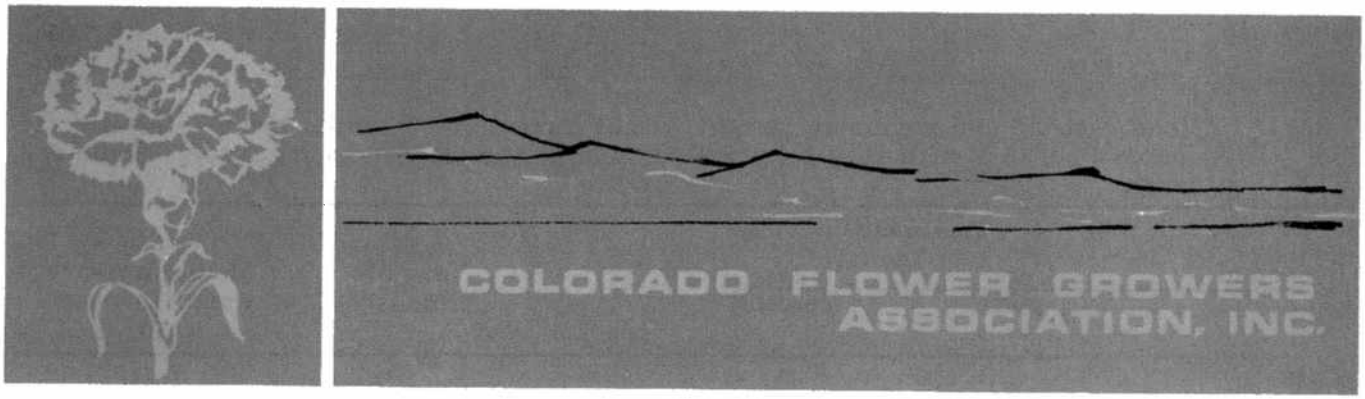

IN COOPERATION WITH COLORADO STATE UNIVERSITY
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EFFECTS OF GROWTH REGULATORS, HQC, AND SUGAR ON CUT ROSE VASE-LIFE

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Cut "Forever Yours" roses were treated with the growth regulators Alar, Cycocel, Quel, and SD-8339. Each was combined with sugar and/or 8-hydroxyquinoline citrate (HQC) and the vase-life compared to that obtained with a solution of only HQC + sugar. Roses held in a solution of 500 ppm Alar + 5% sugar increased vase-life up to four days above that obtained with HQC + 5% sugar. The roses in Alar + sugar maintained acceptable quality for up to 13 days when held at 70 to 75°F and 40 to 45% relative humidity.

A solution of HQC + sugar is presently the best floral preservative for roses. A combination of HQC + sugar with Alar added has provided longer vase-life than only HQC + sugar with carnations and snapdragons (Larsen and Frolich 1969). Alar and Cycocel have also proven slightly effective as preservatives in an overnight base immersion treatment with carnations and snapdragons (Halevy and Wittwer 1965). The work reported here was undertaken to determine the effects of several growth regulators, HQC, and sugar on the vase-life of cut roses.

MATERIALS AND METHODS

Freshly cut "Forever Yours" roses were hardened at 35°F overnight and placed in the various test solutions the following day. Each treatment contained two replicates of five flowers per replicate except Experiment 3 which had six replicates. The following growth regulators were used alone and with HQC and/or 5% sugar: Alar, Cycocel, Quel, and SD-8339. These were all growth retardants except the experimental synthetic cytokinin SD-8339. Three experiments were conducted in the evaluation. In Experiment 1, each growth regulator and HQC were used alone in distilled water and then with sugar added. Experiment 2 compared Alar + sugar to Alar + HQC + sugar. Experiment 3 compared Alar + sugar with and without HQC to a solution containing HQC + sugar.

The flowers were placed in an air-conditioned, air-filtered room held at 70 to 75°F and 40 to 45% relative humidity. Flowers were graded daily on a 1 to 5 scale and the end of vase-life was set at a rating of 3 when petal burn, wilt, or blueing began to appear. The experiments were conducted between January 19 and April 30, 1972.

RESULTS AND DISCUSSION

In Experiment 1, roses held in Alar + sugar and Cycocel + sugar had significantly longer vase-life than those in HQC + sugar (Table 1). Quel and SD-8339 with and without sugar reduced the vase-life below that of the distilled water controls. These two growth regulators were not suitable for use in keeping solutions.

