

Special Research Report #409: Postproduction
Three C's of Success with Fresh Cut Flowers (1) – “Cooling”
 M.S. Reid, Professor, University of California, Davis, 95616
 T.A. Nell, Professor and Chairman, University of Florida, Gainesville, 32611



Phone: 618/692-0045
 Fax: 618/692-4045
 E-mail: afe@endowment.org
 Website: www.endowment.org

BACKGROUND

To be a successful retailer, questions must be answered. They are: (1) what customers want and, (2) how to provide it.

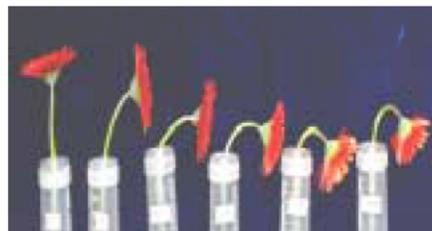
In the fresh cut flower industry, customers want flowers that last. Unfortunately, answering the second question is not easy. Scientific studies show that many factors affect cut flower quality and longevity. They include diseases, water supply, ethylene exposure, food supply, temperature, and the variety. Among these, temperature control, has been proven to be the most important factor affecting fresh cut flowers.

KEEP IT COOL!

From the moment the flower is cut until it is placed into a floral preservative solution, fresh cut flowers only have access to the food stored in their leaves and petals. Flowers stored and shipped at

high (suboptimal) temperatures respire rapidly and thus, use greater amounts of their limited resources. Consequently they age prematurely.

For example, Gerbera daisy 24 hours after 5 days of storage at different temperatures provides an excellent illustration of the drastic decline in vase life due to high temperature storage.



32 37 41 46 50 55
 Storage temperature (°F)

Keeping flowers at 33°F slows down the respiration process. Thus, when placed at room temperature, they possess a vase life similar to freshly cut flowers.

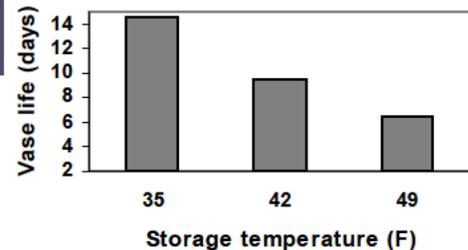
The optimum storage temperature for most non-tropical cut flowers is between 33°F and 35°F. Every degree above this range decreases vase life and increases respiration rate. Tropical flowers, e.g., anthurium, bird-of-paradise, ginger, and tropical orchids are damaged when exposed

to cold temperatures and, therefore, require warmer temperatures (50 to 55°F).

FROM GROWER TO FLORIST

The longer cut flowers are exposed at temperatures outside the optimal 33° to 35°F range, the shorter their vase life (Fig. 1). This means that flowers shipped and stored at high temperatures, have a reduced vase life before they even reach the florist.

Fig. 1. Temperature effects on vase life of ‘Valentino’ roses.



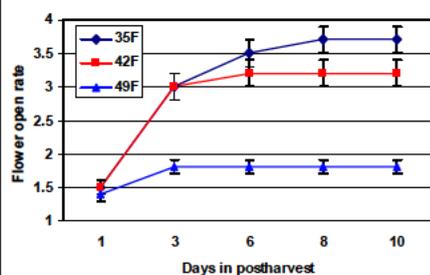
Since temperatures often vary greatly providing from the field to the flower shop, it is important for florists to question suppliers about temperature control. Also, florists must inspect shipments upon arrival to ensure quality for their consumers.

When flowers arrive, they should be visually inspected for signs of temperature fluctuations e.g., heavy

condensation in sleeves and mold on the flowers or leaves. Condensation and mold are signs that these flowers are not as fresh as they should be and will probably have a reduced vase life.

Along with a careful visual inspection, newly arrived flowers should be subjected to some simple temperature readings. To get an accurate reading for boxed flowers, insert probes behind flower heads. For flowers that were transported wet, measure the temperature of the solution. Temperatures outside the 33°F to 35°F range mean that freshness has been compromised. (see Fig. 2)

Fig. 2. Effect of high storage temperature on flower opening of 'Black Magic' roses.



IN THE FLOWER SHOP

Once flowers are in the shop, florists must do their part to keep flowers cool and fresh. The most common error that florists make is ignoring their coolers. Checking wall thermometers inside coolers once in a while is not enough to guarantee flower freshness. Place additional digital

thermometers at varying heights throughout the cooler to identify warm and cool spots. Also, take the temperature of bucket solutions. This temperature won't fluctuate every time the cooler door is opened.

