LENGTHENING THE VASE LIFE OF POST HARVESTED ROSE AND ALSTROEMERIA USING SUCROSE AND CITRUS SODA SOLUTIONS

(RESEARCH PAPER)

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TABLE OF CONTENTS

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ABSTRACT

This study aims to determine the effect of sucrose and citrus soda concentrations in prolonging the vase life of cut *Rosa chinensis* (rose) and *Alstroemeria* sp. Solutions consisted of two treatments-- sucrose concentrations at 0.1, 0.2, 0.3 and 0.4 M ; and citrus soda concentrations at 25%, 50% and 100%. The quality of the flower is evaluated every 24 hours in terms of its flower appearance, stem stiffness, and leaf yellowing.

Results showed that floral appearance of roses is lengthened by one day when soaked in solutions containing 0.1M, 0.2M, and 0.4M sucrose solution. In terms of stem bending, stiffness of the stem was retained up to the fourth day when treated with 0.3 M and 0.4 M sucrose solutions Results showed that post harvested rose has the most favorable response when treated with 1:1 ratio of citrus soda and water solution, deterioration of floral appearance and stem bending was postponed by one day and leaf yellowing/ drying is not significantly affected.

In terms of lengthening the floral acceptability of alstroemeria, more evident positive effect of sucrose and citrus soda solutions was observed in delaying the leaf yellowing. Post harvested alstroemeria in 1:1 ratio of citrus soda and water solution provides the same effect in floral appearance and stem stiffness compared to untreated ones but has the ability to postpone the leaf yellowing by one day.

Results obtained from this study can be a basis for horticultural studies, for plant preservation, as well as for the improvement in growing flowers.

INTRODUCTION

Background of the Study

The Philippines is home to diverse ornamental plants that grow in various regions. One economically important ornamental plant being grown in the country is the rose (*Rosa chinensis*). Different varieties are already present in the market and are of great demand in floral arrangement and other horticultural related businesses. Despite innovations and new technology, horticulturists in the Philippine flower industry still face a few constraints and challenges – especially small farmers. The distance of the farm to the market is a great hindrance to the transport of the harvested flowers. Lengthy travels can result to early deterioration of the floral features before reaching the target market (Island Rose, 2008).

Focusing on the household usage of cut flowers for ornaments, homeowners start to invest on artificial floral decorations due to expensive prices of this flower and early senescence.

These problems raised suggests that there is a need for postharvest evaluation of cut flowers to increase the quality of ornamental plants being transported to various part of the country and being exported by the Philippines to different country. Several studies suggested that various chemicals can lengthen the vase life of cut flowers. This includes the usage of preservatives in prolonging the life span of gerbera cut flowers (Khan,

2011). Various studies cited that sucrose has a great potential in lengthening the life span of plants like in eustoma and godetia flowers (Anderson, 1994; Cho et al., 2001). Abdulrahman et al. (2012) also pointed put the feasibility of acidic solution, like ascorbic acid, in prolonging the vase life of *Antirrhinum majus* L. (snapdragons). Other flowers were also evaluated, like *Alstroemeria* sp., in terms of post harvest quality after treatingwih sucrose coupled with plant hormones like gibberellins. Results showed that these preservative can postpone the leaf yellowing of the post harvested flowers (Sea Yeat et al., 2012). However, no study has been done in the effect of this solution to the growth of Philippine-grown roses and alstroemeria which is physically different from the imported ones.

Rooted on the need for developing an economical way of prolonging vase life of ornamental plants in the Philippines, this study was conducted to determine if sucrose solution will provide a positive effect to roses and alstroemeria. This study also targets to determine the feasibility of rice broth citrus soda in contributing to longer vase life of roses.

Statement of the Problem

This study aims to determine the effect of sucrose solution and citrus soda concentrations in prolonging the vase life of cut *Rosa chinensis* (rose) and *Alstroemeria* sp. Specifically, this study aims to:

1. determine the floral appearance of cut rose in four levels of sucrose (0.1M, 0.2M, 0.3M and 0.4M) and three levels of citrus soda (25%, 50% and 75%);
2. determine the stem stiffness of cut rose in four levels of sucrose (0.1M, 0.2M, 0.3M and 0.4M) and three levels of citrus soda (25%, 50% and 75%);
3. determine the leaf yellowing of cut rose in four levels of sucrose (0.1M,0. 2M, 0.3M and 0.4M) and three levels of citrus soda (25%, 50% and 75%);
4. determine the floral appearance of cut alstroemeria in four levels of sucrose (0.1M, 0.2M, 0.3M and 0.4M) and three levels of citrus soda (25%, 50% and 75%);
5. determine the stem stiffness of cut alstroemeria in four levels of sucrose (0.1M, 0.2M, 0.3M and 0. 4M) and three levels of citrus soda (25%, 50% and 75%);
6. determine the leaf yellowing of cut alstromeria in four levels of sucrose (0.1M, 0.2M, 0.3M and 0.4M) and three levels of citrus soda (25%, 50% and 75%);

Significance of the Study

Utilization of sucrose solution and rice broth as an alternative vase solution will be of great help to different members of the society.

Household. This study can be used by family members particularly housewives, because instead of buying chemical solutions for prolonging the vase life of a cut flower, they can use rice broth or sucrose solution that can be easily obtained.

Horticulture. This study aims to develop a cheap method of horticulture that may help the following groups: family, farmers & businessmen/women. This can be a basis for horticultural studies, for plant preservation, as well as for the improvement in growing flowers.

Floral Industry. Our solution is natural, and has no harmful effect on the environment, unlike other chemical-based solution. Local florists can use this solution as an alternative to commercial and chemical-based preservatives applied to the vase solution.

Scope and Limitations

The primary concern of the study is to determine the ability of sucrose solution and citrus soda concentrations in prolonging the vase life of a cut *Rosa chinensis* (rose) and *Alstroemeria* sp. The response of the cut roses to the prepared solutions was measured in terms of visual quality of flower, stem stiffness and leaf yellowing. Chemical analyses of the solutions used were beyond the scope of the study.

The study was conducted from June until September 2014 at Cavite National High School, Cavite City.

METHODOLOGY

Preparation of the Materials

In investigating the effect of sucrose and citrus soda concentrations on the vase life of cut roses and alstroemeria, four sucrose solutions and four citrus soda concentrations were prepared. Distilled water was used as the control setup.

The four sucrose concentration levels was prepared by dissolving 34.2 g, 68.4 g, 102.6 g and 136.8 g of sucrose in one liter distilled water to come up with 0.1M, 0.2M, 0.3M and 0.4M sucrose solutions, respectively. For the three citrus soda concentrations levels, 25%, 50% and 75% of the citrus soda on distilled water were prepared. The stock solutions prepared were stored under room temperature.

Figure 1. Materials used in the treatment of cut roses.

The prepared solutions prepared were used as vase solution for red roses and alstroemerias. A total of 27 roses and 27 alstroemeria cut flowers were used. The post harvested flowers used in this experiment were obtained from a farm in Silang, Cavite.

These flowers had not undergone any preservation treatment before obtaining. After harvesting, a smooth slanting cut was given to each stem to facilitate the optimum uptake of vase solution. The cut flowers were immersed in tap water before the experimentation started. Three roses were placed in each setup with different color designation by attaching colored yarn on its stem.

Treatments

From the stock solutions prepared, 500 mL was obtained and placed in separate containers. Table 1 summarizes the contents of each setup.

Table 1. Overview of the content of each setup.

Setup Number	Cut flower	Concentration	Content	
			Sucrose (g)/ citrus soda (mL)	Distilled water (mL)
1	Rose	0.1 M	34.20	1000.00
2	Rose	0.2 M	68.40	1000.00
3	Rose	0.3 M	102.60	1000.00
4	Rose	0.4 M	136.80	1000.00
5	Rose	100% water	0	1000.00
6	Rose	25% citrus soda; 75% water	125.00	375.00
7	Rose	50% citrus soda; 50% water	250.00	250.00
8	Rose	100% citrus soda	500.00	0
9	Rose	100% water	0	500.00
10	Alstroemeria	0.1 M	34.20	1000.00
11	Alstroemeria	0.2 M	68.40	1000.00
12	Alstroemeria	0.3 M	102.60	1000.00
13	Alstroemeria	0.4 M	136.80	1000.00
14	Alstroemeria	100% water	0	1000.00
15	Alstroemeria	25% citrus soda; 75% water	125.00	375.00
16	Alstroemeria	50% citrus soda; 50% water	250.00	250.00
17	Alstroemeria	100% citrus soda	500.00	0
18	Alstroemeria	100% water	0	500.00

Random assignment of roses in the setups was done. Labeling rose 1 with red yarn, rose 2 with pink yarn, rose 3 with purple yarn. The same assignment was also done with the alstromeria setups.

