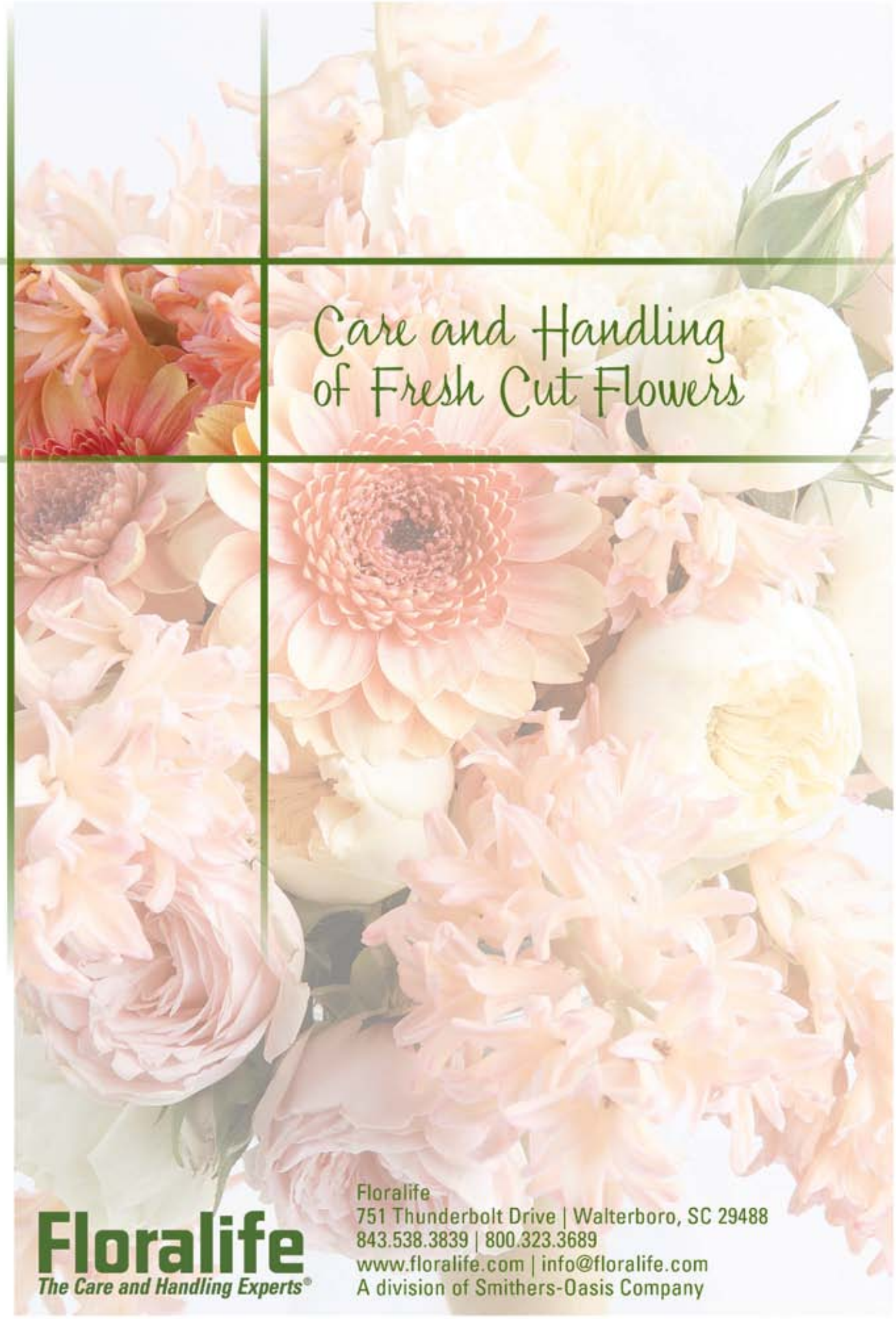

Care and Handling of Fresh Cut Flowers

Floralife
The Care and Handling Experts®

Floralife
751 Thunderbolt Drive | Walterboro, SC 29488
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www.floralife.com | info@floralife.com
A division of Smithers-Oasis Company

Table of Contents

Fresh Ways To Peddle Your Petals.

1. Get 'Em Ready.

Unpack and process your flowers immediately. Begin by removing foliage below water level to prevent rotting. Start with the most expensive and problem flowers.

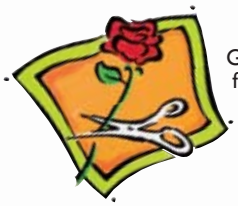
2. Nip It In The Bud.

EthylBloc

Ethylene kills. Flowers exposed to ethylene fail to open or have a wilted appearance. Blocking ethylene should be done as a pretreatment at all levels of the floral industry. Only EthylBloc™ Technology is EPA approved.

The sensitive kind - Ethylene's especially mean to these flowers:

- Roses
- Alstroemeria
- Orchids
- Delphinium/Larkspur
- Lilies
- Carnations
- And many others …



3. Get Cutting.

Give all flowers a fresh cut. It helps ensure hydration.

4. Do The Dip.

Use Floralife's Quick Dip® Instant Hydration Pretreatment to help ensure hydration and a free flowing stem. This can be especially helpful with field grown crops. It's a must for roses and gerbera daisies to help prevent bent necks.

5. Please Feed.

Place flowers in a flower food solution. They need to be nourished for maximum enjoyment. Flower foods generally contain:

- An acid to lower the pH of the solution. Flowers like a pH of 3 - 4.5 depending on water quality
- Ingredients to keep the stems free flowing
- An energy source (sugar) to nourish the flowers

6. Measure Up.

Measure flower food correctly to maximize results. Mark gallon levels on the side of your stock buckets. Take the guesswork and labor out of this step and utilize a Floralife® FloraCare® Dispensing System unit.

7. Keep Cool & Humid.

Place in a 34 – 38°F cooler with 80 - 90% humidity. This is crucial. Maintaining low temperature and high humidity is important to

- reduce water loss and maximize shelf life.

8. Give It Away.

Include a Floralife® Fresh Flower Food packet (10 grams) with each purchase. Helps educate the consumer on care and handling.

9. Soak It Up.

Soak floral foam and shapes in a Floralife® Flower Food solution.

10. Clean It Up.

Clean buckets and coolers with Floralife® D.C.D.® Industrial Cleaner. This helps inhibit bacteria problems. Floralife® D.C.D.® Industrial Cleaner solution also helps keep buckets clean days after treatment.

11. Finishing Touch!

Finish all design work and potted plants with a spray of Floralife Finishing Touch® Spray. It refreshes, hydrates and protects to ensure maximum customer satisfaction.

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Reduce waste by using the proper flower care and fine Floralife® products.