Flowers of 'Red Jewel' roses lasted twice as long when stored at 35°F as compared to 49°F.



35°F 49°F

Ideally, an employee should check the cooler's thermometers several times a day. At a minimum, thermometers should be checked twice a day. The cooler should be adjusted to maintain the proper 33°F to 35°F range. Flowers can easily withstand temperatures down to 32°F without sustaining damage. However, if the cooler is consistently too warm (over 35°F), a new thermostat may be necessary. If temperatures in the cooler vary too widely, the air circulation should be checked.

It is also important to keep coolers free of plant debris and to disinfect the cooler walls, floor, and shelves. Lastly, keep the time in storage to a minimum.

CONCLUSIONS

Vase life and quality is highly impacted when improper temperatures are used during transport and storage. For most cut flowers, the ideal range is from 33°F to 35°F. Tropical flowers, however, require 50 to 55°F. Temperatures above the optimum levels reduce vase life and quality. Keeping flowers cool slows down respiration rate and maximizes vase life.

IMPACT TO THE INDUSTRY

If florists take care to question their suppliers and vigilantly monitor temperatures in their coolers, they can ensure that their flowers will last when customers get them home. By providing outstanding quality flowers, florists gain customer loyalty and repeat sales.

For additional information contact:

msreid@ucdavis.edu

tnell@mail.ifas.ufl.edu

2004 January © Copyright
The American Floral
Endowment. All Rights
Reserved.

Special Research Report #410: Postproduction

The Three C's of Success with Fresh Cut Flowers (2) – “Cleanliness”

T.A. Nell, Professor and Chairman, University of Florida, Gainesville, 32611

M.S. Reid, Professor, University of California, Davis, 95616



FUNDING INDUSTRY SOLUTIONS
TODAY & TOMORROW

Phone: 618/692-0045

Fax: 618/692-4045

E-mail: afe@endowment.org

Website: www.endowment.org

BACKGROUND

In the floral industry, there is increasing competition. It seems that everyone from supermarkets to discount warehouses are selling cut flowers. With this increased competition, retail florist must prove to consumers that their flowers are “a cut above the rest.” The question is – how?

One of the most important factors in marketing high quality, long-lasting cut flowers is a clean environment. Cut flowers are living organisms that, like humans, require hygienic conditions to stay healthy. No Doctor would dream of keeping a filthy office full of dirty tools. Likewise, florists should not disregard the cleanliness of their shop. Just like people, cut flowers kept in unsanitary conditions are prone to diseases and premature death. The simple

guidelines provided below ensure the health and vase life of fresh cut flowers.

SOURCES OF CONTAMINATION

Tools of the Trade

Re-cutting the stems of flowers is an important step in flower processing. (See Special Research Report #411) The bottom 1 to 2 inches are likely clogged with microorganisms or air bubbles when flowers arrive in the shop. Cutting the clogged portion of stem is not only crucial to the life of cut flowers, but also it is important not to introduce new microbes. Cutting tools must be washed and sterilized at least once a day, preferably more, to reduce the chances of spreading infections. Also, dull blades can also cause problems by crushing stems and causing them to release increased amounts of sap. Therefore, it is prudent to keep all clippers, scissors, and knives sharp and clean.

Cutting stems in air is okay, but cutting underwater can increase initial rehydration. The benefits of cutting flower stems underwater are negated, however, if stems are cut in dirty water

(Table 1). Cutting stems underwater does not increase vase life for most flowers, but initial water uptake may be higher.

Table 1. Bacterial counts in cutting water (propagules/ml) initially and after 300 and 600 cut stems.

Water sample	Bacteria count
0 stems cut	55
300 stems cut	1.47×10^5
600 stems cut	6.34×10^5

Re-used water, like that used in many commercial flower cutters, contains all the sap and microbes from previously cut flowers. Cutting in dirty water can reduce vase life and quality (Fig. 1 and Table 1).

