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# DETERMINING THE BEST CONDITIONING METHOD FOR CUT-ROSES

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## ABSTRACT

**Background:** *Conditioning is an important step in the flower maintenance post-harvest. It helps in increased storage time and better shelf-life of the cut flowers. Conditioning provides the cut flowers with certain nutrients required for their sustainability and prevents them from getting infected from some disease-causing microbes. People generally don't pay much importance to this step which leads to early decay and loss of their hard-earned flowers. Good conditioning can help sort out this problem and help prevent the cut-flowers from getting bad, by providing ambient conditions for the flower.* **Objective:** *The objectives of this study were to determine the best conditioning method for cut-Rose flowers through scientific experiment and getting the views on the flower behavior under different conditions based on the visual parameters.* **Methodology:** *The methodology undertaken for this work was a combination of experimental as well observational study. The experimental study was conducted in the housekeeping lab of IHM Pusa under the guidance of the research guide and lab attendant. The observational study was conducted through a google form questionnaire and was filled by some experts of the domain based on the visual parameters from the experiment conducted.* **Results:** *The most favorable conditions for the cut-Rose were provided by SET 'C' from the experiment conducted which contained a solution of sucrose, citric acid and bleach in distilled water. Also, based on the visual parameters SET 'C' was voted 69.04% as the best conditioner for cut-rose flower.* **Conclusion:** *Based on the results obtained from the experiment conducted and through the observations made, it was concluded that the mixture containing sucrose, bleach and citric acid proved to be helpful in conditioning of the flower in the best way, hence using the same can prevent the decay of cut flowers in a substantial manner, increase the vase-life and in-turn help attain sustainability.*

**Key Words:** *Conditioning, Cut-flowers, Floriculture, Loose-flowers, Vase-life.*

## INTRODUCTION

In the past, when science and technology were not as advanced, the flower had a very small vase life. In most of the countries, flower being perishable commodity, it was extensively used a local crop. The cut flowers were supposed to last for a day or two in maximum once they have been cut off from their life imparting source i.e., roots. But as soon as researches started happening over the conditioning and maintenance of cut flower postharvest, the scenario changed. Now the concerned florists were aware that nutrition and supplies are required to sustain the cut flowers, the cut flowers are required to be protected from microbes and infections caused by them. The majority of cut flowers can now be expected to last for several days if not weeks, if provided proper care and treatment. As Flower was able to survive the time, it soon started getting transported all around the world. While Netherlands has maintained rank 1 as the exporter of flowers for over 200 years, the countries in the tropical and sub-tropical regions are gaining an equal importance.

As of data collected in 2019, cut flowers are the world's 346th most traded product. Floriculture in India is undergoing a rapid growth. In India at present, the area under floriculture

production is 305 thousand hectares with a production of 2301 thousand tonnes loose flowers and 762 thousand tonnes cut flowers (*as per National Horticulture Database – published by National Horticulture Board during 2019-20*). The country has managed to export 15 thousand tonnes of floriculture products to the world for the worth of 576 crores/ 77.84 USD millions in 2020-2021, USA being the major export destination. The most important floriculture crops in the cut flower trade are Rose, Carnation, Chrysanthemum, Gerbera, Gladiolus, Gypsophila, Orchids and Oriental Lilies.

Zelter and Mayak (1995) on their study of sugar as a nutritive for cut flowers found that the sugar solutes support the growth of the flowers such as rose and extend their longevity. Doi and Reid (1995) showed that Sucrose increased the postharvest life of cut flowers of a hybrid *Limonium* flower. Study done by Van Doorn (2001) also suggested that sugars reduce ethylene sensitivity and, thereby delay the wilting in ethylene sensitive flowers like *Orchids* and some varieties of roses.

In flowers having tender foliage such as *Rose* and *Chrysanthemum*, sugar pulse should be maintained at low concentrations because of foliage damage caused by excessive sugar in the solution. Halevy and Mayak, (1981) concluded this on their experiment of examining sugar pulse in rose and chrysanthemums.