Rev. 3.11

Introduction

The following flower care and handling techniques have been thoroughly investigated and tested at retail level. These techniques have been shown to greatly enhance the customer's satisfaction of all fresh cut flowers, while decreasing waste and dumpage. Some general increases by important flowers are listed below:

'CHARLOTTE' ROSE VASE LIFE

Treatment (Holding Solution)	**Vase Life**
* Underwater Cut/Quick Dip/One of Floralife® Fresh Flower Food Solutions	9.8 Days
Underwater Cut/Water	6.8 Days
	44% increase in vase life over plain water

(experiment #053100)

IMPROVED 'DELPHI' CARNATION VASE LIFE

Treatment	**Vase Life**
* Underwater Cut/Ethylene Inhibitor/One of Floralife® Fresh Flower Food Solutions	21 Days
Underwater Cut/Water	7 Days
	200% increase in Vase Life

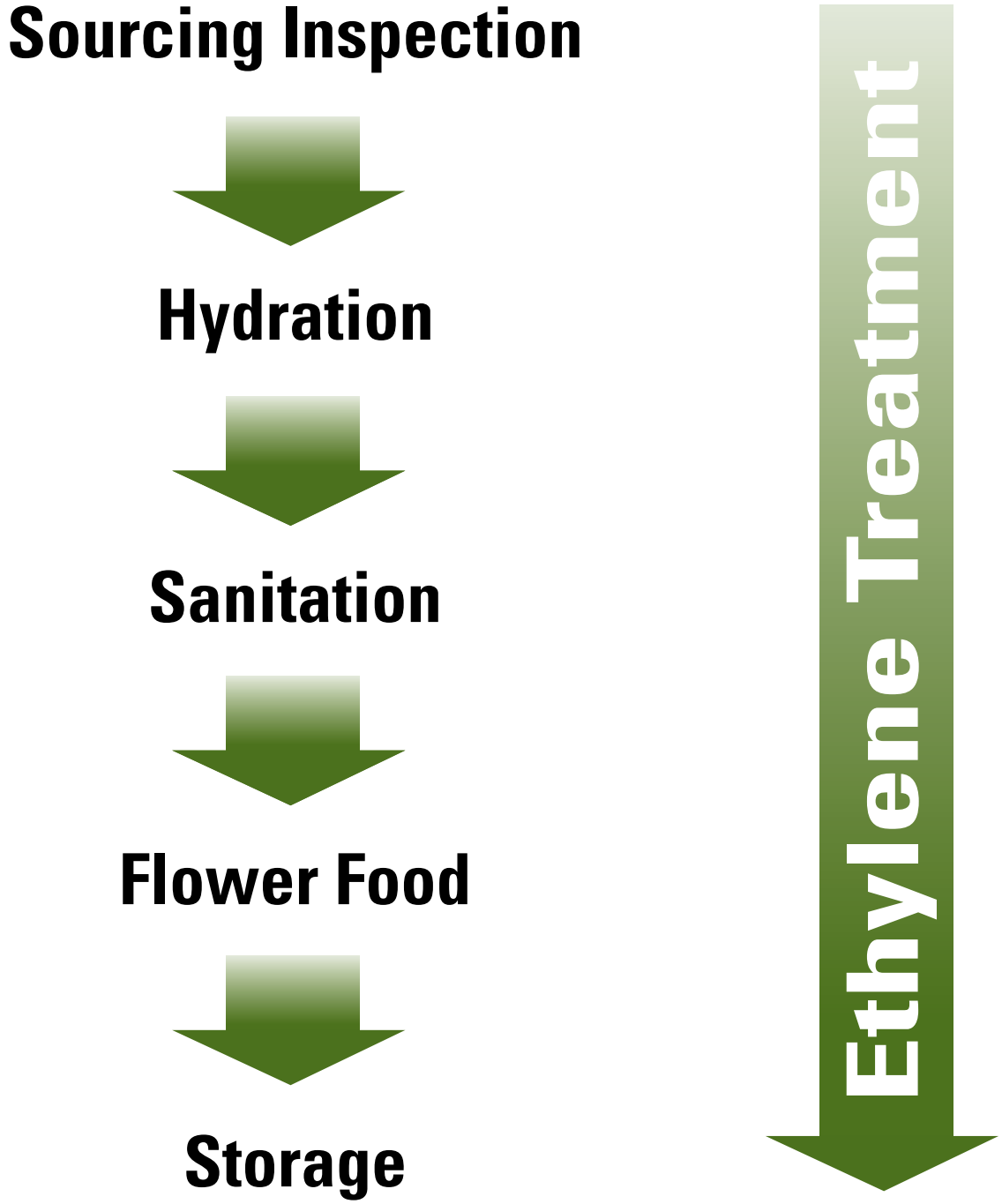
** These treatments will be explained in this manual.*

Also, you will realize a large decrease in dumpage. This translates to direct dollars into your wallet. The following numbers are taken from a before and after study done at a flower distributor:

1. Carnation shrinkage was reduced from 15.1% to 9.5% because they initiated the use of underwater cutting and an ethylene inhibitor product.
2. Consumer complaints for roses were reduced by 21% after the implementation of underwater cutting, Hydraflor and one of Floralife® Fresh Flower Food solutions.
3. Consumer complaints concerning arrangements were reduced by 38.1%.

These are just a few of the benefits from implementing a postharvest care and handling program. The bottom line is that you will be selling **QUALITY** fresh flowers.

Care and Handling Model



Sourcing & Variety Knowledge

SOURCING: Sourcing flowers is very important. It is the first step in ensuring the best quality flowers for your customers. The adage widely used in the computer industry "garbage in garbage out" is a good example of this concept. For example, you may be the most conscientious retailer from a postharvest point of view, but if you start with bad product *(garbage in)* it won't matter what you do. Chances are the flowers will still be of low quality when your customer receives them *(garbage out).* Remember, we are not buying and selling widgets, but flowers, a biologically perishable product. The cheapest is not necessarily the best. Below are some helpful tips:

1. **Do your homework.** Check to make sure your wholesaler is committed to quality. Does your wholesaler use proper care and handling techniques? Do they use good refrigeration, clean buckets, etc.?

2. **Periodically test the flowers in your shop.** Know what you are sending to your customers.
   - $ Ethylene sensitive flowers such as carnations can be tested for an anti-ethylene treatment by using the "Apple Test" *(see reference 1, page 9).*
   - $ Non-ethylene sensitive flowers can be tested in fresh flower food using the In-house Experiment test *(see reference 2, page 14).*

Flower testing should be ongoing, designed around a complete quality control program. Not only will you be controlling your quality, but learning the best varieties at the same time.
(Beware: Don't jump to any major conclusions based on one in-house test.)

3. **Work with one source, if possible.** That eliminates inconsistencies in your quality and makes it easier to track down any possible problems. A solid relationship with your supplier is crucial to your quality efforts.

VARIETY KNOWLEDGE: When you set out to purchase your first car or house, most likely your thoughts weren't, "I want a red car or I want a red house," but, "I want a car made by Ford with four doors, front wheel drive, a CD player and leather interior." "My house should have four bedrooms, three floors, two bathrooms . . . ." All right, you get the point. But, you reply, these are huge purchases requiring large sums of money. Do I need to put that much thought into it? That's right, you do. But, in one year, aren't the flowers you buy as much or more of a huge expenditure than a nice car? However, florists continue to order flowers by color (pink or red), not having any idea which variety of flowers they are or the characteristics of the flowers.

- $ Rose varieties vary greatly in vase life and quality problems like bent-neck susceptibility, ethylene susceptibility, botrytis infection . . . just to name a few.
- $ Carnation varieties vary greatly in ethylene sensitivity. Picking the right variety can cut back on carnation shrinkage.

Hydration of Fresh Flowers

Flowers contain a waterway system (xylem) consisting of capillaries. These capillaries act like straws that carry water and nutrients to the vital areas of the flower. This important process is called "Hydration."

