MARGUERITE DAISIES - POSTHARVEST HANDLING METHODS
A Review and Update

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We previously reported results from three experiments evaluating selected postharvest treatments for prolonging the vase life of field-grown Marguerite daisies (*Chrysanthemum frutescens*) (Byrne, Farnham, and Pyeatt, 1979). Here we are presenting data from several additional experiments conducted at the University of California's Floriculture Research Facility at San Jose. Some of the data previously reported are again presented, because many interacting factors contribute to performance of Marguerite daisies at the consumer level.

Dry handling before packing was investigated, as were chemical treatments at the packing shed. The use of vase water additives at the consumer level was also evaluated. Flowers grown in Watsonville, California, were used throughout the studies. These were treated overnight at the grower's shed, placed into daisy hampers at prevailing shed temperatures the following day (no artificial cooling), and taken 50 miles to San Jose for storage and evaluation. The refrigerator at the research station was kept at 36° F and 85 to 90 percent relative humidity (RH) unless otherwise noted, and blooms were evaluated in a room kept at 74° ± 2° F (or as noted) and 45 to 50 percent RH with 16 hours per day of 100 foot-candles of cool, white fluorescent light.

Dry handling and stem recutting

Dry handling before packing is feasible for carnations and some other flowers. It was thought that it might also be a satisfactory cost-reducing method for handling Marguerites. And, indeed, it appears that it may be. Dry-handled daisies kept as well as those held overnight in deionized (DI) water, whether either group was evaluated fresh or after 1 or 2 weeks of dry storage at 36° F and 85 to 90 percent RH (table 1).

The longer storage period, however, reduced vase life of both groups by nearly two-thirds. Recutting the stems, on the other hand, markedly improved vase life and somewhat mitigated the adverse effects of storage. Fresh dry-handled flowers, for example, lasted 7½ days when stems were recut, compared with 5½ days when stems were not recut. After 2 weeks of storage, non-recut flowers lasted less than 2 days compared with almost 5 days when recut.

Conditioning solutions

Three overnight conditioning treatments were compared, since this type of treatment might fit into a grower's routine with minimum disturbance:

1. *Silver dip*—bunched stems dipped for 10 minutes in 1,000 parts per million (ppm) silver nitrate solution, then held overnight in DI water.

2. *Physan-20 soak*—bunches held overnight in a solution of 200 ppm Physan-20.

3. *Guardex soak*—bunches held overnight in a solution of 200 ppm SDT prepared with 95 percent Guardex.

The silver dip and Physan-20 treatments were more effective than the Guardex. Both resulted in much better keeping life when stems were *not recut*, regardless of whether the flowers were evaluated fresh or after 1 week of storage. After 2 weeks of storage, the non-recut silver-treated flowers lasted 7½ days, and those treated with Physan-20 lasted 5½ days. This is in comparison to the 1½-day longevity of flowers stored for 2 weeks after having been held overnight in DI water or handled dry throughout.

The silver dip and Physan-20 treatments were no better than the plain DI overnight soak or the dry-handled treatment when stems *were recut* before evaluation of the fresh flowers or those stored 1 week. Both, however, did extend life by 1 day of flowers stored for 2 weeks (6 days compared to about 5 days for the dry-handled). The data are summarized in table 1.

Use of cytokinen

Some of the daisy bunches in the first experiment were momentarily immersed in a solution containing 100 ppm benzyladenine (BA), a cytokinen known to improve water balance, delay wilting, and extend longevity of cut flowers (Byrne, Farnham, and Pyeatt, 1979). There was no difference in the vase longevity of fresh flowers so treated (6.5 days) and control flowers (6.8 days). After 7 days of storage, however, vase life was reduced by about 15 percent in the BA-treated group. The reduction increased to 50 percent after 14 days of storage (2.5 days compared to 4.9 for control flowers).

Another experiment was conducted in which the 100-ppm rate of BA was compared with 10, 1, and 0 ppm BA. The 10 ppm rate prolonged vase life, but some incipient petal injury was observed on the stored flowers. The use of BA in this manner does not appear promising (table 2).

HQC in vase water

The biocide 8-hydroxy quinoline citrate (HQC) was evaluated as a vase water additive at rates of 50 to 400 ppm. Longevity at the lower rate was twice that observed for flowers held in plain DI water. However, about 20 percent of the leaves were yellowed at this rate. The conclusion was that Marguerite daisies are too sensitive to HQC to allow its use at effective rates.

Response to sugar

Initial experiments with Oasis floral preservative in the vase water at rates useful to other crops resulted in sugar injury to leaves (Byrne, Farnham, and Pyeatt, 1979). Later studies comparing lower rates of sugar in combination with 25 ppm silver nitrate ($AgNO_3$) as a biocide showed that ½ percent sugar is the maximum that ought to be used in a vase solution. Longevity was increased 50 percent using this amount; higher rates reduced vase life (table 3).