Figure 2. Experimental setups used in the study of rose vase life.

The set-ups were placed in a single location at 30±2 ^{0}C and 12 h photoperiod by fluorescent lamp. Solutions were changed every other day to inhibit the growth of bacteria and microorganisms. The quality of the flower is evaluated every 24 hours in terms of its flower appearance, stiffness of stem, and the yellowing of leaf. The visual quality ratings used for the cut flowers were based from standardized vase life evaluations by Reid & Kofranek (1980). Following are the visual quality ratings used:

Table 2. Rating scale for the visual quality of cut roses.

Score	Verbal Description
1	No flaws in flowers
2	Some flaws on flowers
3	Minimal flawed petals; no senesced petals
4	Majority of the petals flawed; petals starting to senesced
5	Flower petals senesced

Table 3. Rating scale for stem stiffness.

Score	Verbal Description
1	Stem is firm; compact and solid
2	Stem is less firm; still straight
3	Stem is slightly soft
4	Stem is soft; delicate stem
5	Curved stem

Table 4. Rating scale for leaf yellowing.

Score	Verbal Description
1	Normal leaves
2	Limited yellowing
3	50% of leaves are yellow
4	75% of leaves are yellow
5	100% of leaves are yellow and with drying parts

Data Analysis

Mean was used for all the obtained data in the three trials performed. Mean scores for every variable under investigation was tallied and given the following interpretations:

For floral appearance:

Range	Description
1.00-1.79 :	No flaws in flowers
1.80-2.59 :	Some flaws on flowers
2.60-3.39 :	Minimal flawed petals; no senesced petals
3.40-4.19 :	Majority of the petals flawed; petals starting to senesced
4.20-5.00 :	Flower petals senesced

For stem stiffness:

Range	Description
1.00-1.79 :	Stem is firm; compact and solid
1.80-2.59 :	Stem is less firm; still straight
2.60-3.39 :	Stem is slightly soft
3.40-4.19 :	Stem is soft; delicate stem
4.20-5.00 :	Curved stem

For leaf yellowing:

Range	Description
1.00-1.79 :	Normal leaves
1.80-2.59 :	Limited yellowing
2.60-3.39 :	50% of leaves are yellow
3.40-4.19 :	75% of leaves are yellow
4.20-5.00 :	100% of leaves are yellow and with drying parts

RESULTS AND DISCUSSION

Floral Appearance of Cut Rose in Sucrose and Citrus Soda Solutions

Every 24 hours, in five days, the floral appearances of cut rose were evaluated. Following is the pictorial data showing the change in appearance of the cut flowers (Figure 3 to7).

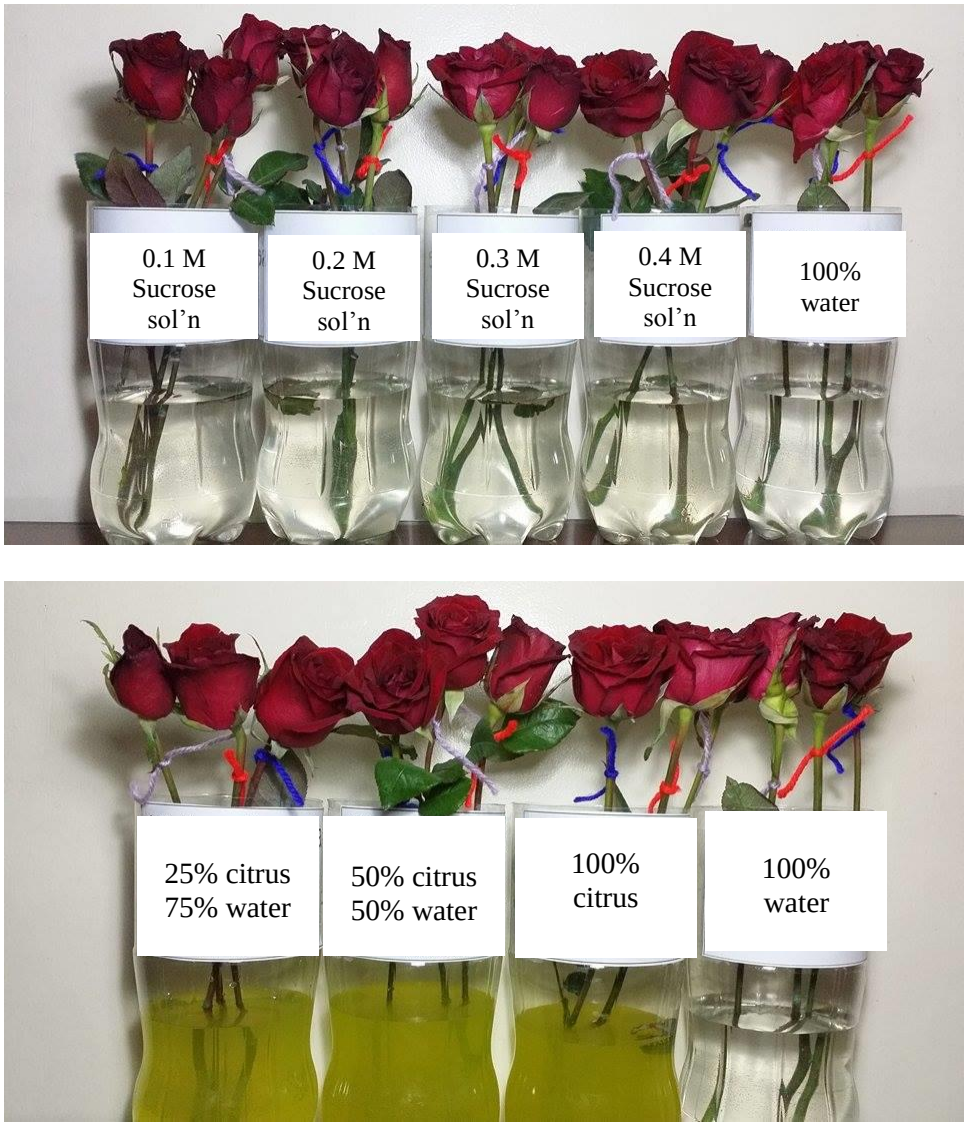

Figure 3. Cut roses during the first day.

