NYSFG New York State Flower Growers
INCORPORATED

BULLETIN 224 Secretary, Charles Wilton, Prattsburg, Steuben Co., N. Y. 14873 JULY, 1964

Improved Lasting Life of Velvet Times Roses With Chemicals

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With the exception of a few varieties, such as Baccara and Tiara, roses usually have a short vase life. Better Times and Velvet Times, probably the most widely grown cut roses in the United States, have a keeping life that varies from an average of 5 days in the summer to 3 days following a period of low light intensity in mid-winter. Some other varieties keep for even shorter periods of time, and often change color or fade. Poor keeping quality could possibly be one of the contributing factors to the decline of roses from first place standing among cut flowers (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12).

MATERIALS AND METHODS

Fresh, unhardened cut roses of variety Velvet Times were obtained from the Cornell Floriculture Department Greenhouses at Ithaca, or from Elmira Floral Products Company, Elmira, New York. These roses were cut to a uniform length, and the bottom leaves were removed. The roses were placed in each treatment solution and then hardened overnight at 40°F. After hardening, the flowers were placed in the laboratory at a temperature of 76°F.

Except for the sugars, reagent grade chemicals were used throughout the experiment. The sucrose was table sugar, and the glucose was technical grade.

Chemicals, except silver acetate, were made up into 5% stock solutions by dissolving 5 grams of reagent in 100 mls. of distilled water. Silver acetate was made up in a 2% solution. The desired amount was then pipetted into the sugar solutions. Quart jars were used as containers. The jars were washed, disinfected, and autoclaved after each use. Those chemical treatments that appeared promising as single compounds were repeated and the chemicals used in combination with other chemicals to further verify the response obtained.

To test for the presence of microorganisms, the base of rose stems from each treatment was touched onto petri plates containing potato-dextrose agar (PDA). These plates were then incubated at room temperature and checked daily for growth of microorganisms. Daily observations were also made on the flowers for color fading and other factors which are indicators of keeping quality.

The experiment was subjected to an analysis of variance and Tukey's honesty significant difference procedure was used to determine differences among treatments.

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RESULTS AND DISCUSSION

Influence of Chemicals on Keeping Quality

Of all chemicals tested, only *para*-nitrophenol, 8-quinolinol sulfate, Roselife, silver acetate, silver nitrate, glucose, and sucrose were effective in maintaining keeping quality as well as color, fragrance, and natural petal enlargement. Copper sulfate, 2, 4-dinitrophenol, *para*-dibromobenzene, potassium cyanide, and SD 4901 had no effect on color, fragrance, or enlargement. Cupferron, maleic hydrazide (MH), Foligard, Phosphon D, sodium disulfite, and sodium fluoride adversely affected the color, fragrance, or natural opening of the flower.

Solutions of *para*-nitrophenol at concentrations of 25-50 ppm delayed bluing of the flowers. Silver acetate at concentrations of 10-100 ppm and 30-50 ppm of silver nitrate were even more effective than *para*-nitrophenol in delaying bluing. Complete bluing was delayed 2 to 3 days.

Glucose and sucrose were found to be equally effective in preventing bluing and fading. This agrees with the findings of Aarts (1) and Neff (7). The optimum concentration of sugar necessary to prevent fading varied with time of year. In spring and early summer a concentration of 5% sugar in the solution maintained the original red color throughout the life of the cut flowers. From August through December a concentration as high as 10% sugar was necessary to maintain red color. When concentrations below these were used, the roses faded and became pink. At concentrations near optimum, only the center of the flower would fade (10). The degree of fading was proportional to the amount of sugar used in relation to the optimum concentration. Mastalerz (6), Neff (7, 8), and Tinga (12) also found that sugar solutions would maintain red color of roses and Tinga (12) found a variation from season to season in the amount of sugar required to maintain red color.

Roses were always a more intense red with treatments that contained either *para*-nitrophenol, silver acetate, or silver nitrate in combination with sugar than were those kept in sugar solution alone.

Roselife used alone prevented bluing of Velvet Times roses, but did not maintain red color. The roses always faded and turned pink after 3 to 5 days.

Roses which open naturally on the plant are generally much larger than roses that open after they have been cut.

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Cut roses placed in treatments containing 20 ppm 8-quinolinol sulfate opened larger than did those placed in water. When 200 ppm of 8-quinolinol sulfate was combined with 50 ppm of silver acetate and 5% sucrose, the 8-quinolinol sulfate remained active and increased the size of the flower as it did when used alone. In addition, opening of the flowers was delayed by 1 to 2 days with this latter treatment.