There are two main reasons why the hydration process might be interrupted:

1. These capillaries can become blocked and plugged. This can slow or impede hydration which can result in the acceleration of flower death.
2. Another way the waterway can be impeded is when a flower is placed in a "stressed" environment, causing air blockage. Some examples of these causes are extreme heat, lack of water and other shocks to the flower's system.

The best way to combat these problems is by treating the flowers with a solution like Floralife Quick Dip® Instant Hydration Pretreatment or Floralife® Hydraflor® 100 Hydration Postharvest Treatment that lowers the pH of the water and keeps capillaries free flowing.

Some advantages of using these products are listed below:

1. Prevention of bent-neck and wilting in roses:

'DOLORES' ROSE

Treatment	**Vase Life/Days**
Floralife Quick Dip® Instant Hydration Pretreatment/ Floralife® Special Blend Pure Water® Fresh Flower Food	7.0
Water/Water	1.0

(Experiment #071300)

2. Decreased wilting in cut field crops.

3. Some flowers that would normally be considered dumpage can now be salvaged:

- By lowering the pH of the water, the water uptake through the capillaries will be increased. An increase in uptake will hydrate the flower and eliminate a water stressed flower.
- The addition of chemicals that prevent blockage in the flower will help keep the capillaries free flowing.

4. Water stressed flowers will increase their ethylene production.

Instructions for maximum hydration of all crops, including roses, gerbera daisies, field grown crops, mixed bouquets:

1. Recut all flowers.
Recutting stems eliminates much of the blockage at the bottom of the stem (bacteria, and other blockages). If you chose to recut underwater, be sure the solution is kept sanitary and debris free.

2. Hydrate flowers for one second in Floralife Quick Dip® Instant Hydration Pretreatment.
Place **two** inches of Floralife Quick Dip® Instant Hydration Pretreatment in the bottom of a container. Dip the bottom **two** inches of the cut stem in the solution for **one** second.
Or Hydrate flowers for one half to one hour in Floralife® Hydraflor® 100 Hydration Postharvest Treatment at room temperature or overnight at 34 - 38˚ F).

Floralife
The Care and Handling Experts®

Floralife Quick Dip® Instant Hydration Pretreatment

one-second hydration solution

Floralife Quick Dip® Instant Hydration Pretreatment helps maximize solution uptake and keeps flower stems free flowing.

Features and Benefits

- Ready to use solution, no mixing required.
- Helps reduce flower scrap.
- Ideal for all operations, saves space, time and labor.
- Aids in reducing bent neck and droopy stems.
- A must for roses, gerbera daisies and field grown crops.
- Can be used on all flower varieties including premade cash-and-carry bouquets.

Directions for Use

- Follow the instructions on the product label.
- Remove foliage that will be below the solution level in container.
- Recut flower stems 1 - 3" with a clean knife or cutter.
- Place stems in two inches of Floralife Quick Dip® Instant Hydration Pretreatment for one second.
- Immediately place flowers in a Floralife® Fresh Flower Food solution.
- Discard used solution daily or if it becomes cloudy or contaminated with debris.
- Never pour used solution back into the original bottle.

Read and follow label directions.

Dosage

Liquid

- Do not dilute. Ready-to-use solution.

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Ethylene Sensitive Flowers

When flowers are properly treated with an ethylene action inhibitor you can expect some of the following benefits:

1. **Longer Flower Life.** Ethylene inhibitor products such as EthylBloc™ Technology will greatly increase the vase life of ethylene sensitive flowers. The following experiments performed at Floralife show this fact:

Flower	% Increase over untreated
'First Red' Rose	+303%
'Colorado Gold' Carnation	+103%
'Belladonna' Delphinium	+47%
'Gilboa' Gypsophilia	+38%

2. **Increased Bud Opening.** EthylBloc™ Technology will not only increase the vase life of flowers like alstroemeria and lilies, but will also increase the number of fully open buds from 60% to 93% of total buds.
3. **Prevents Premature Shattering.** EthylBloc™ Technology can prevent the premature shattering of florets in Snapdragons, Delphinium and Agapanthus.

1. Check to see if your flower sources are using an anti-ethylene treatment.
Use the Apple Test (see reference 1, page 19)

If not . . .

2. Treat flowers with an anti-ethylene product, such as EthylBloc™ Technology.
   - Use the Apple Test to insure that the flowers are being treated correctly.

Ethylene Sensitive Flowers

Achillea	Campanula	Doronicum	Lavatera	Rudbeckia
Aconitum	Carnation	Echium	Lily	Saponaria
Agapanthus	Celosia	Eremurus	Limonium	Scabiosa
Alchemilla	Centaurea	Eustoma	Lisianthus	Silene
Allium	Chelone	Freesia	Lysimachia	Snapdragon
Alstroemeria	Consolida	Francoa	Mini Carnation	Solidaster
Anethum	Cymbidium	Gladiolus	Monkshood	Stock
Aquilegia	Crocosmia	Godetia	Orchids (some)	Sweet Pea
Asclepias	Daucus (Queen-Anne s Lace)	Gypsophila	Phlox	Sweet William
Astilbe	Delphinium	Helianthus	Penstemon	Trachelium
Astrantia	Dendrobium	Ixia	Physostegia	Trollius
Bouvardia	Dicentra	Kniphofia	Ranunculus	Veronica
Brodiaea		Larkspur	Rose*	Wax Flower

*Cultivar specific

EthylBloc™ Technology

What is Ethylene?

The USDA attributes about 30% of shrink to ethylene. Ethylene is a gaseous plant hormone that profoundly influences the growth and development of plants. Some deleterious effects of ethylene exposure include leaf yellowing, flower (or petal) drop, irregular opening, and premature death. Any individual flower produces ethylene, but is also susceptible to ethylene produced by many other sources (including produce, propane heaters, gas-powered forklifts, cigarette smoke, other flowers).

Ethylene levels above 100 ppb can do damage to flowers over time periods greater than 24 hours. Levels of about 250 ppb can do damage to flowers in as little as 12 hours.

It is important to understand the small amount that 100ppb represents. If you add 100 drops of food coloring to 26400 gallons of water, the concentration of the food coloring is 100ppb.

What is EthylBloc™ Technology?

EthylBloc™ Technology is a powder that, when mixed with water or a buffer solution, releases a gas to extend the life and usefulness of many fresh cut flowers, potted flowering, bedding, nursery and foliage plants. Crops are treated with this gas in enclosed areas such as rooms, coolers, greenhouses, truck trailers and shipping boxes/containers. **ETHYLBLOC™ TECHNOLOGY IS THE FIRST AND ONLY PATENTED, EPA APPROVED ETHYLENE ACTION INHIBITOR.**

How does EthylBloc™ Technology work?

EthylBloc™ Technology works by inhibiting the negative effects of ethylene and thus prevents or reduces premature flower death, leaf and/or flower fall, and leaf yellowing. The active ingredient in EthylBloc™ Technology binds to the ethylene receptor in plant cells. This prevents binding of harmful ethylene from the plant itself or external sources. It is the binding of ethylene to the receptors that causes damage—NOT the production of ethylene.

Who should use EthylBloc™ Technology?