Fig. 1. Vase life of cut roses is reduced when cut in dirty (reused) water

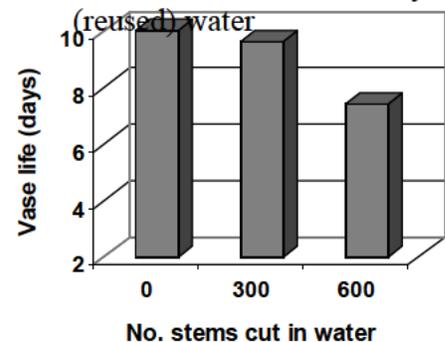
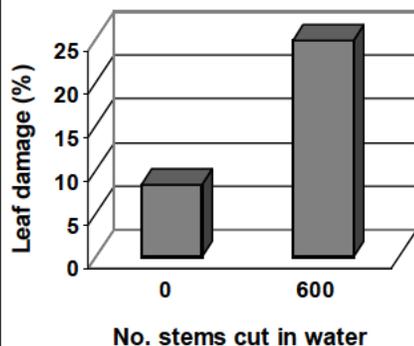


Fig. 2. Leaf damage increased on Chrysanthemums when cut in dirty water.



The likelihood of infections and blocked stems increases when clean water is not used. When cutting stems underwater, be certain to use fresh water for each bunch of flowers.

Buckets

It is important to clean and disinfect buckets and tubs between every batch of flowers processed. Flower stems contain cells full of sugary sap that is released when flowers are cut. This sap bleeds into solutions in buckets where it serves as food for yeast, and other microorganisms found on cut flower stems, causing them to multiply. These organisms are absorbed into the stem where they block water uptake. The larger and more plentiful the organisms, the more clogged the flower stems become.

Use a commercial anti-bacterial cleaning solution and a brush to sterilize and scrub buckets. Clean and

sterilize buckets in one step by submerging them in a detergent that contains a disinfectant. When using a non-sterilizing detergent, dip buckets in a solution of 1 part bleach to 10 parts water. Also, use white buckets to make cleaning simple - dirt is easy to see on the lighter colored surface.

To make sure that they remain clean, do not place clean buckets on the floor before stacking. The floor is rife with microbial organisms. Either stack buckets as soon as they are removed from the cleaning solution so that only one bucket touches the ground or place buckets on a cleaned and disinfected cart to dry before stacking.

Coolers

Another spot for problematic organisms is the cooler. If coolers are not cleaned properly, they can become a haven for spores of the "grey mold" (*Botrytis*). Be sure to sterilize the floors, shelves, and walls of coolers with either an anti-bacterial cleaner or a bleach solution (1 part bleach to 10 parts water) every 4 to 6 weeks or sooner, if needed. In addition, dead flower parts such as dropped leaves and petals should be removed from coolers on a daily basis.

CONCLUSIONS

Cleanliness is a necessary ingredient in all aspects of floral practices. It eliminates

microbial contamination and diseases and maximizes quality and vase life. The guidelines listed below will help to ensure a clean environment.

Cleanliness Guidelines

- * Wash hands frequently
- * Sterilize cutting tools
- * Change cutting water for each bunch of flowers
- * Keep buckets clean
- * Keep coolers clean
- * Remove dead flower parts

IMPACT TO THE INDUSTRY

Success in floral retailing is dependent upon providing quality products to the consumers. Keeping shops clean allows florists to provide consumers with flowers that are alive and thriving. Flowers processed and stored in a clean environment reflected their treatment with higher quality and longer lasting flowers. This translates into satisfied customers and repeat business for floral shops.

For additional information contact:

tnell@mail.ifas.ufl.edu
msreid@ucdavis.edu

2004 January © Copyright
 The American Floral
 Endowment. All Rights
 Reserved.

Special Research Report #411: Postproduction

The Three C's of Success with Fresh Cut Flowers (3) – “Care”

T.A. Nell, Professor and Chairman, University of Florida, Gainesville, 32611

M.S. Reid, Professor, University of California, Davis, 95616



FUNDING INDUSTRY SOLUTIONS
TODAY & TOMORROW

Phone: 618/692-0045

Fax: 618/692-4045

E-mail: afe@endowment.org

Website: www.endowment.org

BACKGROUND

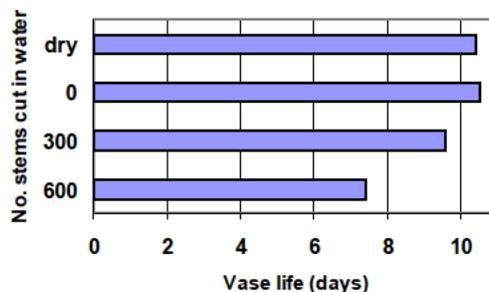
The concept of fresh cut flower care appears simple, i.e., care for your flowers and they will perform well for customers. But floral care is not that easy to quantify. Hidden pitfalls and misinformation can result in poor quality flowers. Thus, every florist should know how to provide the necessary care that results in beautiful, long-lasting cut flowers.