Acidified vase water

Flowers from Watsonville usually arrived at San Jose late in the morning, and processing at laboratory temperature (72° to 78° F) often took 2 to 3 hours. In one experiment severely wilted flowers recovered much more quickly when placed in acidified water, even though their stems were not recut. In another experiment flowers were either placed in the vase treatments as soon as possible or allowed to wilt on the laboratory table for 4 hours (77° F, 48 percent RH). At the time the wilted flowers were placed in the vases, the group that had been placed in vases four hours earlier was rated for degree of wilt. Those placed in tap water were still reasonably wilted, whereas those placed in DI water containing citric acid were essentially turgid. The same relationship held for those allowed to wilt for 4 hours before being placed in the vase. The wilted flowers placed in tap water kept less than a day; those in acidified DI water kept as well as fresh flowers placed in the same solution. The data are summarized in table 4.

Stem diameter not a factor

Marguerite daisies vary from one part of the plant to another and from one plant to another. Variability in flower maturity is reduced by discarding fully open blooms in the field. Eliminating variability in stem thickness, on the other hand, would involve increased handling. The importance of stem diameter as a factor in vase longevity was evaluated. Daisies were graded into groups with average stem diameters of 7.3, 5.2, and 3.8 mm. As shown in table 5, all had the same vase longevity. Disparities in stem size, then, do not appear to contribute to vase life problems in this crop.

TABLE 1. Longevity of Marguerite Daisies as Influenced by Overnight Conditioning Treatment, Length of Storage, and Stem Recutting Immediately before Evaluation in Deionized Water, San Jose, May 1979

Overnight treatment before storage	No storage*		7 days storage*		14 days storage*	
	Stems not recut	Stems recut	Stems not recut	Stems recut	Stems not recut	Stems recut
	days	*days*	*days*	*days*	*days*	*days*
Handled dry	5.5 ab	7.5 bcde	2.2 k	4.7 klm	1.7 w	4.8 xy
Held in DI water	3.2 a	6.0 bc	2.3 kl	3.7 klm	1.4 w	3.6 x
Dipped in 1000 ppm $AgNO_3$, then held in DI water	8.5 de	8.3 cde	8.4 0	6.6 mno	7.4 z	6.2 yz
Held in 200 ppm Physan-20†	9.1 e	7.5 bcde	8.1 no	5.2 klmn	5.5 y	5.9 yz
Held in 200 ppm SDT (from 95% Guardex)‡	6.8 bcd	8.1 bcde	3.6 kl	5.4 lmno	4.5 xy	5.0 xy

*Figures for each storage are means of three replications of eight stems each; those followed by the same letter are not statistically different (Duncan's Multiple Range Test, P = 0.05).

†Physan-20 active ingredients: n-alkyl (60% C_{14}, 30% C_{16}, 5% C_{18}) dimethyl benzyl ammonium chlorides . . . 10%; n-alkyl (68% C_{12}, 32% C_{14}) dimethyl ethylbenzyl ammonium chlorides . . . 10%. Inert ingredients: 80%. Distributed by Consan Pacific, Inc.

‡Guardex is a product of Purex Corporation and contains 95% sodium dichloro -s- triazinetrione.

Acidified conditioning solutions

The response to acidified water in the evaluation vase prompted a final experiment last fall in which the grower's practice (overnight conditioning in tap water) was compared with overnight conditioning in acidified water with or without Physan-20 or Physan-20 plus ¼ percent sugar. Physan-20 was included because of its effectiveness in earlier experiments, and because it is readily available. The flowers were stored at 36° F as usual and evaluted *without recutting* the stems. The keeping room was maintained at 77° F ± 2° F for this experiment, and RH was 40 to 45 percent.

Daisies conditioned in acidified DI water containing 200 ppm Physan-20 kept as well after 12 days of storage as unstored flowers conditioned in tap water (table 6). Adding ¼ percent sugar to the conditioning solution did not increase longevity. The data are based on 15 vase replications per treatment.

Summary

Dry handling of Marguerite daisies is as effective as an overnight conditioning in DI water, promoting better keeping life whether or not the stems are recut before evaluation. This is true for both stored flowers and those evaluated the day after harvest, although storage in itself reduced vase life markedly, regardless of treatment.

Dry-handled flowers kept as well as those given chemical overnight conditioning treatments only when stems were recut before evaluation; otherwise, a silver nitrate 1,000 ppm dip followed by overnight conditioning in DI water (possibly not too practical), or conditioning in DI water containing 200 ppm Physan-20 were much more effective, especially after storage. Conditioning with Guardex in DI water was less effective than the other two treatments.

HQC causes injury at rates marginally effective as a preservative. Floral preservatives containing HQC are not recommended for Marguerites.

Marguerites are sensitive to sugar and are injured when left for more than a few hours in concentrations above ½ percent (about 4 level teaspoons per gallon of water) under conditions of these tests.

Placing the daisies in DI water acidified with 320 ppm citric acid markedly improves water uptake and flower longevity. The addition of 200 ppm Physan-20 increases the effect.