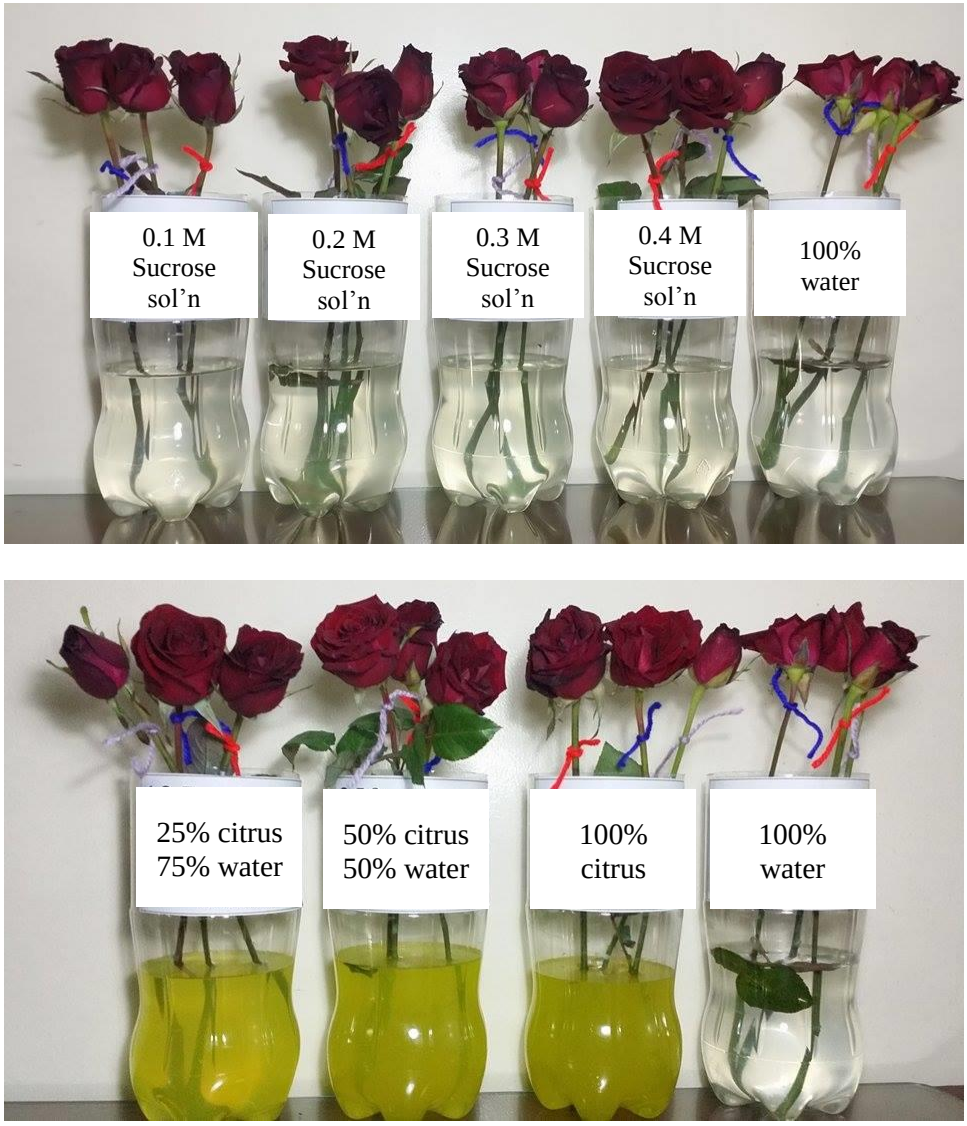

Figure 4. Cut roses during the second day.

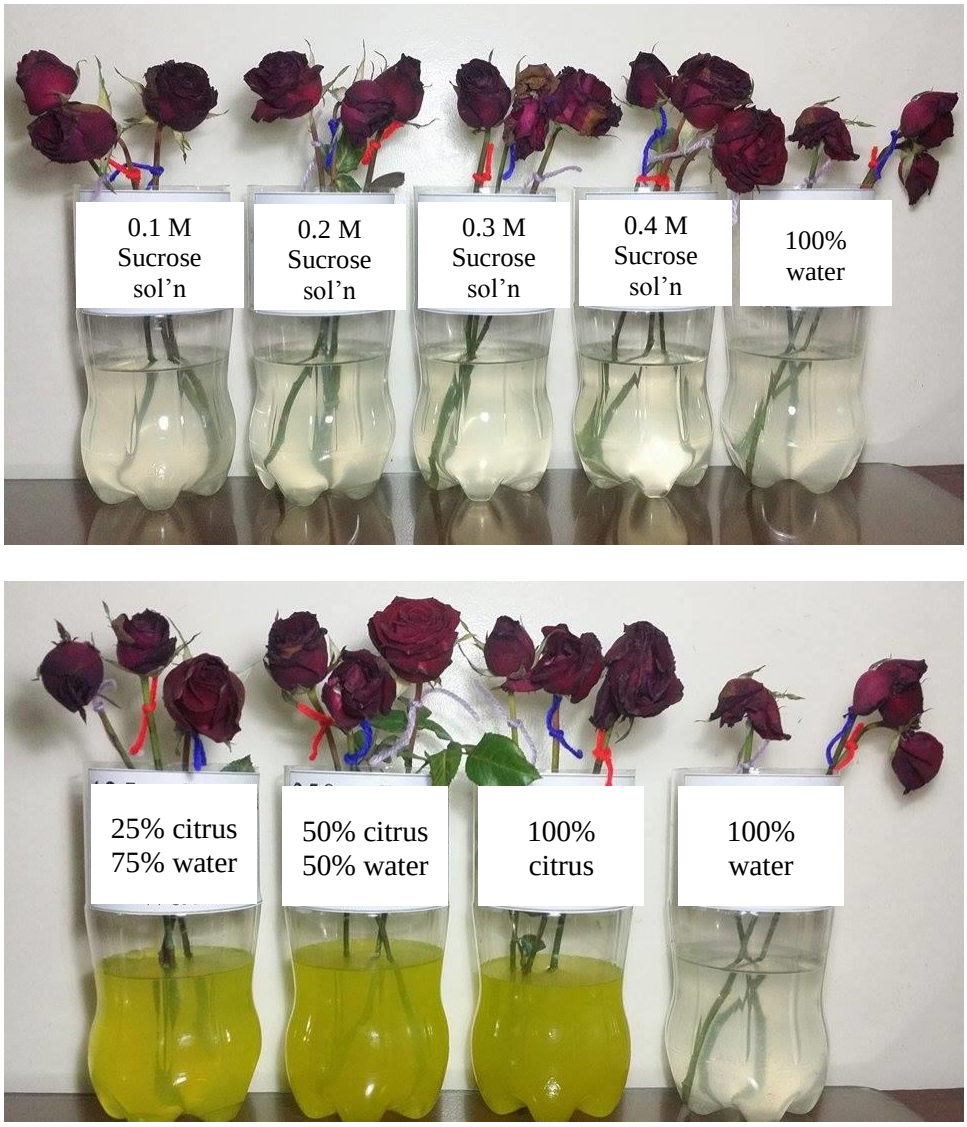

Figure 5. Cut roses during the third day.

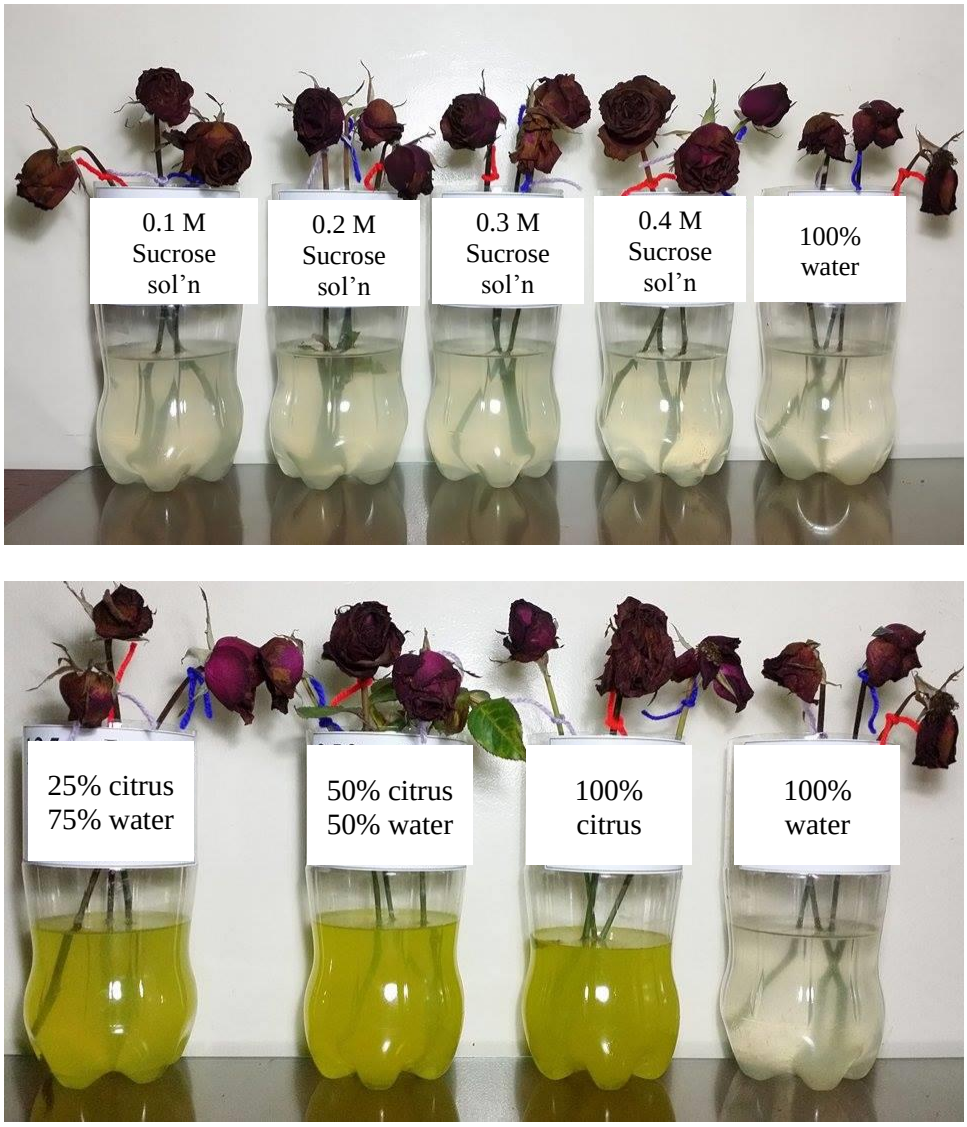

Figure 6. Cut roses during the fourth day.