CARE UPON ARRIVAL

Flowers should be processed immediately upon arrival at the shop. If flowers must be stored before processing begins. Handle the boxes with care and store for only a short period at the proper temperature. (See Special Research Report #409). For every day of storage, valuable vase life and quality is lost. Never toss boxes and always stack them neatly in the coolers.

To process flowers, cut off the lowest 1 to 2 inches of the stem. This portion of the stem is likely to be clogged with debris, microorganisms or air bubbles. It is okay to cut stems in air, but cutting underwater can increase initial hydration. You must, however, be certain to use **clean water!** Re-used water contains dirt, sap, and microorganisms that can get taken up by the stems and block water uptake. This greatly negates the positive effect of underwater cutting and can result in flowers that die prematurely.

Fig. 1. Vase life of cut roses when cut dry or cut in clean (0) versus dirty (300 or 600 times) water.



REHYDRATION

In most cases, flowers need to be hydrated upon arrival. Many commercial hydration solutions are available. Be certain to follow mixing directions and maintain the

flowers in the solution for the recommended time.

Many florists believe that warmer air helps flowers absorb water more quickly and, thus, place flowers outside the cooler after processing. In reality, flowers should be rehydrated in the cooler. Flowers rapidly absorb water in a cooler and, in addition, they lose less water to transpiration. The result is a quicker net gain of water for flowers hydrated in the cooler.

Some florists burn, boil, or smash stems in the belief that this assists rehydration. In reality, none of these practices work. Although hot, even boiling water can increase initial water uptake, research shows that it has no significant effect on vase life.

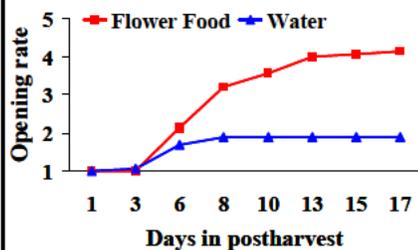
Furthermore, hot water kills stem tissue, providing a source for microbial organisms. Thus, what is the bottom line? For best results, use a cool rehydration solution and place the flowers in the cooler.

FLOWER FOOD

After flowers are cut and rehydrated, they should be placed in flower food until sold. Flowers placed in

flower foods open better and last longer than those stored in plain water. An injection system should be used to properly mix the flower food.

Fig. 2. Flower opening of the cut rose 'Valentino' is in floral food as compared to water.



Maintaining flowers in flower food is one of the most important steps for a florist. It maximizes quality and longevity.



Water Flower Food

ETHYLENE

Ethylene is a colorless, odorless gas that can negatively affect fresh cut flowers. Wilted petals, dropped buds and yellowing leaves are symptoms of ethylene damage.

Some sources of ethylene are: dead and decaying flowers, vehicle exhaust, and ripening

fruit. To prevent ethylene damage, idling delivery trucks must not be near open doors. Also, keep all areas free of dead flower parts and keep fruit out of coolers and away from flowers. All ethylene sensitive flowers should be treated with anti-ethylene materials, preferably, by the grower or wholesaler.

Ethylene causes premature flower death in delphiniums and other sensitive species.



Ethylene No ethylene

KEEP IT CLEAN AND COOL

Cleanliness and temperature are important aspects of floral care. Reduce stem blockage and microbial infection by keeping all buckets, tools, cutting tanks, and coolers clean. Also, always monitor cooler temperatures. All, but tropical flowers, should be stored between 33° and 35° F. High temperatures will decrease vase life and reduce quality. Storage time should be kept to a minimum.

CONCLUSIONS

Proper care will maximize fresh cut flower quality and longevity.

Care Guidelines Are:

- * Process upon arrival
- * Re-cut stems and hydration
- * Maintain proper cooler temperatures
- * Use flower food
- * Keep away from ethylene
- * Maintain clean and sterile conditions
- * Keep storage time short

IMPACT TO THE INDUSTRY

Proper floral care takes time and dedication. However, in the end, well cared for flowers produce satisfied consumers.

For Additional Information Contact:

tnell@mail.ifas.ufl.edu
msreid@ucdavis.edu

2004 January © Copyright
 The American Floral
 Endowment. All Rights
 Reserved.