When Velvet Times roses were placed in a treatment solution containing 50-75 ppm of cupferron, the roses became blue overnight, and within 2 days were purple in color. Sodium disulfite and sodium fluoride also brought about premature bluing.

INFLUENCE OF CHEMICALS ON KEEPING LIFE

After the study on chemical treatment the results were analyzed statistically (11). The treatments were divided into three groups. Of the 112 chemicals, compounds or combinations of materials tested (10), 39 produced a statistically significant increase in the keeping life of Velvet Times roses compared to tap water controls. The average increase in keeping life in half-days ranged from 8.6 to 1.2. Fifty-four chemicals, compounds or combinations produced no statistically significant differences compared to tap water controls. The range was from an increase of 2.9 to a decrease of 2.9 half-days. Nineteen chemicals, compounds or combinations produced a statistically significant decrease in the keeping life of Velvet Times compared with tap water controls. The range was from minus 1.2 to 8.0 half-days.

Of the materials tested one combination of chemicals can be singled out as being superior to all others. This combination contained 8-quinolinol sulfate, silver acetate, and sucrose. The optimum concentrations of these chemicals were 200 ppm-8 quinolinol sulfate, 500 ppm silver acetate, and 5% sucrose. This treatment increased keeping life of Velvet Times roses nearly 4½ days, however, concentrations of 160 ppm, 40 ppm, and 4% respectively of these chemicals, when used together, still increased keeping life by more than 3½ days.

Each of these chemicals controlled more than one factor necessary to maintain keeping quality. Silver acetate prevented petal fall and caused an increase in color intensity; 8-quinolinol sulfate controlled microorganisms and caused the flower to enlarge; and sucrose provided a substrate for respiration and maintained natural flower color. When calcium nitrate was added to the solution there was no reduction in keeping life, and precipitation of silver was reduced.

Treatments consisting of Roselife and either silver acetate or silver nitrate were also very effective in increasing keeping life. However, because of fading that occurred, these treatments were not as desirable as were those which maintained red color. When sugar was added to the Roselife-silver acetate combination to maintain red color, the effectiveness of the treatment was decreased and lasting life of the roses was reduced by 2½ days.

When 5-50 ppm of copper sulfate, 50-85 ppm of cupferron, 10-100 ppm of silver acetate, or 30-50 ppm of silver nitrate were used in the treatments, no petal drop occurred. Petals remained firmly attached to the receptacle until the flowers were dead.

Each time that Roselife did not significantly increase keeping life, it was because the petals dropped off or shattered before the rose had reached senescence.

CONTROL OF MICROORGANISMS

Only one chemical used in this study effectively controlled microorganisms. When 8-quinolinol sulfate was used at concentrations of 200-1000 ppm, no growth of microorganisms occurred on the PDA that had been spotted wtih solution from the treatments. This agrees with the work of Zentmyer (13), who found that 8-hydroxyquinoline (8-quinolinol) at a concentration of 100 ppm would completely control microorganisms in water. Concentrations of 1000 ppm 8-quinolinol sulfate caused stem damage and petal edges were "burned" and became dry. At 200 ppm there was little or no phytotoxicity, and any damage noted was limited to the base of the stem.

Amphyl and sodium hypochlorite, which are disinfectants, did not satisfactorily control microorganisms at any of the concentrations used in this study. The concentrations at which these chemicals are commonly used, 3500 ppm of Amphyl and 5000 ppm of sodium hypochlorite, were phytotoxic. Copper sulfate controlled bacteria at all concentrations used, but had no effect on fungi. Aarts (1), Bancroft (2), Hitchcock and Zimmerman (3), Howland (4), and Knudson (5) reported favorable results. In this experiment, silver acetate and silver nitrate reduced the number of microoganisms in the solutions but did not completely control them. Both Aarts (1), and Ryan (9) reported highly favorable results with silver salts and ions in controlling microorganisms. Ryan also reported favorable results with zinc acetate but indicated that it should not be used on roses. In this study it was found that aluminum nitrate and zinc acetate controlled microorganisms to some extent but were phytotoxic at the concentrations used. Maleic hydrazide seemed to stimulate the growth of bacteria. Bacterial populations were higher after one day in solutions of MH and sugar than after four days in solutions that contained sugar alone.

CONCLUSIONS

Chemicals used to enhance rose keeping quality must maintain flower color, allow natural development, and control microorganisms. No single chemical fulfilled these requirements. A combination of chemicals must therefore be used to maintain optimum keeping life. The combination of chemicals that was found to most nearly fulfill these requirements was 200 ppm 8-quinolinol sulfate, 50 ppm silver acetate, and 5% sucrose.

