STABILIZED CHLORINE COMPOUND AS A VASE-WATER ADDITIVE

Anton M. Kofranek, Professor, Harry C. Kohl, Professor, and John Kubota,
Staff Research Associate, Department of Environmental Horticulture, Davis

Several vase-water additives have been formulated to improve the vase life of cut flowers at the consumer level. The additives consist of sugar, anti-microbial chemicals, and possibly other materials, such as buffering agents. Researchers are constantly trying to improve these vase-water additives. In particular, they are searching for anti-microbial agents that are more effective, less phytotoxic, readily available, inexpensive, and not hazardous to the user.

Results from tests with sodium dichloro-s-triazine-trione (SDT), a stabilized chlorine compound, indicate that it is an effective, inexpensive, readily available, anti-microbial, vase-water additive. It is the active ingredient in a swimming pool additive, Guardex®,[1] which was used as the source of SDT in these tests.

COMPARATIVE EFFECTIVENESS

In a series of cut-flower performance tests, SDT, when added to vase water along with sugar, proved as effective as proprietary

[1] Guardex®, a product of the Purex Corporation, contains 95 percent sodium dichloro-s-triazine-trione.

products or silver ions plus sugar.[2] Average vase life of 'Forever Yours' and 'Golden Wave' roses was 7.2 days in water only, 11.4 days when 1.5 percent sucrose and 50 ppm SDT were added to the vase water, 12.3 days when 1.5 percent sucrose and 10 ppm silver nitrate were added to the vase water, and 10.7 days when Floralife®[3] was used at the rate of 1 tablespoon per quart.

In a preliminary experiment, the average vase life of 'Improved White Sim' carnations was 5.2 days in water only, 15.5 days in Everbloom®[4] at 2 tablespoons per quart, and 16.5 days when 3 percent sucrose and 500 ppm SDT were added to the vase water. The 500 ppm SDT bleached the stem below the solution level.

Two separate carnation experiments followed, using various levels of SDT with and without additions of 3 percent sugar (table 1). As the concentration of SDT increased in combination with 3 percent sugar, the vase life of both white and pink Sims also increased. Stem injury was again noted at the 500 ppm rate, and that treatment was not included for the pink cultivar. Additions of SDT to the vase water without sugar did not extend carnation vase life.

[2] All tests were performed in an air-conditioned room kept at 68° F, with cool white fluorescent lights constantly yielding 100 foot-candles at flower height. All water was deionized.

[3] Floralife® is a proprietary vase-water additive.

[4] Everbloom ® is a proprietary vase-water additive.

An experiment to determine the average vase life of fully opened 'Albatross' chrysanthemums resulted in the following: 15.8 days in water alone; 24.2 days when 25 ppm silver nitrate was added to the water; and 22.3 days when 250 ppm SDT was added. Unlike the results with carnations, the SDT was very effective alone. Additions of 2 percent sucrose to the SDT or the silver nitrate solutions yielded no greater vase life of cut chrysanthemums.

CONCENTRATION

Vase life of carnations was about doubled at 100 ppm SDT with 3 percent sucrose (table 1). A concentration of 250 ppm SDT in combination with sugar was the most effective. The wide range over which SDT, with sucrose, is effective without injury to carnation is very attractive.

Roses performed quite differently. Surprisingly, there was no significant difference in vase life whether 5 ppm or 50 ppm SDT was added to the vase water containing 1.5 percent sucrose.

Roses show leaf injury at concentrations of 100 ppm SDT or more, which is not surprising. Roses are more sensitive to vase-water additives, including sucrose. A probable reason is that roses transpire much more freely than carnations so that high concentrations of soluble materials from the vase water enter the leaves.

TABLE 1. Vase Life of Carnations as Affected by SDT and Sucrose in the Vase Water

Concentration of SDT (ppm)	Vase Life of Carnation Flowers (Days)			
	'Improved White Sim'		'Improved Pink Sim'	
	No sugar	3% sugar	No sugar	3% sugar
0	6.7	—	8.1	7.1
25	7.6	12.1	—	—
50	7.9	12.8	8.6	12.6
100	7.4	14.8	8.2	15.7
250	7.1	16.2	8.8	20.2
500	6.9	16.6	—	—

NOTE: Experiments were conducted in late September and early November for the white and pink cultivars, respectively.

In tests of SDT with 'Marguerite' daisies, rainbow asters, snapdragons, stocks, and gladioli (table 2), the daisies, asters, and gladioli reacted equally and without apparent injury to SDT concentrations of 50 to 400 ppm. The keeping life of snapdragons and stocks was less favorable at concentrations over 100 ppm, although there was no visible injury.

RANGE OF SPECIES

SDT gave satisfactory results with the major cut flowers—roses, carnations, and chrysanthemums. Table 2 summarizes the results of a trial with five other crops. The total value points (see footnote to table 2) for 'Marguerite' daisies were markedly higher when SDT was used without sugar. Additions of sugar resulted in reflexing petals and yellowing of leaves, which lowered the total value.

Asters, snapdragons, stocks, and gladioli, on the other hand, responded favorably to 2 percent sugar in the vase water even without SDT, although the addition of SDT further enhanced the total value points. Likewise, all four species showed an increase in total value points when SDT was added without sugar.

In general, overall quality and days of vase life increased when sucrose plus SDT was used in the vase water. The flower qualities improved were: size, which was greater for asters, stocks, snapdragons, and gladioli; vividness of color, which was particularly noticeable in rainbow asters; and number of flowers open on a spike, which was most evident with stocks.

CONCLUSION

The results of these trials are most encouraging. SDT seems to be a very useful antimicrobial vase-water additive. A concentration between 100 and 250 ppm with 2 percent sucrose would seem to be useful, except for roses. SDT without sugar is satisfactory for chrysanthemums and 'Marguerite' daisies.

TABLE 2. Vase-Water-Additive Trials with Five Flower Crops

Treatment	'Marguerite' Daisies		Rainbow Asters		Snapdragons		Stocks		Gladioli	
	Vase life (days)	Total value*	Vase life (days)	Total value*	Vase life (days)	Total value*	Vase life (days)	Total value*	Vase life (days)	Total value*
DI water only	9.4	18	4.1	7	3.0	5	3.4	6	6.4	13
SDT added:										
50 ppm	10.5	26	5.4	12	8.5	15	3.4	6	6.8	15
100 ppm	10.3	23	6.0	14	9.2	18	4.8	10	7.6	17
200 ppm	10.7	24	6.6	15	7.8	15	3.8	8	6.8	15
400 ppm	10.6	26	6.0	12	5.2	8	4.6	10	7.0	16
2% sucrose added	6.6	9	5.5	10	6.3	11	6.6	12	7.4	16
SDT plus sucrose added:										
50 ppm SDT + 2% sucrose	7.0	10	10.5	27	10.0	20	10.4	26	9.6	24
100 ppm SDT + 2% sucrose	10.9	16	9.0	20	10.6	23	10.4	24	7.8	19
200 ppm SDT + 2% sucrose	10.4	16	6.8	16	8.0	14	8.4	19	8.6	21
400 ppm SDT + 2% sucrose	8.1	15	9.6	26	8.0	14	8.0	17	9.4	22

*Total value points were obtained by grading the quality of the vase of flowers, on a scale of 3 for highest quality to 1 for lowest quality, each day until the vase became useless, and then adding up the points.