EthylBloc™ Technology is designed to be used by all levels of the floral and nursery industries including growers, shippers, wholesalers, bouquet manufacturers, mail order houses and retailers (such as florists, garden centers, nurseries and mass market outlets). EthylBloc® Technology is nontoxic and very easy to use with almost no labor costs.

EthylBloc™ Technology Apple Test

For determining EthylBloc™ Technology product effectiveness, Floralife, Inc. developed a simple experiment to test your EthylBloc™ Technology treatment.

Materials Needed:

- Two large, very ripe apples that are at room temperature. An apple is a large producer of ethylene as it ripens.
- Two vases or quart canning jars labeled #1 and #2.
- One tall waste basket, bucket or ice chest that has a good seal and has a known volume.
- One bunch of fresh carnations (larkspur, white stock) that have not been treated with an anti-ethylene product . . . IMPORTANT!

Procedure:

For Vase #1

Place 8 flowers in vase #1 containing a Floralife® fresh flower food. Place vase / flowers in the sealable bucket. Partially close the lid. In a small cup, pour the appropriate amount of buffer (see label directions). Immediately before closing the bucket, add the amount of EthylBloc™ Technology powder for a 4 - 6 hour treatment to the buffer solution. Promptly seal the bucket. Wait 4 - 6 hours before taking the flowers out of the bucket and proceed to vase #2.

For Vase #2

Recut a second group of 8 carnations and place them directly into vase #2, which also contains one of Floralife®'s Flower Food solutions at the recommended concentration. This vase represents the untreated flowers.

Combining Vases #1 and #2

Place the two vases and the two apples carefully under the wastebasket, so that the wastebasket is standing upside down and completely covering the vases and the apple. Allow the flowers (with the apples) to remain covered for 24 hours at room temperature (72˚ F or 22˚ C). After the 24-hour period, remove the two vases containing the flowers and place them on a table to observe their respective vase lives.

Description of Results

IF . . .	THEN . . .
Flowers in all vases die in 5 days or less . . .	**The flowers were bad to begin with OR your EthylBloc™ Technology did not work. Redo the test.**
Flowers in both vases lasted more than 10 days . . .	**The flowers were all properly treated with an anti-ethylene product before you received them. Redo the test.**
Flowers in vase #1 lasted twice as long as vase #2 . . .	**The EthylBloc™ Technology is effective in preventing ethylene damage.**

Note: This test can also be used for potted plants. Substitute the vases of flowers for ethylene-sensitive plants (plants that are in bloom).

If you have any questions and / or comments regarding the test procedures and /or test results you obtain, please call Floralife's Technical Service at 800.323.3689.

Quick Tips for Testing EthylBloc™ Technology

The following is a list of tips to insure the proper use of EthylBloc™ Technology in a test setting.

The Treatment Chamber

1. Be sure the container is sealed on all sides. A plastic tent, refrigerated shipping container, storage cooler or any sealed chamber should be adequate.
2. A fan or some type of device to insure air movement in the chamber is best.
3. Be sure to follow the time/temperature directions, a lower temperature will require a longer treatment time.

Mixing the Powder

1. Be sure to mix the powder in the treatment chamber. Gas is released immediately upon mixing. Mixing the powder outside the chamber will result in an immediate loss of at least 25% efficacy.
2. The powder becomes soluble when the gas is released. If at the end of the treatment there is powder remaining in the mixing container the gas was not completely released (a small residue usually sits on the bottom of the mixing, even if all the gas has been released). If this becomes a problem use a stirrer or heater.

Treatment of Plants

1. If flowers are being tested, the flower must not be treated with Silver Thiosulfate (STS). Most ethylene sensitive flowers (see list in instructions) are treated at grower level with antiethylene chemicals. Thus, special instructions must be given to the grower. If flowers were previously treated with STS, EthylBloc™ Technology will have little effect.
2. An effective bioassay testing the proper treatment can be performed using the apple test—see attached ref.1
3. Symptoms of ethylene damage in the control groups are crop specific and may vary (i.e. carnations "go to sleep", delphiniums drop their flowers).
4. Applying an ethylene source after treatment will produce better results (as in the "real world").
5. For flowers not considered "ethylene sensitive", positive results may not be obvious unless exposed to high levels of ethylene after the EthylBloc treatment.
6. Flowers must not be considered "old". As in any antiethylene chemical the efficacy decreases with older crops.
7. Florets must show color for effective treatment.

Floralife
The Care and Handling Experts®

EthylBloc™ Sachets

anti-ethylene product

Like the transport kit treatment, the EthylBloc™ sachet is designed to protect flowers and plants from ethylene-related damage and loss. The sachet's effectiveness is comparable to the transport kit treatment's, while the smaller-sized sachet offers maximum application flexibility, allowing even the smallest box shipments to be protected. EthylBloc™ sachets can be used at any point in the supply chain–immediately after harvest, just prior to shipment, upon shipment arrival or just prior to sale. The sachet is also patented, and is approved by the U.S. Environmental Protection Agency (EPA).

The EthylBloc™ technology powder contained in the sachet is released when the sachet is dipped in water. Designed for in-box use, the sachet's active ingredient is slowly dissolved and released to ensure that all the plants in the box are thoroughly protected. The sachet's EthylBloc technology leaves no trace or residue after treatment is completed, and is safe for workers.

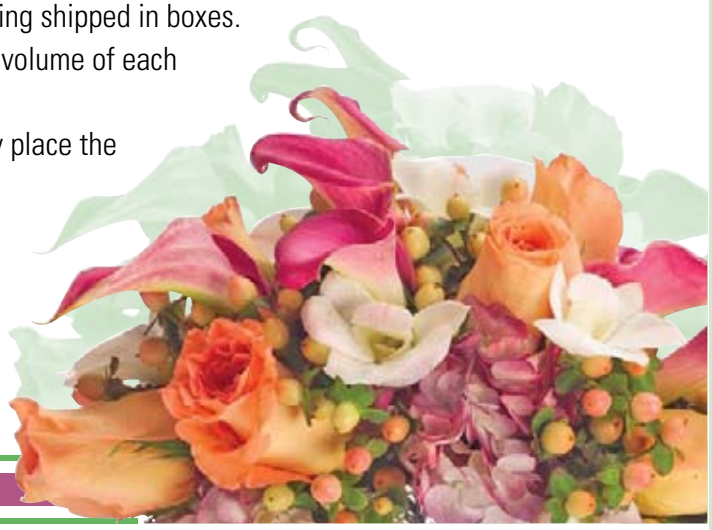
Features and Benefits

- Extends flower life.
- Protects against leaf yellowing, decreases premature flower aging, and reduces flower, bud and leaf drop comparable to the truck kit.
- Ideal for in-box use during shipment.
- Allows smaller-sized shipments to be protected.
- Adds the flexibility of scaleable protection that can be tailored to any box size.
- Can be used at any time – immediately after harvest, just prior to shipment, upon shipment arrival or just prior to sale.
- Easy to use, nontoxic and safe for workers.

Read label instructions.

Directions for Use

- The sachet is designed for treating plants or flowers being shipped in boxes.
- Determine the number of sachets needed based on the volume of each shipping box.
- Dip each sachet in water for 1 - 2 seconds, immediately place the sachet in the box and close the box lid. For maximum effectiveness and safety, ensure the box will not be reopened until treatment is complete.
- Minimum treatment time is four hours.



EthylBloc is a trademark of AgroFresh Inc. Not for use on food or food crops.