The addition of sugar to each growth regulator resulted in significantly increased vase-life.

Table 1. Mean vase-life and maximum percent weight increase of "Forever Yours" roses treated January 19, 1972 with vase solutions containing various growth regulators, HQC, and sugar.

Compound	Treatment Conc. (ppm)	Treatment Sugar (percent)	Vase-life (days)	Maximum percent weight increase (g)
Quel	45	—	2.5	3.0
SD-8339	200	—	3.0	19.5
Quel	45	5	4.0	11.5
SD-8339	200	5	4.0	20.5
Alar	500	—	5.0	17.0
Water control	——	—	5.0	20.5
HQC	700	—	6.0	25.0
HQC	700	5	6.0	28.0
Cycocel	500	—	6.0	15.0
Cycocel	500	5	9.5	18.0
Alar	500	5	10.0	32.0

Table 2. Mean vase-life and maximum percent fresh weight increase of cut "Forever Yours" roses treated February 13, 1972 with Alar + sugar and Alar + HQC + sugar.

Compound	Treatment Conc (ppm)	Treatment Sugar (percent)	HQC Conc. (ppm)	Vase-life (days)	Maximum percent weight increase (g)
Alar	500	5	—	8.0	34.0
Alar	500	5	700	7.0	36.0
Water control	—	—	—	5.0	26.0

Roses in all solutions developed severe blueing when sugar was not included.

The greatest fresh weight gains were produced by roses in Alar + sugar. Increased vase-life was closely correlated with the largest increases in fresh weight, except with Cycocel. Flowers with the longest vase-life also maintained the increased fresh weight for the longest time.

A solution pH of 4 is optimum for cut roses. The initial pH of the Alar and HQC solutions was close to this value. Solutions containing Cycocel had an initial pH of 5. All three of these chemicals maintained a pH near the initial readings for the duration of the experiment. Quel, SD-8339, and distilled water had an initial pH near 5 and increased to 6 or 6.5 at the end of each experiment. The maintenance of a lower pH may partly account for the superior effects of the Alar, Cycocel, and HQC.

In Experiment 2 (Table 2), the flowers in Alar + sugar again had the longest vase-life. Both the Alar + sugar and Alar + HQC + sugar provided significantly longer vase-life than the distilled water controls. The addition of HQC to the Alar + sugar solution resulted in decreased vase-life when compared to Alar + sugar. Fresh weight increases were similar for both solutions. The complementary effects of Alar and HQC with carnations and snapdragons do not appear to occur with cut roses.

Experiment 3 (Figures 1 and 2) was included to verify the findings of the first two experiments with regard to the superior effects of Alar + sugar. The flowers in the Alar + sugar solution again had the longest vase-life. The Alar + sugar solution provided acceptable quality for up to 13 days compared to nine days for the HQC + sugar and Alar + HQC + sugar solutions. Flowers in the Alar + sugar solution had a slightly lower increase in fresh weight but maintained the increased fresh weight for longer than those in HQC + sugar. These results clearly show that nearly all the beneficial properties of Alar are lost