Heavy-stemmed daisies do not necessarily last longer than thinned-stemmed ones. Initial loss of quality in Marguerites is typically related to leaf wilt or yellowing caused by a water deficit. Stems of different sizes appear to be equally susceptible.

Conditioning Marguerites in DI water containing 320 ppm citric acid and 200 ppm Physan-20 may be the most effective way to improve longevity where stems cannot be recut after the bunches are unpacked.

Conclusions

Recutting the stems of Marguerite daisies appears to be the single most important way to improve water relations and increase longevity, just as it is in the case of roses and other flowers. This is especially true where field heat cannot be removed readily. Where recutting is practiced, dry handling seems to be a suitable alternative to the traditional practice of conditioning overnight in tap water.

If recutting is not in the cards because of costs involved, conditioning overnight in DI water containing 320 ppm citric acid (about 1 slightly rounded teaspoon per 5 gallons) and 200 ppm Physan-20 (about ¾ teaspoon per 5 gallons) may be a useful method of improving product quality. This particular solution is easily mixed up and should be helpful in prolonging the vase life at any point in the distribution chain, including the retail florist who prefers to hold a little better quality. This solution with some added sugar (about ½ to 1 teaspoon per gallon) makes a good short-term floral preservative for a number of flowers.

Literature cited

Byrne, T. E., D. S. Farnham, and L. S. Pyeatt.

1979. Postharvest studies with Marguerite daisies. Flower and Nursery Report, Winter 1979. pp. 1-4.

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TABLE 2. Longevity of Marguerite Daisies Dipped in Benzyladenine (BA) after Harvest, Recut, and Evaluated Fresh or After Storage, San Jose, 1979

Treatment	Longevity*†	
	Fresh	Stored‡
	days	*days*
100 ppm BA	2.0 a	0.0 z
10 ppm BA	4.3 c	4.0 x
1 ppm BA	3.7 b	2.8 y
No BA dip	3.3 ab	2.3 y

*Evaluated in deionized water; room 77° ± 2°F; relative humidity 48% ± 8%.
†Figures within columns followed by same letter are not statistically different by Duncan's Multiple Range test (p = .05).
‡Seven days dry storage at 48° ± 1° F.

TABLE 3. Longevity of Fresh Marguerite Daisies Evaluated in Deionized Water Containing Silver Nitrate and Silver Nitrate Plus Sucrose, San Jose, 1979

Sucrose concentration in vase	Longevity*†
	days
1 percent	8.9 b
0.5 percent	10.4 c
0.25 percent	8.5 b
None	5.2 a

*Room temperature 77° ± 2° F; relative humidity 48% ± 8%.
†Figures followed by same letter are not statistically different by Duncan's Multiple Range test (p = 0.05).

TABLE 4. Wilt Ratings and Longevity of Fresh and Wilted Marguerite Daisies Evaluated in Three Vase Treatments, San Jose, 1979*

Vase treatment	Fresh flowers†		Wilted flowers**	
	Wilt rating 4 hr after put in vase‡	Longevity§	Wilt rating when put in vase‡	Longevity§
		days		*days*
Tap water	4.8	1.5 b	10.0	0.9 a
Deionized (DI) water	2.1	3.1 d	10.0	2.2 c
DI water + 320 ppm citric acid	0.5	5.7 e	10.0	5.2 e

*Room temperature 77° ± 2° F; relative humidity 48% ± 8%.
†Bunched at Watsonville immediately after harvest and transported dry to San Jose.
‡0 = no wilt; 10 = severely wilted stem and leaves.
§Figures followed by same letter are not statistically different by Duncan's Multiple Range Test (p = 0.05).
**Bunched and transported as fresh flowers, but allowed to wilt on laboratory table for 4 hours at 78° F and 55% relative humidity.

TABLE 5. Vase Longevity of Three Sizes of Marguerite Daisies, San Jose, 1979

Stem grade designation	Longevity*†
	days
Large: diameter of base of stem 7.3 mm	4.3
Medium: diameter of base of stem 5.2 mm	4.6
Small: diameter of base of stem 3.8 mm	4.5

*Held overnight after harvest in tap water; taken to San Jose, graded, and left on table two hours at 72° F; stems recut 2 cm before evaluation in acidified, deionized water.
†Differences are not statistically different at 95% confidence level, Duncan's Multiple Range Test.

TABLE 6. Longevity of Conditioned Marguerite Daisies, San Jose, 1979

Treatment	Longevity*†
	days
EVALUATED BEFORE STORAGE	
Overnight conditioning in tap water	3.3 d
EVALUATED AFTER 12 DAYS STORAGE AT 36° F	
Overnight conditioning solution:	
Tap water	0.3 a
DI water + citric acid (cit)	2.0 bc
DI + cit + Physan-20	2.4 cd
DI + cit + Physan-20 + ¼ percent sugar	2.3 bcd

*Daisies not recut before evaluation in deionized (DI) water at 77° F.
†Figures are means of 15 replications. Those followed by same letter are not statistically different at 95% confidence level, Duncan's Multiple Range Test.