The optimum concentration of sugar varies with the season, ranging from 4 to 10%. If less than the optimum amount of sugar is used, flower color will fade.

Flower color is probably the best indicator of keeping quality. Any change in color, particularly bluing, generally signals the approach of senescence.

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New Greenhouse & Biological Growth Chamber Facilities

J. W. Boodley

Visitors to the Floriculture greenhouses at Cornell will quickly become aware that expansion of the Tower Road greenhouse complex is going on. Officially known as project 17120E, the greenhouse and biological growth chamber facilities will greatly increase the physical plant for the departments of Entomology, Floriculture and Plant Pathology.

This first phase of construction represents approximately 60% of the facilities that will be obtained when the construction is completed. Phase I represents a 1.9 million dollar investment in glass houses, laboratories and controlled growth chambers for research in the departments of Entomology, Floriculture and Plant Pathology.

To make room for the Floriculture construction, the old orlytes and the conservatory have been demolished. In their place will go two 36 x 75 foot aluminum frame glass greenhouses that will have the latest control of ventilation by means of fan and pad cooling. These greenhouses will be compartmented for maintaining separate temperatures for investigative work. The greenhouses will be connected by a corridor to the existing Floriculture greenhouses and to a new 2 story laboratory building to be constructed facing Tower Road.

Fig. 1. Overlooking view of area of new construction. Floriculture center, Entomology left and Plant Pathology far right rear.

On the second floor of the laboratory building will be 8 controlled environment growth chambers. These growth chambers will enable researchers to control light quality, light intensity, and temperature to an exacting degree that is not possible in a glass house structure. The growth chambers are the results of 4 years intensive research efforts by Dr. A. W. Dimock of the Plant Pathology department. Dr. Dimock has developed the chambers from scratch and they are also of the latest design. The growth chamber level will be on the same level as the greenhouses so that plants may be moved from the greenhouses to the growth chambers if this should be a necessary part of the experimentation that will be carried on.

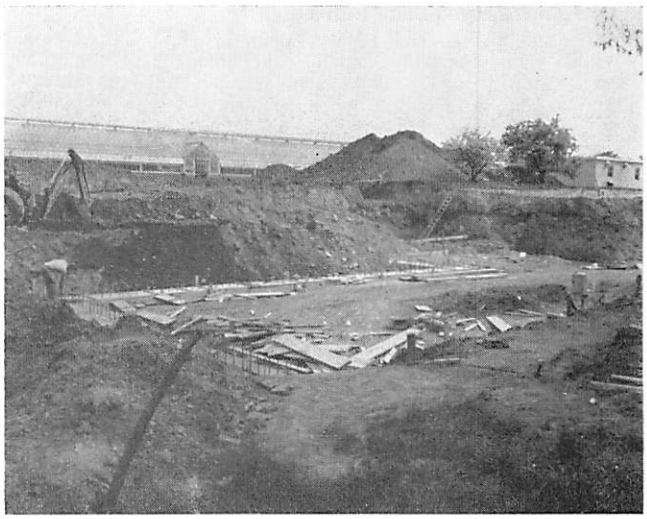

Fig. 2. Footer for new floriculture laboratory building are in place. Greenhouses to the rear are Floriculture.

In the first floor area, a plant physiology laboratory, a radioactive isotopic laboratory and counting room will be constructed. In addition, there will be a room for plant preparation. In this room, plant material will be washed, dried, and processed for chemical analysis. The room will also be equipped with balances for obtaining accurate weight and other measurements. Another room will be devoted to the study of postharvest physiology of cut flowers. This room will enable experimentors to maintain cut flowers in various treatments to determine the effects of chemicals on their longevity and also other aspects of improving cut flower storage and shelf life. Another room will be devoted to subzero environment and dormancy studies.

The greenhouses and laboratory building are anticipated to be constructed and closed in by November 1, 1964. Growers who are planning to attend the Cornell Short Course at the end of October will be able to see these facilities first hand.

Future construction will provide another set of double greenhouses opposite the 2 new ones being constructed at present. Also at a later date, the department of Vegetable Crops will move from the Tower Road facilities to a new location. At that time, it is anticipated that the three greenhouses vacated by Vegetable Crops department will be turned over to the Department of Floriculture & Ornamental Horticulture.

These greenhouses will be absorbed by the department and primarily are slated for teaching purposes. The use of these greenhouses for teaching of the Floriculture courses will be a decided advantage in providing a greater amount of laboratory and practical work for the students who are taking floriculture at Cornell.