EPA Reg. #71297-5-32258

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EthylBloc™ Transport Kits

anti-ethylene product

The first patented, EPA-approved ethylene action inhibitor, in a turnkey kit for truck or storage room use. The negative effects of ethylene are estimated to cause 30 percent of all floriculture crop losses, causing colors to dull, leaves and flowers to drop, and aging to accelerate.

EthylBloc™ technology is an ethylene action inhibitor that works naturally with flowers and plants to keep them fresh, right through to the consumer. EthylBloc™ technology protects against both internal and external sources of ethylene. It is designed to be used by all segments of the floral and nursery industries, including growers, shippers, wholesalers, bouquet makers, mail order houses and retailers. Suppliers and retailers will be delighted to have more logistical flexibility and less product shrink. Consumers will be delighted that their flowers and plants look better and last longer.

Features and Benefits

- Increases flower life up to 300 percent.
- Helps eliminate leaf yellowing.
- Decreases premature flower aging.
- Reduces flower, bud and leaf drop.
- Inhibits flower opening and wilting.
- Helps reduce costly scrap and credits.
- Protects many cut and potted flowers, foliage plants, and bedding flowers and plants.
- Ideal for use during shipment.
- Effective in both refrigerated and room-temperature conditions.
- Easy to use.
- Nontoxic and safe for workers.

Read label instructions.

Directions for Use

The transport kit is designed for larger areas that can be tightly enclosed to prevent leakage, such as a truck compartment or storage room.

- Flowers and/or plants are placed inside the enclosable area.
- There are two transport kit sizes: one kit is designed for volumes up to 2,040 cu. ft. and the other is for volumes up to 3,604 cu. ft.
- Add the packet to the buffering solution, then exit and close the area. For maximum effectiveness and safety, prevent re-entry until treatment is completed.
- Minimum treatment time is four hours.

EPA Reg. #71297-5-32258

Fresh Flower Food

The importance of using a Floralife® Flower Food with fresh cut flowers is well documented. Floralife® Flower Food gives flowers the food they need, decreases bent neck and increases bud opening in many varieties like 'Classy' Roses.

A Floralife® Flower Food is formulated to give these benefits by providing the following ingredients:

- **Sugar -** Providing a carbohydrate, as an energy source to keep the rose alive.
- **Acidifier -** Increasing & maintaining the uptake of water & nutrients by lowering the pH of the water.
- **Stem unpluggers -** Surfactants and a low pH can help eliminate stem plugging.

Fresh cut flowers will only receive these benefits whenflower food is used at the correct concentration. To show how important the proper amount of flower food is to flower life, a test was completed placing 'Royalty' and 'Samantha' roses in different amounts of fresh flower food solutions. Three leading fresh flower food brands were used. The following chart displays the average flower life at each level of fresh flower food use:

Amount of Fresh Flower Food Used	Flower Life in Days
Recommended rate (10 g/l)	8.4
Twice the recommended rate (20 g/l)	7.5
One-Half the recommended rate (5 g/l)	6.5
One-Fourth the recommended rate (2.5 g/l)	5.1
Water	6.4

This data verifies the importance of using the recommended amount of fresh flower food for the best results.

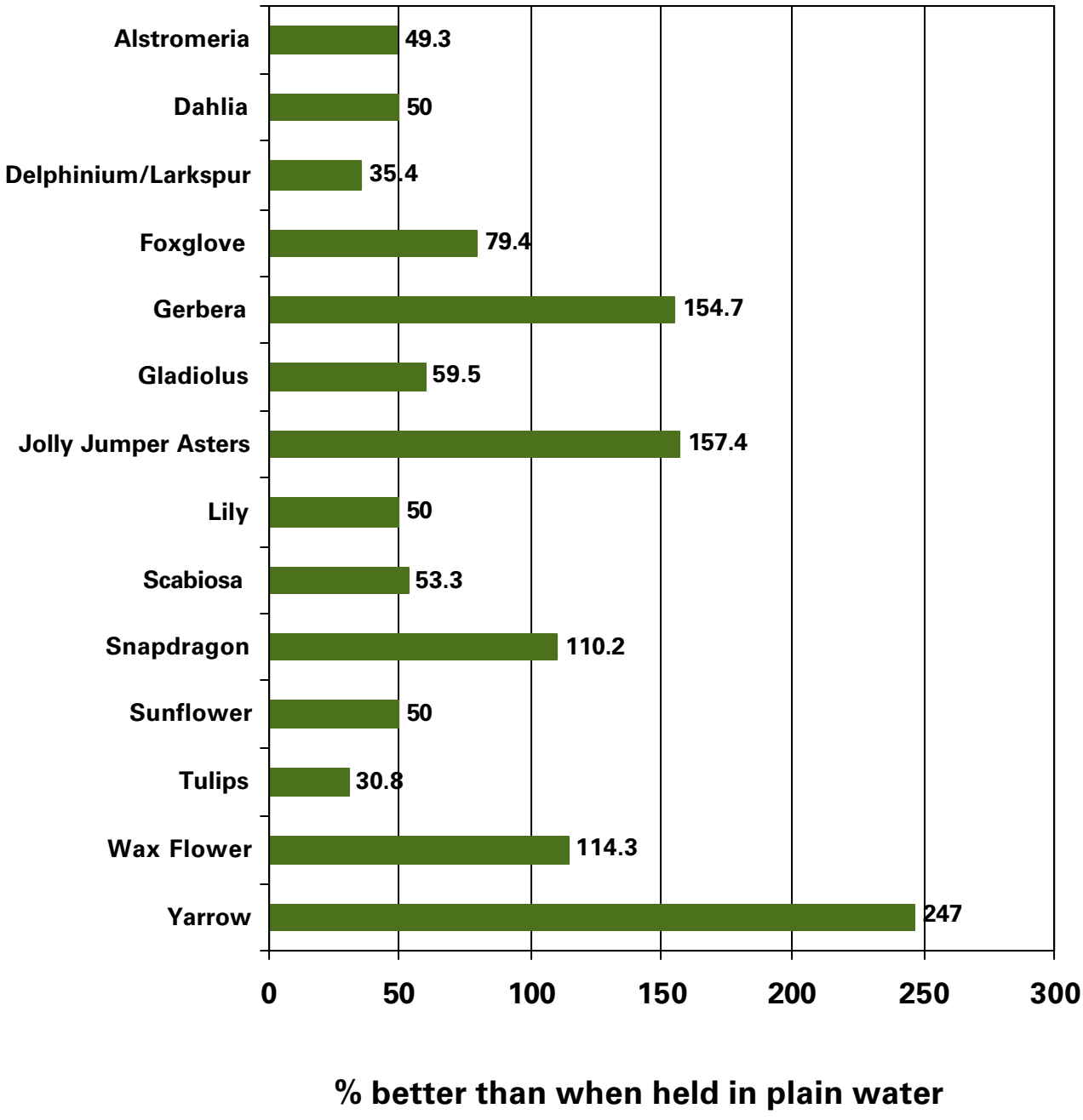
When the Floralife® Flower Food was doubled, the vase life decreased. This is probably due to some toxicity of the components in the fresh flower food at high concentrations.

More startling is the data that shows that using less than the recommended amount is no better than, or even worse than, using plain water. Not using enough fresh flower food will promote stem blockage, resulting in decreased flower life.

