
The Three C's - A check list for Optimal Postharvest Handling of Cut Flowers and Foliage

Postharvest handling systems for all cut flowers and cut foliage have three essential common elements - Care, Cleanliness, and Cooling. Other manipulations - chemical pretreatments, elegant packaging, and expensive transportation are of no value unless these products are of good initial quality, are handled carefully, are kept clean, and are brought to the proper storage temperature as quickly as possible. The check list is intended as an opportunity for you to review your operation and think about these three critical elements to ensuring long vase life and customer satisfaction.

Grades and standards. There are no legal grades and standards for cut flowers, but unless you have some written statement of what you regard as the proper quality for these items (degree of openness, stem length, acceptable levels of damage, uniformity, stem strength, etc.), you cannot be sure that you are providing your customer with product that you would be proud of. A written set of grades and standards makes it easier to train new employees and remind long-term employees of what you mean by a quality product.

Shelf-life evaluation. The most important aspect of quality in ornamentals is shelf-life. Quality control programs should include routine evaluation of the shelf-life of your product. The best way of achieving this is to have a special room, or a space in the main office where some product from each day's production is placed in standard vases containing a commercial preservative. You need to assign someone to set up the flowers and to check them (after one week or ten days you'd want them still to be in good condition).

Preventing unnecessary damage. It is hard to remember that flowers and foliage are delicate living products, and that unnecessary abuse will make them more susceptible to disease and shorten their life. Constant reminders are necessary, not only for those harvesting and packing the product, but also for those handling packed boxes. Don't throw, dump, or otherwise abuse cut flowers and foliage!

Clean buckets. Clean buckets are the most important tool in ensuring good vase life for your product. And white buckets are best for seeing if they've been cleaned. Don't put newly harvested product into water that's already been used. Chances are it's already contaminated with bacteria. And if your coolroom is fitted with those troughs that get cleaned out once a season, think about a way to replace them, or to ensure that they, too, are cleaned each time new flowers are placed in them. Clorox or another chlorine-containing product is an excellent general biocide for flowers and foliage. Water containing 50 ppm is obtained by putting 1 teaspoon of liquid Clorox in 8 gallons of water. Cheap, isn't it?

Clean coolrooms. Flowers are very susceptible to rots caused by grey mold, *Botrytis cinerea*. This fungus grows on dead or dying plant tissue in the greenhouse, field, packing shed or cooler. Keep trash out of those areas. Cleaning out the coolroom regularly and wiping down walls, floors and ceiling with an anti-fungal solution (Clorox, Physan-20 or other), can reduce the chance that fungal spores will contaminate your flowers.

Cool your product. The right temperature for storing and transporting most Californian-grown flowers and foliage is close to the freezing point, and we recommend 0.5-1.5°C (33-35°F). You spent a lot of money installing your coolers. Make sure that they're working for you. Use a high quality thermometer - an old-fashioned glass thermometer is foolproof, cheap, and accurate. Make sure the thermometer has been calibrated - check the temperature of a rapidly-stirred slurry of ice and water, the thermometer should read 0 °C (32°F); if it doesn't throw it away and get a new one. It's best to put the thermometer in a small jar of water. That way you get a better reading of the average temperature in your coolroom. The temperature of the coolroom should be checked regularly (the start and end of each day?), and the person responsible for checking the temperature should write it down so that the performance of the coolers can be reviewed regularly.

Ensure that cooling is effective and efficient.

Forced air coolers only work well if the air can flow through the box. Packers need to be reminded to ensure that paper, plastic, sleeves, or other packing products are placed in such a manner that they do not obstruct the flow of air through the box. The best way of checking whether boxes are properly packed is to monitor the temperature of each box after cooling. Use a digital probe thermometer and measure through the side of the box just behind the flower heads. If the flowers are not at the proper temperature (usually 33 to 35°F) after a normal precooling (half an hour) chances are they're not packed so as to ensure efficient precooling.

Making sure that flowers stay cool during transportation. When you've made every effort to pack quality flowers and cool them to the right temperature, it's all wasted if they're not maintained at that temperature during transportation. If you're sending flowers by air, try to stack them together so that they gain as little heat as possible. Use insulation in the boxes; pallet covers, especially insulated covers, can also help reduce heat build-up. If you're shipping by truck, make sure the truck is cooled before you put your product in it. Recording thermometers are a great insurance policy. If you're shipping flowers by truck make a habit of including a recording thermometer so that you know what the temperature of the flowers was throughout their journey.

The Three C's for Flower Handlers



CARE We care about and are proud of the quality of our product

- We have a system of grades and standards to ensure quality
- It is written down so that everyone understands it
- It is used routinely
- We regularly evaluate shelf-life of our product
- Our product is labeled so that our customers can write with compliments or complaints
- We have an in-house training program for our staff
- We take extra care to ensure that the product is not damaged during marketing:
 - After harvest we _____ to reduce damage en route to the packing shed
- Our staff know that this is a living product and needs to be handled gently
- Our product is packed gently but firmly so as to minimize damage during transport



CLEANLINESS We run a clean operation

- We use white buckets
- They are cleaned every time they are used
- We clean them with detergent and clorox
- _____ (name) is responsible for ensuring that the buckets are clean
- Water in field buckets is chlorinated
- Our coolers are cleared and cleaned every _____ weeks
- We wipe all surfaces down with _____ to get rid of fungal spores



COOLING We make sure that our product is cooled quickly and properly

- We know the proper temperature for handling our product
- It is: _____
- There is an accurate thermometer in each coolroom
- It has been calibrated
- It is checked regularly
- _____ (name) is responsible for checking it
- He/She writes down the temperatures and I review them
- Our coolrooms are held at _____
- We cool our product by forced air cooling
- _____ (name) is responsible for ensuring that the precooler is functioning properly
- _____ (name) is responsible for training the packers to pack so that product can cool
- The temperature of the cooled product is checked before it leaves our dock
- We also check the temperature of trucks that carry our product
- We include a recording thermometer with each load that goes out