Special Research Report #445: Postproduction

Best Practices to Reduce Bacterial Growth in Floral Solutions

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BACKGROUND

Some practices used by the floral industry can promote the incidence and growth of bacteria. Their effects on cut flower quality and vase life are not often recognized by the industry. This research demonstrates the extent and effects of this problem.

MATERIAL AND METHODS

Bacteria content of solutions used in commercial floral operations were determined. We studied the growth of bacteria under various conditions and the resultant effects on quality and vase life of cut roses and gerberas.

RESULTS

BACTERIA TESTS

An evaluation of solutions used to commercially hydrate cut roses for 1-2 days at 35 °F at farms in Colombia and Ecuador found that 5 out of 9 farms used solutions contaminated with bacteria (Table 1). With the exception of two farms, the number of bacteria increased greatly during hydration.

Table 1. Bacteria (cfu/ml) in farm solutions before and after hydration of cut roses.

Farm	Before	After
1	0	3,150,000
2	130	250,000
3	0	84,500,000
4	0	0
5	0	0
6	60,000	200,000
7	8000	255,000
8	175,000	247,500
9	57,500	38,000

A similar test with several retailers in Florida also showed extremely high levels of bacteria in hydration solutions with the majority at improper pH levels (Table 2).

Table 2. Bacteria (cfu/ml) in retail hydration solutions during flower hydration.

Retailer	Bacteria	pH
1	150	3.44
2	6,750,000	5.93
3	3,000,000	3.62
4	7,750,000	6.72
5	850,000,000	5.82
6	5,500,000	6.60
7	6,200,000	6.22
8	675,000	6.47

TEMPERATURE & BACTERIA GROWTH

The bacteria that developed in 2 liters of tap water that held 7 stems of stock, 8 gerbera, and 2 lilies at 35 ºF and 70 ºF was quantified. Bacteria developed at both temperatures, but developed 11.4 times faster after only 2 days at 70 °F as compared to 35 °F (Table 3).

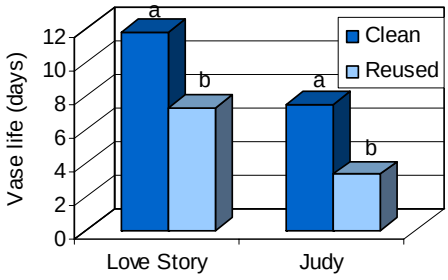
Table 3. Temperature effects on bacteria (cfu/ml) growth during hydration.

Day	35 °F	70 °F
0	0	0
2	48,500	555,500
4	69,333	783,333
6	3.06×10^6	12.5×10^6
8	7.5×10^6	48.3×10^6
10	13.6×10^6	79.5×10^6
12	26.6×10^6	101.5×10^6
14	253.3×10^6	300.0×10^6

REUSED SOLUTIONS

Floral operations often reuse hydration and holding solutions. We found that roses held in a reused commercial hydration solution started with 1,730,000 cfu/ml of bacteria and the counts nearly doubled after 7 days at 42 °F. Thus, vase life was significantly reduced on the roses hydrated in reused solution (Fig. 1).

Fig. 1. Effect of clean versus reused hydration solution on the vase life of cut roses.



Solution uptake of 'Freedom' roses during hydration was significantly higher when held in clean solutions (Fig. 2). Vase life also improved when hydrated in a freshly made solution (Photo 1.).

Fig. 2. Solution uptake of 'Freedom' rose.

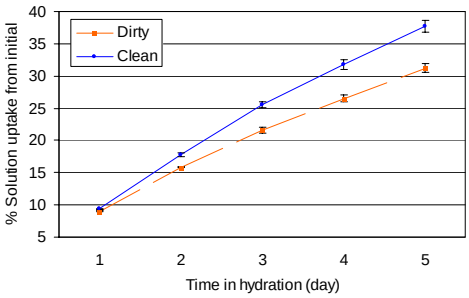


Photo 1. 'Freedom' roses last longer when hydrated in a freshly made solution.

Reused Freshly made

RE-CUTTING STEMS

Re-cutting stems is important before placing flowers in floral solutions. If roses were not cut, especially after hydrated in reused solutions, prior to being placed in flower food, vase life was reduced 60% and flower opening was drastically impaired (Photo 2).

Photo 2. Recutting stems of 'Love Story' roses improved vase life and flower opening.

Not Recut Recut

SANITATION PRACTICE

Pretreating cut gerbera 'Tsar' at harvest with Chrysal CVBN, a chlorine based product, for 3 days at 42 °F, kept the vase water visually clear and extended vase life 3 days relative to untreated stems (Photo 3).

Photo 3. Treating 'Tsar' with Chrysal CVBN at harvest extended vase life.

Control Chrysal CVBN

Vase life was further increased by dipping stems in 10 ppm chlorine dioxide for 1 minute prior to treatment.

CONCLUSIONS

Bacterial contamination of floral solutions has been identified as a problem in all segments of the industry. Bacteria were found to rapidly increase in solutions and drastically reduce solution uptake, flower opening, and vase life of cut flowers. Reusing solutions and not recutting stems was highly detrimental. Using pretreatments to reduce the bacterial load on stems and solutions is essential.

IMPACT TO THE INDUSTRY

The detrimental effects of bacteria on cut flower quality and vase life have been demonstrated. Practices to reduce and control this major postharvest issue will have an immediate and positive impact on improving flower quality and vase life, thus improving customer satisfaction.

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