*Unfortunately, it has been estimated that over 50% of all fresh flower foods used are at too **low** of a concentration!!*

The easiest way to make certain the correct amount of fresh flower food is used at all times is with an automatic proportioner. Proportioners guarantee each bucket, vase, container, etc. has the right amount of fresh flower food, automatically.

Specialty Cut Flowers Improved by Flower Food



In-house Experiments

9 STEPS TO SUCCESSFUL IMPLEMENTATION

Experiment: Fresh Cut Flower Food Solution vs. Plain Water

1. **Remember** that to make the test data worthwhile you must be consistent throughout the experiment. Setting up the experiment and not looking at it for a week will not only give you useless data, but waste your flowers.
2. **Begin** by getting 30 high quality flowers - poor quality flowers will bring poor results.Be sure the flowers are all the same variety from the same shipment from the same grower. This will eliminate some of the variables in the experiment and make the results more realistic.
3. **Use** 6 identical vases or jars. Label 3 water and 3 fresh flower food. Fill each container with the same amount of water. In the 3 containers labeled fresh flower food, add the recommended amount of fresh flower food (10 grams per quart).
4. **Cut** all flower stems and randomly place the flowers in the containers. Each container will have 5 flowers.
5. **These** jars should all be placed near each other, so all of them are exposed to similar environmental effects. Do not place them near a draft or in direct sunlight.
6. **Data** should be taken by the same person every day. This person will have to decide when the flowers are dead or when they would be discarded by your customers. This person will have to be consistent in his/her decisions.
7. **Once** a flower stem is considered dead, record how long the flower lived in days and discard the flower. For example, if the experiment was set up on Monday and by Friday the flower was dead, then the flower lasted 4 days. **Do not count the set up day.**
8. **After** all the flowers in the jar have died, add the five day lengths together and divide by 5. For example: 4+5+5+5+6 = 25/5 = an average vase life of 5 days for that one jar. Do this for every jar. Next add the three jars' averaged days together from each type of treatment and divide by 3. For example: 5 days +6 days + 7 days / 3 = 6 days. That is the average number of days that the group of flowers lived.
9. **The** two values can now be compared and a realistic figure on the difference between the two treatments can be found. This now means that you know how many days longer on an average, the fresh flower food treated flowers lasted over those kept in water.

** This guide can be used for all of your testing. With more treatments added you can compare more procedures or crops. Remember: quality flowers, controlled environment, and multiple testing help make the results more valuable. Do not make any recommendations or changes with just one test; multiple testing is needed.

Floralife
The Care and Handling Experts®

Floralife Crystal Clear® Flower Food

liquid and powder formulation

This flower food treatment is part of the last stage of the postharvest care and handling prior to the end consumer's purchase. Floralife Crystal Clear® Flower Food encourages the flower to properly start opening, showing vibrant colors, just enough to work with in all OASIS® floral foam design and vase arrangements. It hydrates and nourishes the flowers for maximum enjoyment.

For Retail Floral Shops and End Consumers

Features and Benefits

- Vase and OASIS® floral foam solution for full flower development and optimum vase life.
- Enhances flower colors, keeping them more brilliant.
- The clear solution performs well in all water qualities and is an excellent choice for clear glass vase arrangements.
- Helps keep stems flowing freely, keeping flowers hydrated.

Directions for Use

- Remove foliage from the flower stem area which will be located below the solution level in the flower container.
- Recut flower stems with a clean, sharp knife or cutting tool, taking off 1 inch (3 cm).
- Place flower stems in a clean bucket of Floralife Crystal Clear® Flower Food for store floral displays or to keep in the cooler until time for arranging. Add additional solution as needed.
- After treatment with Floralife Crystal Clear® Flower Food, make sure a packet of flower food is provided to customers with their floral purchase to aid in the beauty and freshness of their flowers. Flower packets are available for use to mix with 1 pint (0.5 L) and 1 quart (1 L) volumes of water.

Read and follow label directions.

Dosage

- Powder formula: Dissolve 10 grams Floralife Crystal Clear® Flower Food per one liter of water. Available in 5, 10 , 20, 30 and 100 lb. containers and a 30 quart tub.
- Liquid formula: Mix 0.5 ounces (16 ml) to 1 quart (1 liter) water. Available in 1, 2.5, 5, 15, 30, 55, and 220 gallon containers and an 8 oz. bottle.

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Floralife
The Care and Handling Experts®

Floralife® Flower Food

liquid and powder formulation

Floralife® Fresh Flower Food provides the nutrition flowers need for maximum consumer enjoyment. This product is effective in all water qualities and with any variety of fresh flowers.

For Retail Floral Shops and End Consumers

Features and Benefits

- Vase and OASIS® floral foam solution for full flower development and optimum vase life.
- Enhances flower colors, keeping them more brilliant.
- This solution performs well in all water qualities and is an excellent choice for clear glass vase arrangements.
- Helps keep stems flowing freely, keeping flowers hydrated.

Directions for Use

- Remove foliage from the flower stem area which will be located below the solution level in the flower container.
- Recut flower stems with a clean, sharp knife or cutting tool, taking off 1 inch.
- Place flower stems in a clean bucket of Floralife® Flower Food for store floral displays or to keep in the cooler until time for arranging. Add additional solution as needed.
- After treatment with Floralife® Flower Food, make sure a packet of flower food is provided to customers with their floral purchase to aid in the beauty and freshness of their flowers. Flower packets are available for use to mix with 1 pint and 1 quart volumes of water.

Read and follow label directions.

Dosage

- Dissolve 10 grams Floralife® Flower Food per one quart of water.

Available in 5, 10, 20, 30, 40, 50, and 100 lb. powder containers and a 1 gallon liquid container.

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The Floralife® FloraCare® Dispensing System Maintenance

What: Floralife® FloraCare® Dispensing System units are water powered systems designed to properly measure and mix Floralife® Flower Food solutions. These systems are easily installed in your shop or warehouse and quickly pay for themselves in terms of time and accuracy. Research shows that improperly measured flower food is worse that not using flower food at all.

Who: Floralife® FloraCare® Dispensing Systems are designed for use by professional wholesale florists, retail florists and growers.

How: These systems can easily be mounted on a wall. A fresh water source is connected to one end of the system. The system then draws concentrated solution from a Floralife bucket or drum, mixes it with the correct amount of water, and then dispenses it through a hose and wand.

Floralife® FloraCare® Settings

Floralife Crystal Clear® Flower Food	1.6%	Floralife® D.C.D.® Cleaner	0.8%
Floralife® Flower Food	1.0%	Floralife® Hydraflor® 100 Instant Hydration Pretreatment	0.5%
Floralife Clear Professional® Flower Food	1.0%		
Floralife Professional® Flower Food	1.0%		

Frequently Asked Questions:

Q: How often do I need to clean my dispensing system?
A: Monthly.

Q: Why isn't any liquid being drawn up from the Floralife® Flower Food concentrate bucket?
A: Check the following:

- The Floralife® Flower Food concentrate bucket still has solution in it
- The tube is not sealed to the bottom of the unit (has an air leak)
- The clear tube could be stretched at the top or not pushed up all the way
- The weight at the bottom of the tube is missing
- The screen on the bottom of the tube is clogged
- The tube is kinked or has a hole

Q: The Concentrate solution bucket is filling up with water
A: The check valve in the bottom of the unit is not working: clean or replace.

