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TESTS ON PRESERVATIVE SOLUTIONS FOR CUT ROSES AND CARNATIONS

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Cobalt nitrate was shown to be an effective chemical for control of bent-neck in roses. In our trials, a rose with bent-neck could be restored with a solution of 5% sugar, 270 to 360 ppm cobalt nitrate (CO) and deionised water. Silver thiosulfate solution (STS) was not effective on roses, and not as effective under our conditions as 8-hydroxyquinoline citrate (8HQC) for carnations. We also noticed that hard water reduced effectiveness of preservative solutions, and, if the cut flower was placed in water prior to being placed in a preservative solution, the effectiveness of the preservative was sometimes reduced.

Experiments

In most of the trials, roses and white carnations were harvested at the Lake Street Research Range and held at 33°F in tap water until ready to be placed in the test solution. Fort Collins tap water had an electrical conductivity less than 100 micromhos/cm, which would correspond to a reading of 10 on an RD-15 bridge. Preservative solutions used deionized water, with all treatments containing 5% sugar with the exception of a deionized water control. The silver thiosulfate complex preparation followed standard procedures of mixing one part of a 500 ppm stock solution of silver nitrate with five parts of a 2500 ppm stock solution of sodium thiosulfate. The room for testing keeping life was maintained between 70 to 75°F with 50 foot-candles of fluorescent lighting for 12 hours each 24 hour cycle. Criteria for senescence in roses were bent neck, pronounced bluing, fading or wilting of the outer petals. With carnations, petal wilting, sleepiness, hollow centers or collapse of the flower head resulted in removal of that flower from the treatment. A treatment consisted of 6 cut flowers on 12 to 18 inch stems.

Solutions of 200 ppm 8HQC and 270 or 360 cobalt nitrate (CO) significantly enhanced keeping life of 'Samantha'

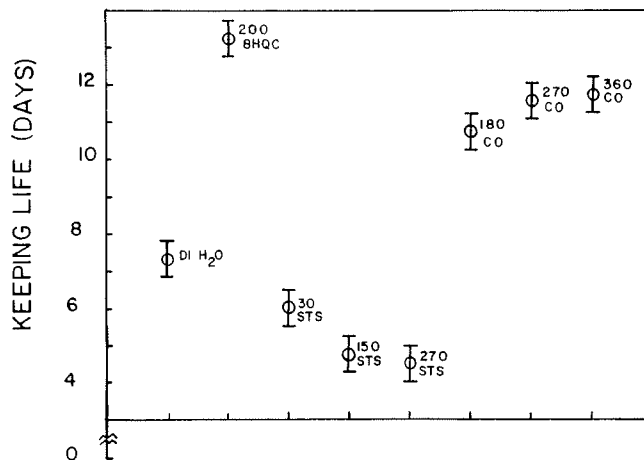


Figure 1: Effect of cobalt nitrate (CO), 8-hydroxyquinoline citrate (8HQC), sodium-silver thiosulfate (STS) and deionized water (DI) on keeping life of 'Samantha' roses.

roses (Fig. 1). Cut roses in STS solution kept significantly fewer days than cut roses in deionized water alone. STS enhanced bent-neck, with very rapid bending at 270 ppm STS. The STS solutions clouded within four days, indicating possible bacterial contamination. Cobalt nitrate at 270 and 360 ppm prevented bent-neck completely. Compared with roses in 8HQC, CO-treated roses opened less fully and had shorter vase life. Combinations of CO and 8HQC (Fig. 2) showed a greater effectiveness than either alone. Roses in this test and all others with one exception were usually mixed 'Samantha', 'Cara Mia', 'Red Success', 'Royalty', 'Visa' and 'Volare'. This tended to increase variability of the treatments. A combination of STS and cobalt nitrate, while better than deionized water, was not as good as cobalt nitrate alone (Fig. 2).

¹Undergraduate student and professor respectively.

