and rose [29]. It is reported that sucrose enhanced the effect of cytokinin in delaying senescence of flowers and also reduced the effect of ethylene which increasing the vase life of the flowers [30]. Similarly, the extended of vase life of cut gerbera with optimal concentrations of sucrose was due to better water relations, and also probable use of sucrose as a repairable substrate [23]. The highest vase life in rose was recorded by at 300 mg/l citric acid concentration. Organic acids such as citric acid were reported as the source of carbon and energy for cells and used in the respiratory cycle and some other biochemical pathway [31, 32]. Citric acid reduced bacterial population in vase solution and increased the water conductance in xylem of cut flowers. Similarly, Citric acid significantly transported iron in plants [33, 32].

4. Summary and Conclusion

This includes the summary of whole research and comes to the conclusion based on the findings of the result. An explore was conducted at Sai Established of Paramedical and allied sciences from April 20th to 31st April 2022 in arrange to discover out best concentration of sucrose and citric acid solution that improves and prolong the way better bloom quality and vase life. of cut roses. Experiment was laid out in Complete randomized design (CRD) with nine treatments and six replications. The treatment combination utilized in investigate were control, 2 % sucrose + 15 ppm citric acid, 4 % sucrose + 30 ppm citric acid, 6 % sucrose + 45 ppm citric acid, 8 % sucrose + 60 ppm citric acid, 10 % sucrose + 75 ppm citric acid, 12 % sucrose + 90 ppm citric acid, 14 % sucrose + 105 ppm citric acid and 16 % sucrose + 120 ppm citric acid. Information were collected on the parameters such as water take-up, transpiration loss, weight pick up or misfortune, bloom breadth, days taken for to begin with petal spreading, days taken for blossom shriveling, days taken for color change, days taken for to begin with petal discoloration, days for neck bending and vase life. Rose sticks were gathered at blossom bud organize and two sticks were kept in each vase.

Out of the nine medications 2% sucrose and 15 ppm citric acid gave the most excellent result in longest days for color change of 5.66 days, days for neck bending of 8.66 days, days for bloom shriveling of 9.33 days and vase life of 10.66 days and distil water gave least result days for color change of 4 days, days for neck bending of 5 days, days for blossom shriveling of 6 days and vase life of 6.66 days [34-40].

In this way by watching all the parameters, the impact of sucrose and citric acid in vase life of rose was found best among all other treatment combinations.

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