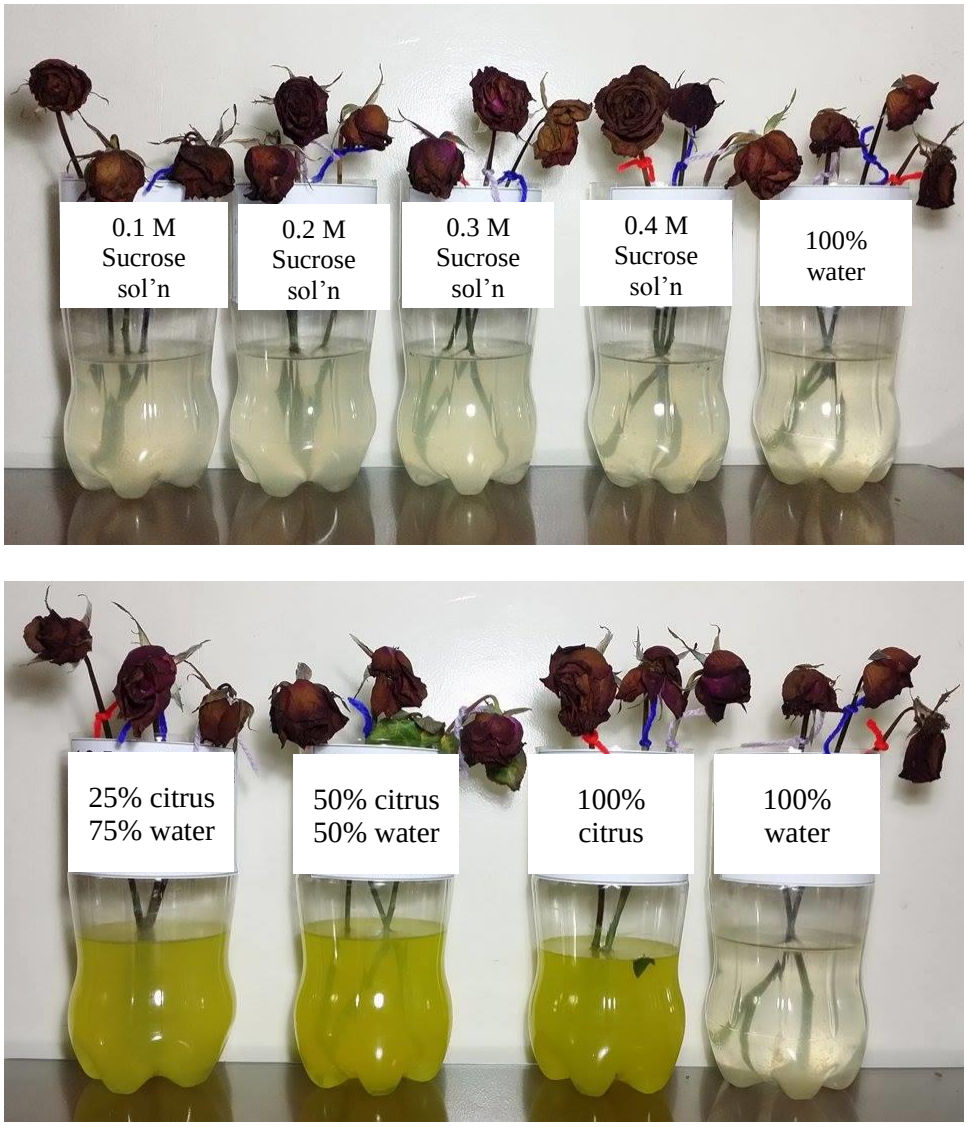

Figure 7. Cut roses during the fifth day.

Floral descriptions for the five-day experimentation are summarized through the following visual quality ratings performed (Table 5).

Table 5. Average rating for floral appearance in varying sucrose and citrus soda concentrations.

Vase Solution	Average Rating				
	Day 1	Day 2	Day 3	Day 4	Day 5
0.1 M sucrose	1.00	2.33	3.33	4.33	5.00
0.2 M sucrose	1.00	2.00	3.33	4.33	5.00
0.3 M sucrose	1.00	2.67	3.67	4.67	5.00
0.4 M sucrose	1.00	1.67	3.00	4.00	4.67
100 % water (control)	1.00	2.67	4.00	5.00	5.00
25% citrus soda; 75% water	1.00	2.33	3.33	4.67	4.67
50% citrus soda; 50% water	1.00	1.67	3.00	4.00	4.67
100% citrus soda	1.00	2.67	3.33	4.00	4.67
100% water (control)	1.00	2.67	4.00	5.00	5.00

Results showed that cut roses soaked in 0.1M, 0.2M and 0.4M sucrose solutions have a minimum acceptable appearance up to the third day as opposed to the cut roses soaked in 0.3M sucrose solution and pure water that only lasted for two days.

On the other hand, cut flowers treated with varying concentration of citrus soda solutions lasted for three days which is longer to the control setup. The most acceptable floral appearance on the third day was observed in flowers soaked in 1:1 ration of citrus soda and water solution.

Stem Stiffness of Cut Rose in Sucrose and Citrus Soda Solutions

Every 24 hours, in five days, the stem stiffness of cut roses was evaluated. Table 6 summarizes the rating of the flower's stem stiffness.

Table 6. Average rating for stem stiffness in varying sucrose and citrus soda concentrations.

Vase Solution	Average Rating				
	Day 1	Day 2	Day 3	Day 4	Day 5
0.1 M sucrose	1.00	1.67	2.67	3.67	4.67
0.2 M sucrose	1.00	1.33	3.00	3.67	4.67
0.3 M sucrose	1.00	1.33	2.33	3.00	4.00
0.4 M sucrose	1.00	2.00	2.67	3.33	4.00
100 % water (control)	1.00	1.33	2.67	3.67	4.33
25% citrus soda; 75% water	1.00	2.00	2.67	3.33	4.00
50% citrus soda; 50% water	1.00	2.00	2.33	3.33	4.67
100% citrus soda	1.00	2.00	2.33	3.33	4.00
100% water (control)	1.00	1.33	2.67	3.67	4.33

Cut roses treated with 0.3M and 0.4M sucrose solution was able to keep the stem of the flower stiff, with minimal softness, up to four days. On the other hand, lower sucrose concentrations (0.1M, 0.2M and 100% water) have minimal accepted stem stiffness on the third day.

For cut flowers in citrus soda solutions, regardless of concentration, the stiffness of the stem was observed to be acceptable on the fourth day which is longer to the control setup that was observed to start curving on the third day

Leaf Yellowing of Cut Rose in Sucrose and Citrus Soda Solutions

Every 24 hours, in five days, the leaf of cut roses was evaluated. Table 7 summarizes the rating of the leaf yellowing.

Table 7. Average rating for leaf yellowing in varying sucrose and citrus soda concentrations.

Vase Solution	Average Rating				
	Day 1	Day 2	Day 3	Day 4	Day 5
0.1 M sucrose	1.00	1.00	2.67	3.67	4.67
0.2 M sucrose	1.00	1.67	2.33	3.33	4.33
0.3 M sucrose	1.00	1.33	2.67	3.67	5.00
0.4 M sucrose	1.00	1.33	2.33	3.67	4.67
100 % water (control)	1.00	1.33	2.33	3.33	4.67
25% citrus soda; 75% water	1.00	1.00	2.67	3.67	4.33
50% citrus soda; 50% water	1.00	1.33	2.33	3.33	4.33
100% citrus soda	1.00	1.67	2.33	3.67	4.67
100% water (control)	1.00	1.33	2.33	3.33	4.67

Leaf yellowing or leaf drying in 0.2M sucrose solution and 1:1 citrus soda and water solution are comparable to 100% water while the other concentrations of sucrose solutions and citrus soda solutions exhibited larger scope of leaf yellowing on an earlier day.