Floral preservatives are very effective in maintaining quality and extending life of cut flowers. As per Rudnicki et al., (1976), Song et al. (1996), preservative solution containing carbohydrate source prolonged the vase life of cut stock flowers. Floral preservatives improved bud opening and floret longevity of cut flowers such as roses and carnations, experimented by Celike and Reid (2002).

Studies done by Staden and Molenaar (1975), Staby and Erwin (1978) suggested that variability in the composition in tap water used as vase water can cause differences in keeping quality of cut flowers. Tap water composition also effects the efficacy of chemicals used. Therefore, Halevy (1976) suggested the use of de- ionized water for pre- harvest conditioning of cut flowers. Later, Reid and Kofranek (1980) on the same note, suggested the use of distilled water as a measure for common control.

Aaarts (1957) in his study of postharvest physiology of cut flowers found that vase life was above all dependent on the water balance, which is the relationship between capacity of the flower to uphold water, water transport and transpiration. He concluded that the effect of low pH was attributed to a reduction of microbial population of vase water, retarding stem blockages by microorganisms.

Plants are found to absorb acidic water [pH 3.5- 4.5] more rapidly than non- acidic water through their cut surfaces, suggests the study done by Weinstein and Laurencot (1958) on the water acidity relations of plants, taken Rose stems as sample.

Van Doorn and Perik (1990) after conducting an experiment on the favourable pH of water for cut flower conditioning, taken rose as the experiment samples found that the bacterial growth in the stems of roses is inhibited as a result of effective buffering of acid around pH 3.

Aaarts (1957a) on his study of reported that the inclusion of acid in the water will prevent bacterial growth but addition of acid to a solution that was already applied to prevent the bacterial growth, further increases the vase life of Roses, Dahlia *(Chrysanthemums) and Convallaria*.

A biocide kills the accumulation and growth of bacteria and fungi like microbes so they do not cause hinderance in transpiration by blocking the water vessels, suggested by Van Doorn et al. (1991) on their study on the importance of biocide as one of the constitute for vase water. Bleach is one of the common disinfectants used as a biocide.

All the cut flowers are short- lived and perishable commodities. They require special and right treatment during harvesting, handling, transport and storage so as to prevent the loss which could be both in qualitative and quantitative aspects. Cut flowers undergo stresses the during post- harvest duration in terms of dehydration, decay and depression due to lack of proper conditioning, treatment and ambient storage.

This research work primarily focuses on the conditioning step of the cut flowers which is done after their harvesting, grading and sorting. Conditioning is a simple process where plants are kept standing loosely in a large container of water to restore the turgidity or lack of water and nutrients of the cut flower under stress brought during their storage and transportation. This may be achieved by treating the cut flowers with various natural or artificial substances mixed in water. Proper conditioning can help in increasing the vase life of the cut flowers thereby maintaining sustainability and reducing monetary expenses.

The objectives of this study were: -

- To examine the best conditioning method for cut-Rose *(rosa)*.

- To study and observe the behaviour of cut-Rose under different conditions, based on the visual parameters.

**METHODOLOGY**

An experimental cum observational survey was done using a set of questions based on the conditional parameters of the conducted experiment which would help in determining the expected result in a better way. The experiment concerned with the research project was conducted in the housekeeping lab of IHM Pusa, New Delhi. The survey was done using a google form and was filled up by faculty, support staff, florists and some students of IHM Pusa, New Delhi who were well aware of the experiment and had some knowledge related to this research work.

**Research Design:** Experimental method was used to determine the primary data. Survey method was used to obtain the secondary data based on observations.

**Locale:** The experiment was conducted in the housekeeping lab of IHM Pusa, New Delhi. The flower samples were collected from the flower mandi of Ghazipur Village, Delhi-NCR.

**Sampling Design:** A total of 20 long stem cut- Rose flower was taken, 5 for each set A, B, C & D. For the survey 30 people were selected to fill up the google form. The respondents included both male & female mostly from an age group of 18-25, designated as students or florists.

**Tools and Technique:** For the Experiment- A total of 20 long stem roses were taken, distributed into 4 sets- set A, B, C and D. Each set containing of 5 flowers put for experiment in different vases for over a duration of 10 days. (This experiment is preferably conducted in the winter season as cold temperatures are favourable for flowers) SET A- Flowers held in a vase filled with "tap water". Water being changed once in 2 days.