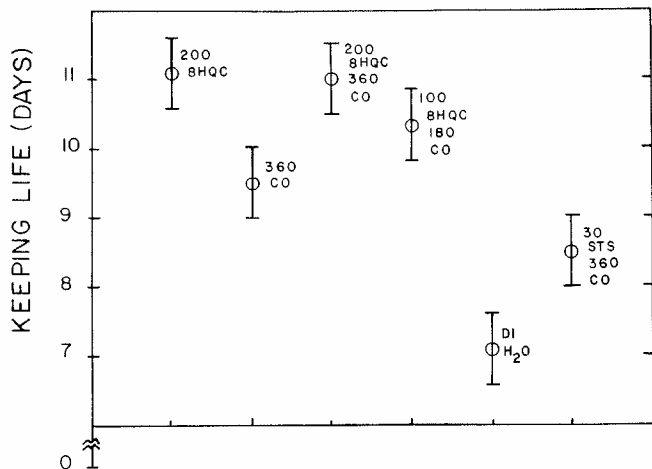


Figure 2: Effect of cobalt nitrate (CO) alone, and in combination with, 8-hydroxyquinoline citrate (8HQC) and sodium-silver thiosulfate (STS) on the keeping life of several rose varieties as compared to deionized water (DI) alone.

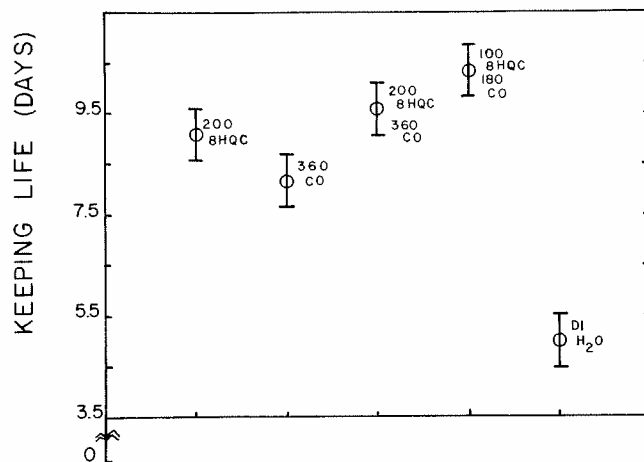


Figure 4: Effect of various preservative solutions on keeping life of roses allowed to wilt prior to placing in solution.

CO = Cobalt nitrate
 8HQC = 8-hydroxyquinoline citrate
 DI = Deionized water

In another experiment (Fig. 3), 50 'Cara Mia' were shipped from Denver to Fort Collins. Prior to shipping, the flowers had been in tap water, which usually has a conductivity of 500 to 600 millimhos/cm. There was no significant difference in keeping life of cut roses in any of the test solutions and deionized water, all flowers keeping about 6 to 7 days. However, there was no bent-neck in any of the CO treatments, whereas 'Cara Mia' in deionized water or 8HQC alone continued to bend and eventually wilted. With cobalt nitrate, flowers which had bent continued to open, the peduncle becoming obviously stiffer. Wilting was deliberately induced by leaving cut roses dry in the cooler for two days and then for two hours in the grading room. Again, combinations of 8HQC and CO (Fig. 4) were more effective than either CO or 8HQC alone. Roses in deionized water never completely opened. Many of the roses in CO treatments straightened up. Red Success' exhibited

severe bluing in CO solutions, particularly at 360 ppm, and 'Cara Mia' had a tendency to lose color in high concentrations of cobalt nitrate. 'Samantha' resisted stress conditions the best.

In still another test, a hard water was created by dissolving 4 meq/l sodium bicarbonate, 2 meq/l calcium chloride, 3 magnesium sulfate and 2 meq/l calcium hydroxide in deionized water. Cut roses in hard water alone kept better than those in deionized water (Fig. 5). A keeping solution of 200 ppm 8HQC and 270 ppm cobalt nitrate was significantly better than deionized water. Cultivar differences were apparent with 'Cara Mia' the first to fade and 'Samantha' lasting longer than any others. 'Red Success' did not blue as much in cobalt nitrate as it did in deionized water.

Two keeping trials were run on white carnations. Carnations from trial one were stored in water, those for trial

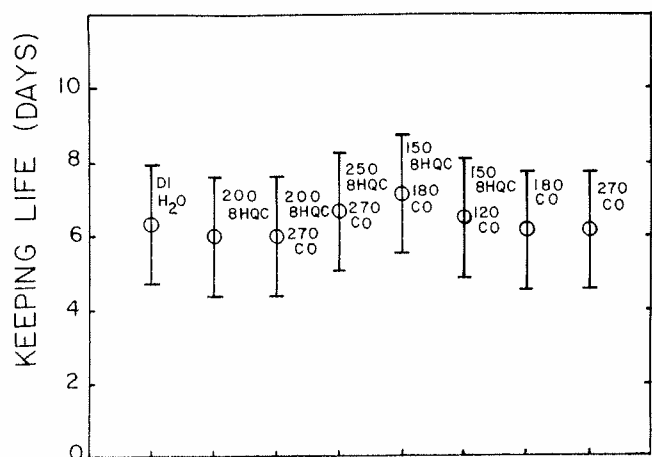


Figure 3: The effect of various preservative solutions on keeping life of 'Cara Mia' roses cut and shipped from a commercial range in Denver, CO to Fort Collins, CO.