Floral Appearance of Cut Alstroemeria in Sucrose and Citrus Soda Solutions

Every 24 hours, in five days, the floral appearances of cut alstroemeria were evaluated. Following is the pictorial data showing the change in appearance of the cut flowers (Figure 8 to 12).

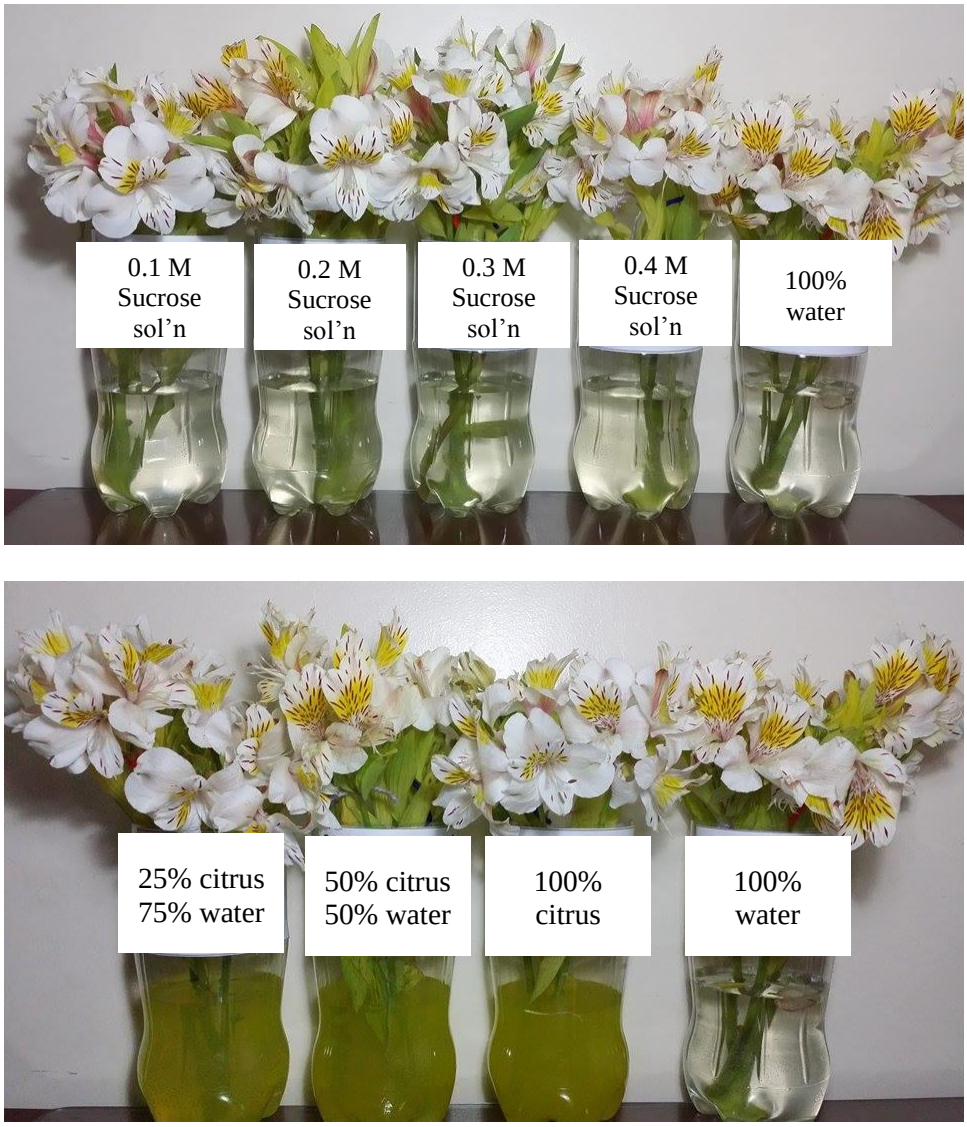

Figure 8. Cut alstroemeria during the first day.

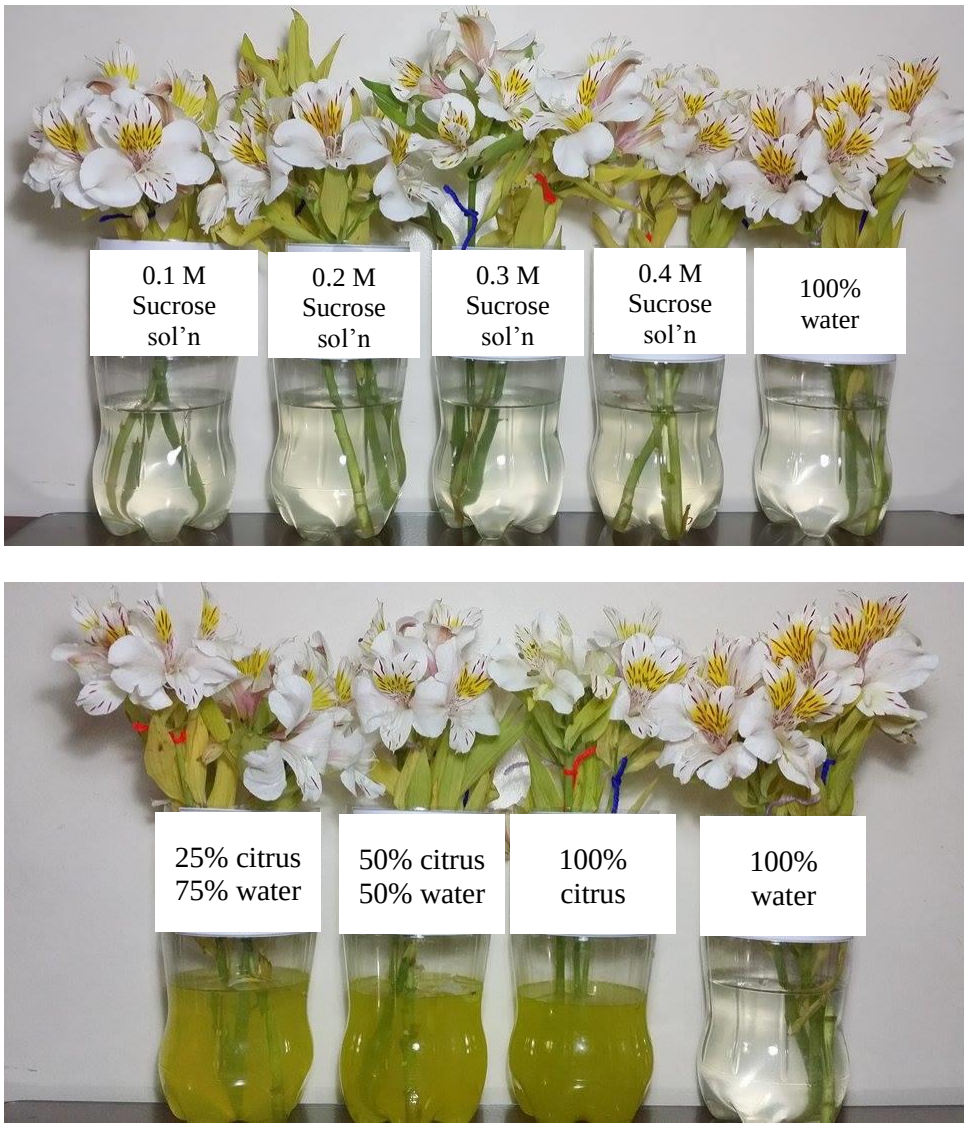

Figure 9. Cut alstroemeria during the second day.