Improved Lasting Life

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LITERATURE CITED

1 Aarts, J. F. Th. 1957. Over de houdbaarheid van snijbloemen, (concerning the keeping quality of cut flowers) Wageningen Lundbouwhogschool Mededlingen. 57, 9:1-62. (Publicatie 174 van het laboratorium voor Tuinbouwplanteelt te Wageninger.

2. Bancroft, C. P. 1937. Studies on the keeping quality of flowers. M.S. Thesis, Ohio State University.

3. Hitchcock, A. E. and P. W. Zimmerman. 1929. Effects of chemicals, temperature, and humidity on the lasting qualities of cut flowers. *Am. Jour, Bot.* 16:433-440.

4. Howland, H. E. 1945. A study of the keeping quality of cut roses. *Am. Rose Annual.* 30:51-56.

5. Knudson, L. 1914. Preserving cut flowers. *American Florists.* 43:649-650.

6. Mastalerz, J. W. 1953. Environmental factors and pre-storage treatments affecting the long-term, low-temperature storage of cut flowers. Ph.D. Thesis, Cornell University.

7. Neff, M. S. 1939. Color and keeping qualities of cut flowers. *Bot. Gaz.* 101:501-504.

8. ————. 1942. Effects of storage conditions on cut roses. *Bot. Gaz.* 103:794-805.

9. Ryan, W. L. 1957. Flower preservatives—using silver and zinc ions as disinfectants. *Florists Review.* 121(3129):59-60.

10. Scholes, J. F. 1963. Some effects of various chemicals on the postharvest physiology of Velvet Times roses. M.S. Thesis, Cornell University.

11. Steel, R. G. D., and J. H. Torrie. 1960. *Principles and Procedures of Statistics.* McGraw-Hill, N. Y. 481 p.

12. Tinga, J. H. 1956. The effect of modified atmosphere storage at low temperature and treatments after low temperature storage which affect the keeping quality of cut flowers. Ph.D. Thesis, Cornell University.

13. Zentmyer, G. A. 1943. Mechanism of action of 8-hydroxquinoline. *Phytopathology.* 33:1121.

APPENDIX

To prepare the preservative as discussed in this report the following materials are used:

Table sugar (sucrose)	1000 grams
8-quinolinol sulfate	4 grams
Silver acetate or silver nitrate	1 gram

Thoroughly mix together.

Use 50 grams of mixture per quart of water.

Large quantities of material can be prepared by increasing the amounts used.

This preservative has worked effectively on red rose varieties only. It has not been reliable on other varieties and should be only used on a trial basis on such varieties.

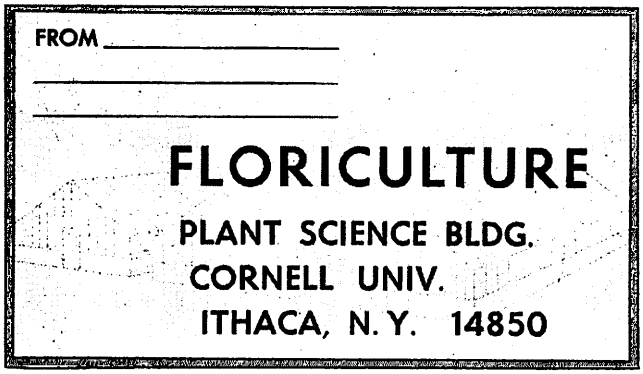
The preservative should only be used in non-metal containers.

Poisonous Plants of the United States and Canada

By John Kingsbury and Published by Prentice-Hall, Inc. Englewood Cliffs, New Jersey. The cost is $13.00. Many florists are interested in a source of information about this subject, because they are a source of help when someone calls "Little Johnny ate all the berries off the neighbor's bush—will he get sick?" This book will help answer such problems.

New Mailing Labels For Soil Boxes

Growers should use the new mailing label that is now being sent out with each two soil sample boxes.



How to Send Samples

DO NOT USE THE WORDS "SOIL TESTING LABORATORY" in the address. Samples so designated often get sent to the Agronomy Laboratory where they may be lost for 3-4 weeks.

First class postage will insure fast delivery. Soil boxes with samples that have been dried and screened average about 5 ounces in weight.

If you are serviced by United Parcel Delivery, you may get faster delivery from them. Charges from Long Island to Ithaca are about $.30 per pound. The cards can be included with the samples at no extra cost. United Parcel advertises "next day delivery."

Soil sample boxes are available at a cost of $1.00 each from the Department of Floriculture or your local County Agricultural Agent. Checks or money orders (no cash please) should be made payable to CORNELL UNIVERSITY and sent to the Department of Floriculture, Plant Science Building, Cornell University, Ithaca, New York, 14850. J.W.B.

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YOUR EDITOR,

Bob Langhans