Q: Only a small stream of water is coming through
A: Check the following:

- Check your water pressure
- See if the system is clogged due to improper care and cleaning

The Floralife® Dispensing System

The Floralife® FloraCare® Dispensing System should be used to accurately dose Floralife® Flower Foods.

1. If Floralife Crystal Clear® Flower Food is being used, the injection unit should be set at 1.6%. (or 4 strokes per one gallon of water if using the dispensing hand pump). If your dispensing system needs to be adjusted call Floralife at (800) 323-3689 or (843) 538-3839 for instructions.

2. If a Floralife® Flower Food powder is being used the dosing should be one scoop per gallon (mixing by hand) or the injection unit should be set at 3.3%. (refer to * below)

3. If Floralife Professional® Flower Food or Floralife Clear Professional® Flower Food is being used, the dosing should be at 40 ml per gallon (mixing by hand) or the injection unit should be set at 1%.

*** To make proper fresh flower food concentrate solution for the Dosatron Injection System (this is only for powders)**

a. When the fresh flower food tank is nearly empty or every three weeks, whichever comes first, dump the remaining solution down the drain.
b. Remove the tube and filter. Clean the tank with Floralife® D.C.D.® Cleaner.
c. To refill the tank after cleaning, add the proper amount of fresh flower food FIRST. Then add the amount of water indicated and stir.

Tank Size Gallons	Fresh Flower Food Added (lb)	Water Added To the Gallon Mark	Total Gallons Use Solution
5	10	4	120
30	50	20	660
60	100	40	1320

d. Put the suction tube back into the tank, making sure the filter is submerged into the fresh flower food solution.

Be sure to clean your dispensing system regularly.

Floralife
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Made in the U.S.A.
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Fax: 800.471.4248 • E-mail: info@floralife.com
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Storage

Store fresh flowers in a 34 - 36˚ F cooler with 80 - 90% relative humidity.

Temperature is one of the most important factors influencing the vase life of flowers. By lowering the temperature, the flower's metabolism (respiration and transpiration) is greatly reduced. The result is a decrease in the natural chemical reactions that cause flower senescence (death). Ethylene action on flowers is greatly inhibited at lower temperatures (while in the cooler only). This slowing of metabolism resembles hibernation in some mammals. An example of the importance of temperature is shown in the chart below.

Relationship of Temperature to the Deterioration Rate of Many Flower Types

Temperature ˚ F	Relative Deterioration Rate
32	1 - Reference Point
37	2 - 3
41	3 - 4
50	4 - 6
68	8 - 10

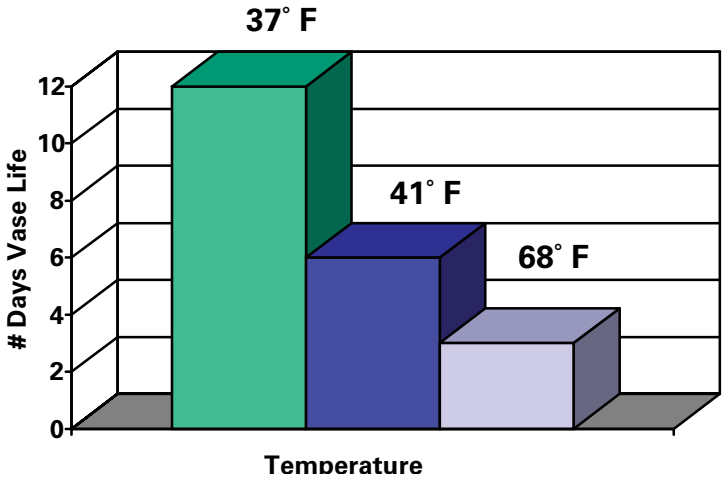
For example, at 41˚ F a flower will deteriorate three-four times faster than a flower kept at 32˚ F.

Tropical flowers should be stored at 55 - 60˚ F or room temperature.

Relative Humidity:

Relative Humidity is also a very important storage variable, especially if the temperature is above 32 - 34˚ F. The proper amount of water in the air will inhibit the fresh cut flower from the process of transpiration. When a flower goes through the process of transpiration, it loses water causing water stress. Water stress can cause many undesirable effects like bent neck and premature wilting. The relative humidity should be kept at 80 - 90%. If the relative humidity gets too high *(as approaches 100%)* condensation will occur. Condensation on flowers can aggravate such problems as botrytis.

The Effect of Temperature on Vase Life



Sanitation

Cleanliness is usually underestimated in terms of its importance concerning postharvest vase life. If we are starting with a dirty and microbe infested bucket, cooler or anything else that might come in contact with the flowers, all other attempts at postharvest care will be less effective *(fresh flower food, hydration etc.).* For example, if a flower is properly treated and then put into a dirty bucket, the flower may prematurely die from the microbes, regardless of the treatment. So make sure that everything that may come in contact with the flower is cleaned with Floralife® D.C.D.® Cleaner, including buckets, cutters, coolers, benches, etc. Floralife® D.C.D.® Cleaner is an approved cleaner for the horticulture industry.

Research has shown that buckets left dirty for four days can reduce the vase life of a rose by up to 20%.

Rose Vase Life in a Clean Bucket vs. a Dirty Bucket

Bucket Status	Vase Life *(relative days)*
Clean	9.0
Dirty/Used Four Days Old	7.5

Why use Floralife® D.C.D.® Cleaner? The product is specifically designed to kill microbes over a long period of time. If you clean your buckets today, tomorrow the buckets will still be protected. Many use a chlorine bleach to clean their buckets. Chlorine is an extremely effective biocide, but does not have any residual effect, leaving no protection much past a day (see chart below).

Relative Effectiveness of Clorox vs. Horticultural Detergent Measured After Three Weeks

Bucket Treatment	Relative Bacterial Counts	Relative Fungal Counts
Floralife® D.C.D.® Cleaner	1	1
Clorox®	389	38
Water	889	560

(Independent study performed at Northview Pacific Laboratories; Berkeley, CA.)

For every one bacteria found in the bucket cleaned with Floralife® D.C.D.® Cleaner, there were 389 bacteria found in the bucket cleaned with Clorox®.

Floralife
The Care and Handling Experts®

Floralife® D.C.D.® Industrial Cleaner

liquid concentrated disinfectant

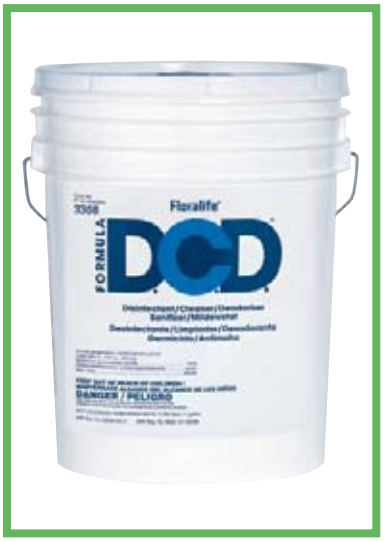
Use Floralife® D.C.D.® Cleaner solution to disinfect, clean, and deodorize flower buckets, vases, containers, tools, work surfaces, coolers, shipping and packing areas. Benefit from the rewards of fewer bacteria affecting the wellness of your flowers for sale. Flower wellness which brings customer satisfaction and repeat flower sales to your business.