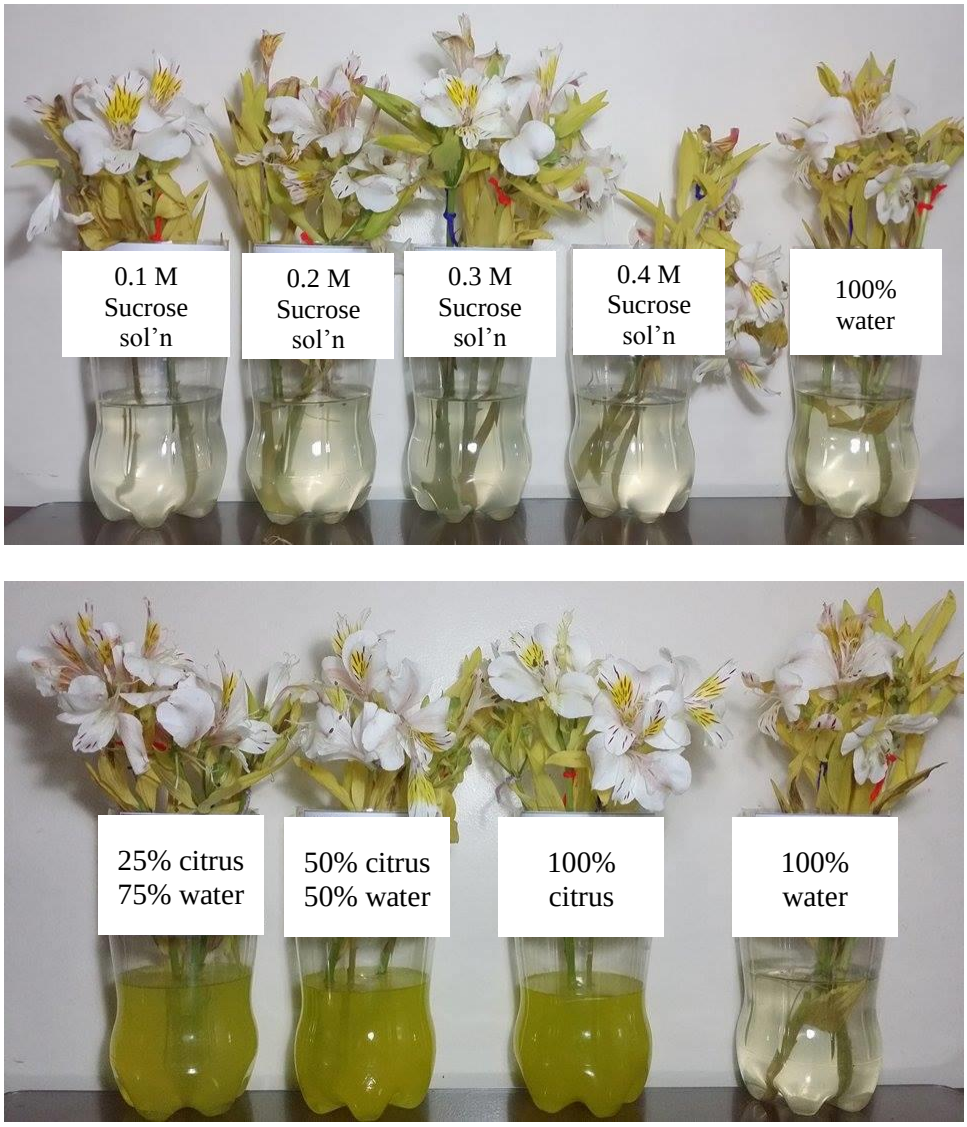

Figure 10. Cut alstroemeria during the third day.

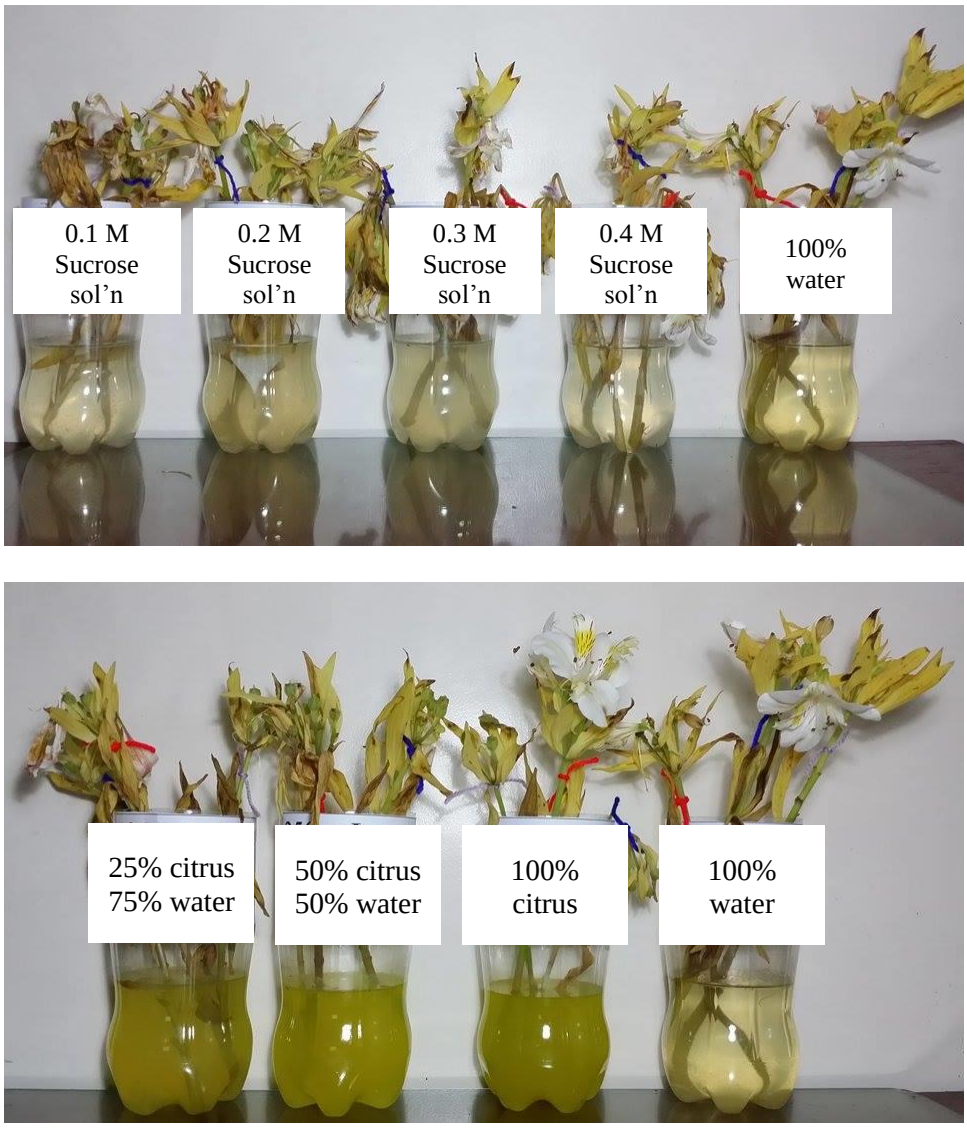

Figure 11. Cut alstroemeria during the fourth day.