CO = Cobalt nitrate
 8HQC = 8-hydroxyquinoline citrate
 STS = Sodium-silver thiosulfate
 DI = Deionized water

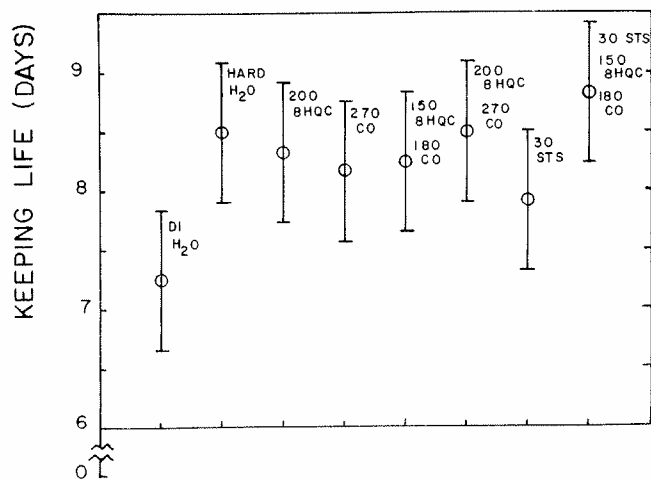


Figure 5: Effect of various preservation solutions in hard water on keeping life of roses.

CO = cobalt nitrate
 STS = Sodium-silver thiosulfate
 8HQC = 8-hydroxyquinoline citrate
 DI = Deionized water

two were stored dry. The averages for all treatments, both trials, were fairly close together (Fig. 6), with the best keeping life obtained (10.2 days) in a solution of 150 ppm 8HQC and 150 ppm STS. Cut carnations in STS alone, however, had the poorest keeping life. Carnations which were dry stored and then put into STS, exhibited a condition analogous to bent-neck on roses. Cobalt nitrate (CO) by itself was no more effective than deionized water alone. STS decreased the keeping life of dry-stored carnations.

Discussion

Bent-neck of roses was absent with solutions of cobalt nitrate. However, there was a more pronounced bluing of petals with cobalt nitrate, which was very evident on 'Red Success' and 'Cara Mia'. Roses in solutions of cobalt nitrate alone did not open as fully as did those in 8HQC. Combinations of $\text{Co}(\text{NO}_3)_2$ and 8HQC seemed to be most desirable. The results, particularly with those flowers shipped from Denver, indicated that maximum effectiveness of a preservative will be obtained if cut roses are placed immediately into the preservative solution. If cut roses are allowed to take up water, especially hard water, we believe the efficiency of any preservative further along in the marketing chain will be reduced. Also, we think that efficiency of preservatives will be reduced in hard water as compared to deionized water. Contrary to what has been

published, STS did not appear to be any better than the existing preservative 8HQC.

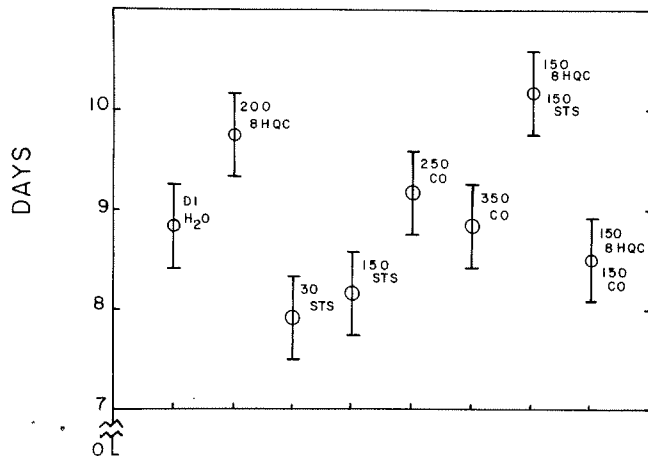


Figure 6: Effect of various preservative solutions on keeping life of white carnations.

CO = Cobalt nitrate

8HQC = 8-Hydroxyquinoline citrate

STS = Sodium-silver thiosulfate

DI = Deionized water