For Growers, Wholesalers, Bouquet Makers, and Florist Professionals

Use as a general purpose, long lasting, antimicrobial detergent for efficient cleaning and action against certain bacteria and fungus. Clean to reduce the plugging up of flower stems which reduces water uptake. Improve flower life as a result of a cleaner environment with less bacteria around which can produce ethylene gas.

Features and Benefits

- Disinfects and reduces bacterial growth which harms flower stem vase life.
- Multiple use areas – coolers, tools, containers, work surfaces, and shipping areas.
- Lasts longer – it doesn't quickly break down or evaporate like bleach. Creates a protective coating that keeps on working over many days.
- Pleasant citrus scent, not overpowering odor like chlorine bleach.
- Concentrated product.
- No rinsing – no need to rinse out buckets with water after cleaning.
- Saves on cleaning time, as the combination of effective ingredients is longer lasting than bleach.



Read and follow label directions.

Directions for Use

- Dosing System: 1:128. Dissolve 1 ounce (30 ml) per one gallon of water.
- Dissolve one capful (2 tsps.) of liquid concentrate in 1 quart tepid water.
- Scrub items with the solution and let soak for 5 to 10 minutes.
- It is not necessary to rinse with water. The coating will be effective in keeping the item which is scrubbed clean.
- Store product away from food items.

Available in 1, 2.5, 5, and 30 U.S. gallon liquid containers.

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Floralife
The Care and Handling Experts®

Floralife® Finishing Touch® Spray

hydration mist

Maximize the natural freshness of fresh cut flower bouquets, floral designs, and evergreens. Floralife Finishing Touch® Spray refreshes, hydrates, and protects with a simple and fast last step measure of insurance before any arrangement goes out a florist's door. A simple fine mist spray is all it takes to maximize customer satisfaction and extend the enjoyment of receiving flowers.

For Wholesalers, Florists, and Growers

Features and Benefits

- Provides ingredients vital to keeping flowers fresh and the color of petals and leaves vibrant.
- Ideal for use on fresh flower vase designs, everyday floral and wedding arrangements, corsages, boutonnieres, foliage and potted plants.
- Safe to use on all flower types.
- Prevents premature petal drop, dehydration, wilting and browning.
- Dependent upon cultivar, a simple spray mist aids in extending flower life an additional 1 to 5 days.

Read and follow label directions.

Directions for Use

- Shake product spray bottle well before and during use. Do not dilute the ready to use product.
- Spray a fine and even mist application from the trigger nozzle onto fresh cut flowers, foliage, evergreens, or potted plants for desired effect.
- Allow the Floralife Finishing Touch® Spray to dry before delivery of the arrangement or storage.

Available in a 32 oz. spray bottle and a 1 gallon container.

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General Care and Handling of Potted and Green Plants

When plants are received:

1 Unpack shipments as soon as possible.
2. Remove packaging sleeves.
3. Record and report damage (including extreme temperatures and physical damage.)

Watering:

Improper watering is the number one problem with plants at the retail/supermarket level!

1. Water all plants after unpacking.
2. Water plants until water is draining out of the holes on the bottom of the pot.
3. Do not leave plants sitting in water for extended periods of time.
4. Check soil daily:
   Push your finger 1 inch into soil. If the soil feels moist, the plant does not need watering. If the soil feels dry, then watering is required. Watering requirements vary by variety of plant.
5. To complete the hydration process, spray plants with Floralife Finishing Touch® Spray.

Fertilizer:

Most potted plants arrive to stores over-fertilized and need to be watered upon arrival (this will leach the soil). There is no need to fertilize most plants at the store level. A general purpose fertilizer can be used by consumers.

Storage:

Temperature:

In general, potted plants should not be stored at 34 - 38˚F at the store level (there are exceptions). Storage of plants varies between crops, so when in doubt, leave plants at room temperature (68 - 70˚ F). Check with your plant source for recommendations concerning specific crops.

Light:

Display plants under a combination of 80% fluorescent: 20% incandescent light (wattage ratio). This brings out the true colors of the plants. Consumer's light levels to maintain the size and fullness of plants vary between varieties. Check specific requirements for each plant.

Know Your Water Quality . . . Your Flowers are Depending on You!

Unsure of your water quality? The labs at Floralife can clear things up for you!

We analyze four parameters when you send in a water sample:

- pH
- TDS (total dissolved solids)
- Alkalinity
- Hardness

pH

The pH is simply a measure of how acidic or basic your water is on a scale of 0 to 14. A pH of less than 7 is acidic; 7 is neutral; and greater than 7 is basic. The pH alone doesn't reveal much about water quality, but how easily the pH changes (buffering capacity) is important. Typically, water alone will have a pH range of 5 to 8. Combined with flower food, the usual pH will be between 3 and 5, or slightly acidic. A slightly acidic solution increases water uptake and prevents bent neck. Fresh cut flowers benefit from a pH in the range of 3-4.5.

What does the pH value tell you? A change in 1 pH unit is a tenfold change in the acidity. For example, a pH of 6 is 10 times more acidic than a pH of 7.

TDS

The TDS is a measure of all the dissolved solids in the water (measured in parts per million or ppm). The level of TDS is important. High levels of certain salts can potentially reduce flower life. The mixture of dissolved solids is also important. A mixture of moderate levels of calcium, magnesium, potassium, and sulfates can be beneficial, while a mixture of high levels of iron, fluoride, and sodium can be harmful. To explore the TDS further, alkalinity and hardness are analyzed. These properties can be considered a part of the TDS.

Alkalinity

The alkalinity level of your water describes its buffering capacity (ability to resist pH changes). A higher alkalinity means that the water contains a higher amount of carbonates, bicarbonates, and hydroxides, which resist the lowering of the pH (and potentially reducing the effectiveness of flower food). When recommending water specific flower foods, water with alkalinity less than 60 ppm is considered pure (recommending Floralife Special Blend PURE Water® Flower Food); from 60 ppm to 180 ppm is considered medium (recommending Floralife® Flower Food); and greater than 180 ppm is considered hard (recommending Floralife Special Blend HARD Water® Flower Food). Alkalinity is the most important factor when considering how cut flowers will react to your water.

Occasionally, water will have such high alkalinity that no flower food is able to bring the pH down into the acceptable range. In these extreme cases (usually with alkalinity much greater than 300 ppm), a deionizing or reverse osmosis system is recommended. These systems remove all of the ions from the water; beneficial ions are added back to the water by using flower food.

Hardness

The level of hardness refers to the amount of calcium and magnesium in your water (measured in ppm). Typically, these levels are not a good indicator of how cut flowers will react in your water. In general, most highly alkaline waters also have high hardness levels. If you have hard water, it is not recommended that you install a water softener. A softener replaces calcium and magnesium ions with sodium ions, which tend to be harmful for flowers at high levels.

Together, pH, TDS, alkalinity, and hardness can tell you how your flowers will react to your specific water type.

Floralife labs will test your water free of charge. Interested in sending in a sample for testing?

1. Rinse out a bottle (at least 1 pint) several times with your tap water.
2. Include your name, address (where report should be mailed), and phone number (in case questions arise).
3. Mail to Floralife, Attn: Laboratory, 751 Thunderbolt Drive, Walterboro, SC, 29488.