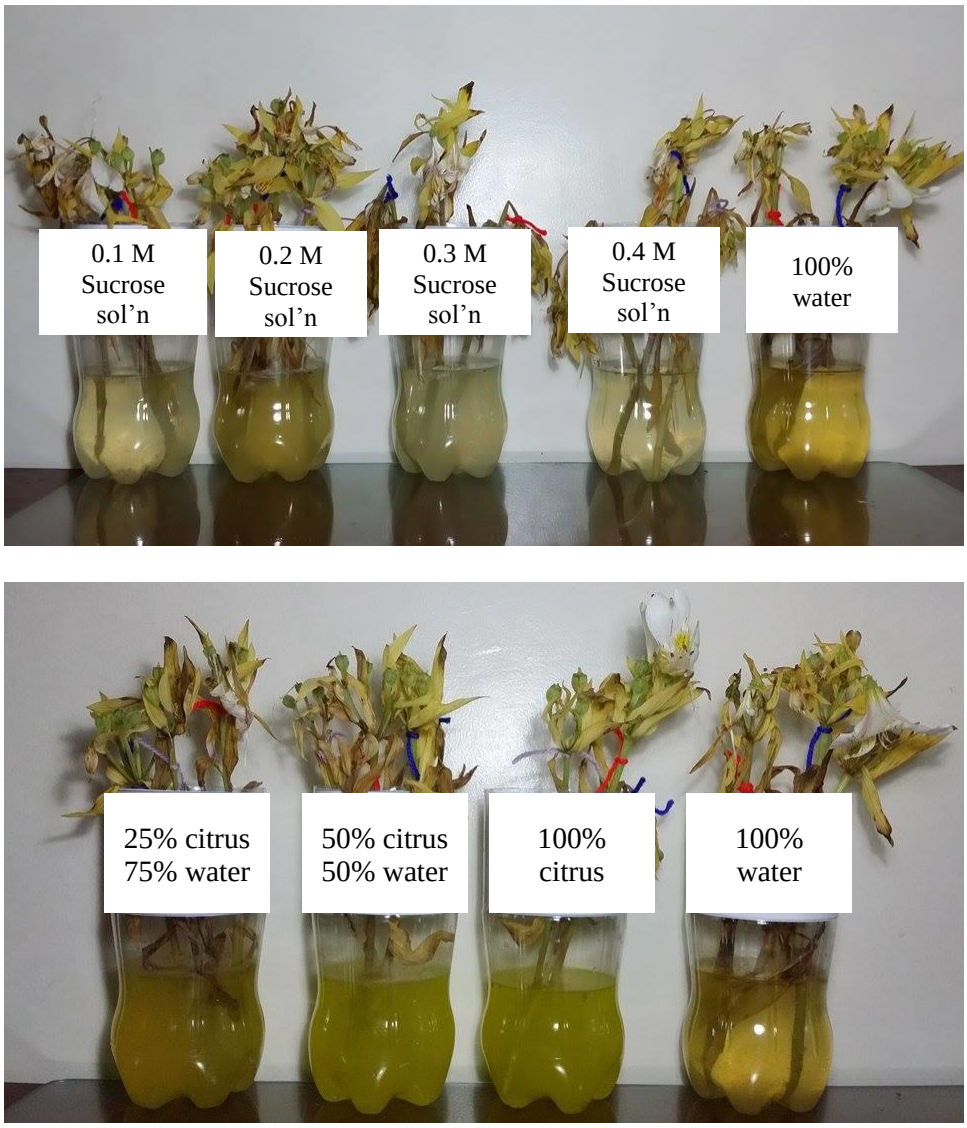

Figure 12. Cut alstroemeria during the fifth day.

Floral descriptions for the five-day experimentation are summarized through the following visual quality ratings performed (Table 8).

Table 8. Average rating for floral appearance in varying sucrose and citrus soda concentrations.

Vase Solution	Average Rating				
	Day 1	Day 2	Day 3	Day 4	Day 5
0.1 M sucrose	1.00	1.67	3.67	4.67	5.00
0.2 M sucrose	1.00	1.67	3.67	4.33	4.67
0.3 M sucrose	1.00	1.67	3.67	4.00	5.00
0.4 M sucrose	1.00	2.00	3.33	4.00	5.00
100 % water (control)	1.00	1.67	3.33	4.33	4.67
25% citrus soda; 75% water	1.00	1.67	3.00	4.00	5.00
50% citrus soda; 50% water	1.00	1.67	3.67	4.67	5.00
100% citrus soda	1.00	1.67	3.67	4.67	4.67
100% water (control)	1.00	1.67	3.33	4.33	4.67

Results showed that alstroemeria soaked in 0.4M sucrose solution exhibited the least acceptable appearance on the third day which is the same with the control setup. However, more acceptable appearance was observed in alstroemeria soaked in the smallest concentration of citrus soda during the third day.

Stem Stiffness of Cut Alstroemeria in Sucrose and Citrus Soda Solutions

Every 24 hours, in five days, the stem stiffness of cut roses was evaluated. Table 9 summarizes the rating of the flower's stem stiffness.

Table 9. Average rating for stem stiffness in varying sucrose and citrus soda concentrations.

Vase Solution	Average Rating				
	Day 1	Day 2	Day 3	Day 4	Day 5
0.1 M sucrose	1.00	1.33	2.33	3.00	3.67
0.2 M sucrose	1.00	1.33	2.33	3.33	3.67
0.3 M sucrose	1.00	1.00	3.00	3.67	4.33
0.4 M sucrose	1.33	2.33	3.33	4.33	4.67
100 % water (control)	1.00	1.00	2.00	2.67	3.33
25% citrus soda; 75% water	1.00	1.00	2.00	2.33	3.00
50% citrus soda; 50% water	1.00	1.00	2.33	2.67	3.67
100% citrus soda	1.00	1.33	2.67	2.67	3.67
100% water (control)	1.00	1.00	2.00	2.67	3.33

In terms of the stem features, straightness of stem lasted the longest (four days) in cut alstromeria treated with 1:3 ratio of citrus soda and water solution. Alstromeria soaked in 0. 3M, 0.4M and 100% citrus soda solutions showed softness of stem in an earlier day (day 3) compared to the control setup (day 4).

Leaf Yellowing of Cut Alstroemeria in Sucrose and Citrus Soda Solutions

Every 24 hours, in five days, the leaf of cut roses was evaluated. Table 10 summarizes the rating of the leaf yellowing.

Table 10. Average rating for leaf yellowing in varying sucrose and citrus soda concentrations.

Vase Solution	Average Rating				
	Day 1	Day 2	Day 3	Day 4	Day 5
0.1 M sucrose	1.00	2.33	3.33	4.00	4.67
0.2 M sucrose	1.00	2.33	3.67	4.00	4.67
0.3 M sucrose	1.00	2.33	3.33	4.33	5.00
0.4 M sucrose	1.00	2.33	3.33	3.67	4.67
100 % water (control)	1.00	2.67	3.67	4.33	4.67
25% citrus soda; 75% water	1.00	2.67	3.33	4.00	4.67
50% citrus soda; 50% water	1.00	2.33	3.33	3.67	4.67
100% citrus soda	1.00	2.33	3.33	3.67	4.33
100% water (control)	1.00	2.67	3.67	4.33	4.67

Leaf yellowing in alstroemeria was postponed by one day by the four levels of sucrose solutions, 1:1 ratio of citrus soda and water solution, and pure citrus soda solution in comparison to the control setup. This suggests that low amount of citrus soda can cause the leaf to behave at a rate similar to pure water.

Referring to Figures 13, floral appearance of roses is lengthened by one day when soaked in solutions containing 0.1M, 0.2M, and 0.4M sucrose solutions and with solutions containing soda of different concentrations. In terms of stem bending, stiffness of the stem was retained up to the fourth day when treated with 0.3 M and 0.4 M sucrose solutions and with solutions containing soda of different concentrations. These results may suggest that 0.2 M sucrose and lower concentration in the vase solution was insufficient to induce measurable responses in the stem bending of cut roses. On the other hand, no delaying property in the leaf yellowing of the leaves was observed in any experimental setups. 0.3 M sucrose solution and 1:1 ratio of citrus soda and water

solution showed comparable leaf yellowing time (four days) which is longer compared to other concentrations.

This investigation further proves that sucrose and citrus soda has the ability to extend the vase life of cut roses by one day. This is further supported by Rezvanypour and Osfoori (2011) pointing out that Iranian roses responded in sucrose and citric acid solution positively in terms of improving fresh weight, water uptake and change in diameter of flowers. Abdulrahaman et al. (2012) discussed that adding a carbohydrate source, such sucrose, to the holding solution can result to vase life extension if growth of microorganism is controlled. As a summary, post harvested rose has the most favorable response when treated with 1:1 ratio of citrus soda and water solution, deterioration of floral appearance and stem bending was postponed by one day and leaf yellowing/ drying is not significantly affected.

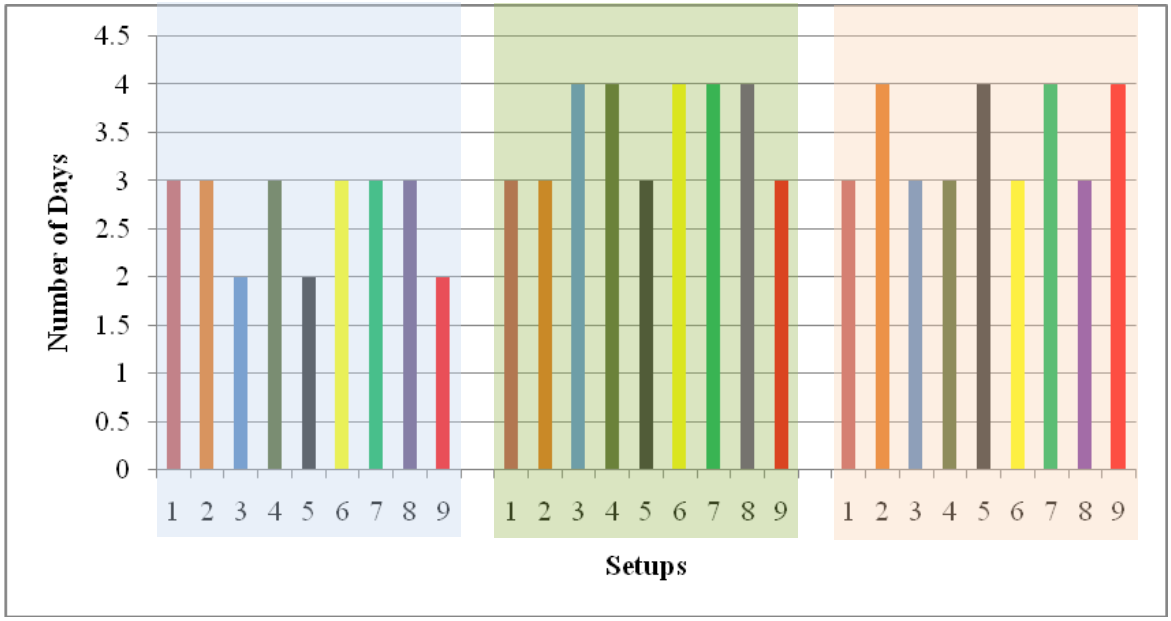

Figure 13. Number of days rose flower exhibited acceptable floral appearance (blue block), stem stiffness (green block) and leaf yellowing (orange block) at varying vase solutions.