SET B- Flowers held in a vase filled with "distilled water". Water being changed once in 2 days.

SET C- Flowers held in a vase filled with "[distilled water + sucrose (5%) + bleach (100 ppm) + citric acid (200 ppm)]". Water changed once in 3 days.

SET D- Flowers held in a vase filled with "[distilled water + Floralife (an artificial flower food by Oasis ®)]". Water being changed once in 3 days.

Tap water is a source of various infection causing microbes and pathogens. It also contains numerous good and bad nutrients and minerals in varying amount. Cut Flower when placed in tap water have a higher chance of decaying and rotting. Distilled water or de- mineralized water is free from the presence of microorganisms and minerals or any other type of foreign substances. Flowers when placed in distilled water has lower chance of decaying but also there is no source of nutrition for the flowers. Sugar or sucrose serves as a food for the flowers and promotes nourishment and longevity. When used in higher percentages (5%- 40%), it is proved to be effective on the bud opening of the plant. Bleach is a common disinfectant which prevents or inhibits the growth of microbes when used in right concentrations, which is 100 ppm. Citric acid is a common acid which helps in reducing the pH of water. Water with pH [3.5-4.5] increase the water uptake by the cut plants is most suitable for plants to maintain hydration. Citric acid also helps in eliminating the bacterial growth.

A mixture of Sugar, Bleach and Citric acid is a basic combination that cut flowers seek for their long vase life and sustainability. Sugar provides nourishment, bleach acts a disinfectant and acidity helps in water uptake.

Commercial preservatives like Floralife by oasis® are proved to increase the vase life of cut flowers. They contain the required concentrations of active ingredients which are basically helpful in cut flower sustainability.

**For the Survey-** A google form questionnaire was created and circulated to the concerned experts of the domain for their views and insights based on the visual/observational parameters. This google form survey questionnaire included the pictures from the experiment conducted from day 1 to day 7 and was aimed to get responses by the respondents based on the visual parameters like wilting of flower head, colour, flower-bud opening, dullness, etc. Each question had 4 options to select from and these were Set A, Set B, Set C and Set D. the respondents were required to the select the most appropriate option based on their observations made from the flower pictures attached from the experiment conducted. After the survey was over, the responses were compiled and the results were produced combining them all into a single pie-chart graph, showing the average percentage value obtained for each option.

**Data Analysis and Statistical Analysis:** The primary data collected from the experiment was noted and assessed daily to obtain a quantitative and analytical statement. The data

collected through the google form in the form of percentage were noted separately. Both these data were assessed quantitatively and qualitatively in the most justified manner to obtain a conclusion.

**RESULTS AND DISCUSSION**

From this this table it can clearly be seen that the Rose performed the best in SET 'C'. SET C was a mixture of distilled water, sucrose, citric acid and ammonia in pre-determined controlled amounts. With an average vote percentage of 69.04% set C has been voted to be the best conditioner for the rose flower.

According to the observations made during the experiment, the rose flower seemed to perform better in set C pertaining to all the above-mentioned parameters except sliminess/ stickiness in the vase water. As set C contains citric acid and bleach which helps fight bacteria and hence bad odor was not felt in set C. Sugar content in set C helped maintained the flower its nutrition, citric acid helped in water uptake and thus hydration of the flower. Therefore, the flowers showed better firmness in set C also the stems were found to be more rigid pertaining to the same cause.

***Table 1: Responses for Rose flower***

| Parameters (based on visual appearance) | SET A | SET B | SET C | SET D |
|---|---|---|---|---|
| **Least wilting of the flower head** | 13.3% | 6.7% | **73.3%** | 6.7% |
| **Least change in the colour of the flower** | 10% | 3.3% | **70%** | 16.7% |
| **Delay in rotting up/ blackening of the stems** | 10% | 6.7% | **70%** | 13.3% |
| **Delay in opening of the flower/ bud opening** | 16.7% | 0 | **70%** | 13.3% |
| **Least drying up/ dehydration in the flower** | 13.3% | 6.7% | **63.3%** | 16.7% |
| **Least falling of the petals out of the flower head** | 16.7% | 3.3% | **70%** | 10% |
| **Least falling of the anthers/ pollen grains** | 13.3% | 10% | **66.7%** | 10% |
| **Average Percentage** | 13.3% | 5.2% | **69.04%** | 12.39% |

Fungus built-up at the base and the head were comparatively low and blackening of the stems were not observed in set C due the presence of bleach.