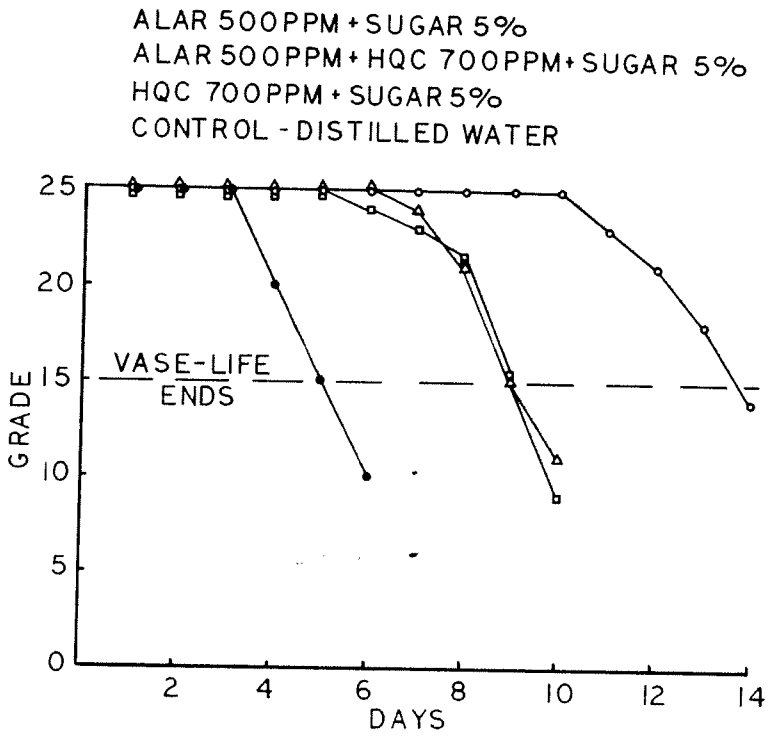

Figure 1. Daily changes in the grade of "Forever Yours" cut roses held in solutions of Alar + sugar, Alar + HQC + sugar, and HQC + sugar from April 16 to April 30, 1972. Grade 25 is perfect for all roses. Six replicates of five roses were used per treatment in this experiment.

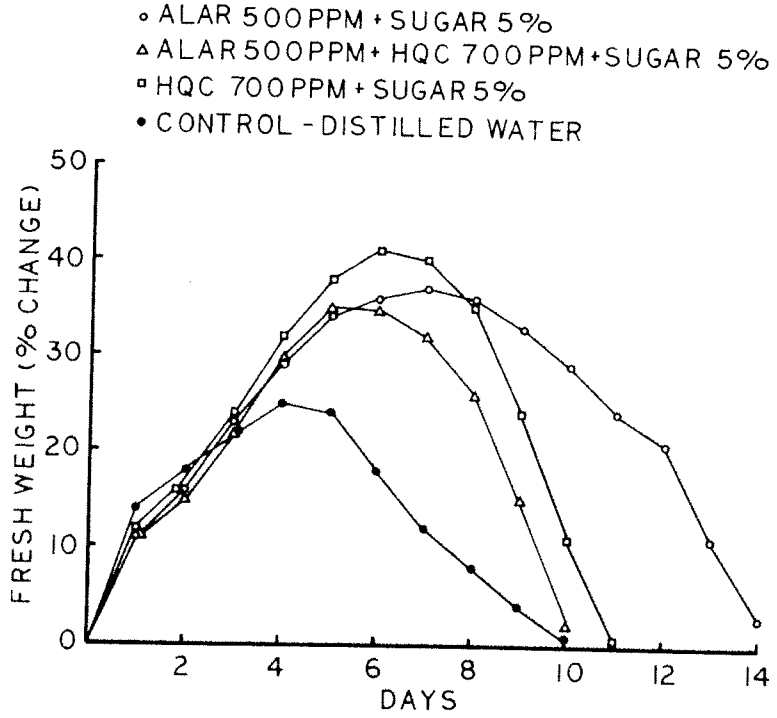

Figure 2. Daily percent changes in fresh weight of cut "Forever Yours" roses held in solutions of Alar + sugar, Alar + HQC + sugar, and HQC + sugar from April 16 to April 30, 1972.

when it is combined with HQC and the final effects approach those obtained with HQC + sugar.

Cut rose vase-life does vary according to the time of year when the flowers are cut. Longer vase-life is usually obtained as the days become longer and the sunlight more intense. These conditions result in an increased carbohydrate level (stored food) and thus the capability for continued development and longer keeping.

Alar + sugar produces results much like HQC + sugar but at an enhanced level. It is known that HQC decreases the blockage of the water transporting tissue in rose stems and increases water uptake, stomatal closure, and respiration. Alar likely functions in a similar manner; however, since it is a growth regulator it probably affects respiration the most.

The addition of 5% sugar in any solution (HQC, Alar, Cycocel, etc.) resulted in the development of interveinal, dry chlorotic areas on the leaves within three hours after being placed in these solutions. This did not alter the keeping life but did detract from the flowers' appearance. This problem can be somewhat alleviated by maintaining higher humidity and by using smaller amounts of sugar. This leaf burn occurs most frequently during the winter and spring and is likely associated with the carbohydrate level in the flowers at the time of cutting.

A solution of Alar and sugar will provide longer vase-life than HQC and sugar. The recommended levels are 500 ppm Alar and 3-5% sugar. Other levels of Alar may also prove to be suitable in extending the vase-life of cut roses.

Your editor,

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