Figure 14 summarizes the response of alstroemeria, a lily, in different concentrations of sucrose citrus soda. In terms of lengthening the acceptability of the floral appearance, high concentration of sucrose (at least 0.4 M sucrose) and low ratio citrus soda and water solution were comparable to the effect provided by ordinary water. In terms of stem stiffness, postponement of its bending was not observed in any alstroemeria treated with sucrose solutions instead it was able to move it earlier by one or two days compared to the one treated with pure water. Alstroemeria treated with 1:1 ratio citrus soda and water solution showed the same effect as that of pure water. A more evident positive effect of sucrose and citrus soda solutions was observed in delaying the leaf yellowing). 0.1 M, 0.3 M and 0.4 M sucrose solutions; 25%, 50% and 100% citrus soda solutions were able to delay the yellowing by one more day as compared to untreated alstroemeria. These results further suggests that treating alstroemeria with 1:1 ratio of citrus soda and water solution provides the same effect in floral appearance and stem stiffness compared to untreated ones but has the ability to postpone the leaf yellowing by one day. Kazemi and Ameri (2012) explained that acid and sucrose is lily can increase the vase life by improving the membrane stability and reducing oxidative stress damage during lily flower senescence.

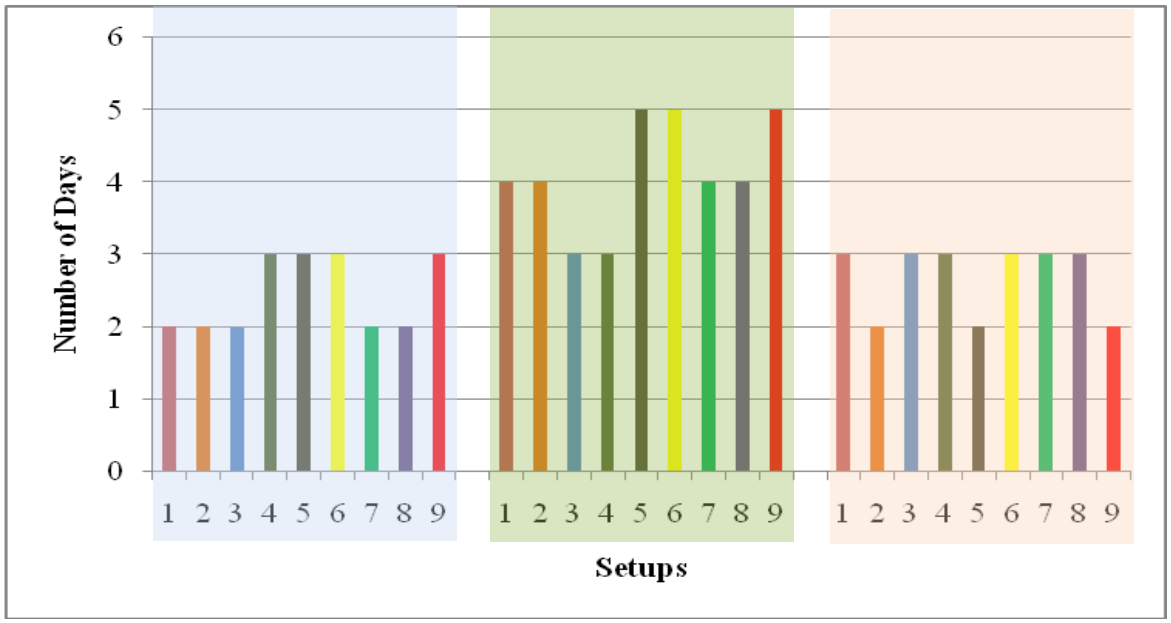

Figure 14. Number of days alstromeria flower exhibited acceptable floral appearance (blue block), stem stiffness (green block) and leaf yellowing (orange block) at varying vase solutions.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study aims to determine the effect of sucrose solution and citrus soda concentrations in prolonging the vase life of cut *Rosa chinensis* (rose) and *Alstroemeria* sp. Vase solutions were freshly prepared at the beginning of the experiment. Solutions consisted of two treatments including sucrose concentrations at 0.1, 0.2, 0.3 and 0.4 M concentrations; and citrus soda concentrations at 25%, 50% and 100%. The set-ups were placed in a single location at 30±2 ^{0}C and 12 h photoperiod by fluorescent lamp. Solutions were changed every other day to inhibit the growth of bacteria and microorganisms. The quality of the flower is evaluated every 24 hours in terms of its flower appearance, stiffness of stem, and the yellowing of leaf. The visual quality ratings used for the cut flowers were based from standardized vase life evaluations by Reid & Kofranek (1980). Mean was used for all the obtained data in the three trials performed.

Results showed that cut roses soaked in 0.1M, 0.2M and 0.4M sucrose solutions have a minimum acceptable appearance up to the third day as opposed to the cut roses soaked in 0.3M sucrose solution and pure water that only lasted for two days. On the other hand, cut flowers treated with varying concentration of citrus soda solutions lasted for three days which is longer to the control setup. The most acceptable floral appearance on the third day was observed in flowers soaked in 1:1 ration of citrus soda and water solution. Cut roses treated with 0.3M and 0.4M sucrose solution was able to keep the stem of the flower stiff, with minimal softness, up to four days. On the other hand, lower sucrose concentrations (0.1M, 0.2M and 100% water) have minimal accepted stem

stiffness on the third day. For cut flowers in citrus soda solutions, regardless of concentration, the stiffness of the stem was observed to be acceptable on the fourth day which is longer to the control setup that was observed to start curving on the third day. Leaf yellowing or leaf drying in 0.2M sucrose solution and 1:1 citrus soda and water solution are comparable to 100% water while the other concentrations of sucrose solutions and citrus soda solutions exhibited larger scope of leaf yellowing on an earlier day.

For alstroemeria response, cut flower soaked in 0.4M sucrose solution exhibited the least acceptable appearance on the third day which is the same with the control setup. However, more acceptable appearance was observed in alstroemeria soaked in the smallest concentration of citrus soda during the third day.In terms of the stem features, straightness of stem lasted the longest (four days) in cut alstromeria treated with 1:3 ratio of citrus soda and water solution. Alstromeria soaked in 0. 3M, 0.4M and 100% citrus soda solutions showed softness of stem in an earlier day (day 3) compared to the control setup (day 4). Leaf yellowing in alstroemeria was postponed by one day by the four levels of sucrose solutions, 1:1 ratio of citrus soda and water solution, and pure citrus soda solution in comparison to the control setup. This suggests that low amount of citrus soda can cause the leaf to behave at a rate similar to pure water.

As a summary, post harvested rose has the most favorable response when treated with 1:1 ratio of citrus soda and water solution, deterioration of floral appearance and stem bending was postponed by one day and leaf yellowing/ drying is not significantly

affected. For alstroemeria, these results further suggests that treating cut flowers with 1:1 ratio of citrus soda and water solution provides the same effect in floral appearance and stem stiffness compared to untreated ones but has the ability to postpone the leaf yellowing by one day.

It is suggested that chemical analyses of the content of the solution be carried out. Also, similar experiments are suggested to be done using different varieties of rose or other ornamental plants.

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