In the study conducted by Zelter and Mayak in 1995 on the importance of sugar as a nutritive for cut flowers found that the sugar solutes support the growth of flowers such as Rose and increase their longevity. Study done by Van Doorn in 2001 also suggested that sugars reduce ethylene sensitivity and thereby delay the wilting in ethylene sensitive flowers such as Roses.

***Table 2: Observations of the experiment***

| Additional parameters (based on researcher's observations) | SET A | SET B | SET C | SET D |
|---|---|---|---|---|
| **Least change in odour/ smell of the flower** | | | ✓ | |
| **Least change in firmness of the flower** | | | ✓ | |
| **Least slimminess/ stickiness in the vase water** | | | | ✓ |
| **Least change in color/ rigidity of the stems** | | | ✓ | |
| **Least slimminess/ blackening at the cut of stem** | | | ✓ | |
| **Least fungus built up over the flower head** | | | ✓ | |
| **Least fungus built up at the bottom of stem** | | | ✓ | |
| **Least change in colour/ clarity of vase water** | | | ✓ | |

Studies done by Staden and Molenaar in 1975, Staby and Erwin (1978) suggest that variability in the composition in tap water used as vase water can cause differences in keeping quality of cut flowers. Tap water composition also effects the efficacy of chemicals used. Therefore, Halevy and Mayak in 1979 suggested the use of de- ionized water for pre- harvest conditioning of cut flowers. Later, Reid and Kofranek (1980) on the same note, suggested the use of distilled water as a measure for common control.

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-flowers concluded that the effect of low pH was attributed to a reduction of microbial population of vase water. On the same note studies conducted by Weinstein and Laurencot (1958) suggested that Rose stems are found to absorb acidic water (pH 3.5-4.5) more rapidly than non-acidic water through their cut surfaces.

Amplified build-up of bacteria and fungi in the vase solution can hasten the deterioration by blocking the eater vessels, therefore several biocides are used to prevent this as suggested by Reid and Kofranek in 1980, Halevy and Mayak in 1974, on their study of biocides and their importance as an inhibitor of bacteria and fungi. Following the same line, on the importance of biocide such as bleach, it was suggested by Van Doorn et al., in 1991 that a biocide kills the accumulation and growth of bacteria and fungi like microbes, thus they do not cause hinderance in transpiration by blocking the water vessels.

## CONCLUSION

As the result was expected, favorable outcomes were obtained for the Rose flower. The Rose performed the best in Set 'C'. Set C contained of Distilled water and a mixture of sucrose, citric acid and bleach in controlled and pre- determined amounts.

Set **'C'** was voted the best conditioning method for Rose by the google form evaluators and also, under the observations made by the researcher during the conduction of this experiment, Set C was found to provide apt conditioning for the flower. Presence of sugar in the water provided nutrition and life to the flowers in the form of sucrose and starch. Bleach helped in the eradication of bacteria, and other harmful microorganisms. Citric acid helped in balancing of the pH of water and also in the hydration of flowers by allowing more water uptake.

It can therefore finally be concluded that a mixture of sucrose, citric acid and bleach in distilled water in controlled and pre-determined concentrations is beneficial for the conditioning of cut Rose flower and it is recommended to use this solution for increasing the shelf life of cut Rose flowers. The first thing one must do after bringing the cut flower from the market is to dip the cut stem part of the flower in the experimented mixture after giving a fresh slant cut at the bottom of the stem (this is done to increase the surface area at the stem for the absorption of water). The items required in making of the solution are all easily available in the market and this and the cost bearing is very minimal. This Research would help a lot of people who are related to the flower business, be it a professional florist or a homemaker by reducing the flower decay significantly and that in-turn would help attain sustainability.

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