

# handle with care

By Bruce Wright

## Botrytis kills—but simple precautions can help protect against it.

WE'VE ALL SEEN IT: petals with brown flecks, spots, or larger areas that eventually cause the entire blossom to shrivel and die. We may or may not witness the stage at which *Botrytis cinerea*, or gray mold, turns into a fuzzy mass of spore-bearing structures that, close up, look like tiny grape clusters (as in the microscopic photo on the opposite page).

Botrytis is considered the number-one disease that threatens floral crops (and many others as well: at some point you've probably had to throw away some grapes or strawberries that were infected with botrytis). In cut flowers, it mainly attacks the tender tissues of the petals and buds, but it can also infect leaves and stems in a flower that is old or damaged.

A fungal disease that is carried by airborne spores, botrytis thrives in warm, overly moist or humid conditions where there is insufficient air circulation. It sometimes shows up in

boxes or bunches of flowers as they are received and processed, but it also may not become evident until later, in your cooler or in the customer's home.

For florists, botrytis means ugly flowers, unhappy customers, and lower profits. What do we do about that?

Because the airborne spores of botrytis are always present, you can't really get rid of botrytis altogether. "There is no silver bullet," says George Staby on the Chain of Life website (an invaluable resource for questions related to care and handling, at [www.chainoflife.com](http://www.chainoflife.com)). But there are a number of ways for retailers to reduce the damage associated with botrytis.

### Purchase botrytis-resistant flowers.

Some flowers and foliages are more prone to botrytis infection than others. Of course, you're not going to give up on roses, for example, just

because they can get botrytis. But some rose varieties are highly vulnerable, others practically impervious.

**Purchase from suppliers who take the proper steps to avoid botrytis.** For growers, that includes choosing their hybrids well. Savvy, conscientious growers also keep their plants dry: that is, they are likely to water in the mornings and vent humidity from greenhouses at sunset so that excess moisture can evaporate rather than condensing on leaves and flowers. Adequate levels of silicon in the soil provide another measure against botrytis infection. Conversely, overuse of ammonium nitrate fertilizers can result in so much lush, new, tender, succulent growth that plants become more vulnerable to botrytis.

Growers do have effective fungicides available to help combat botrytis. However, indiscriminate spraying with fungicides can be counterproductive (as well as expensive, raising the cost of your flowers). Although botrytis is widespread, it is nonetheless probably overdiagnosed, according to George Staby: people often believe that symptoms are owing to botrytis that are actually caused by something else. Botrytis identification test kits are easily available.

Postharvest, precooling flowers to the proper low temperatures as soon as possible has a dramatic effect in reducing botrytis, along with all the other benefits it brings.

**Ask about shipping conditions, too.** If temperatures are allowed to fluctuate during shipping, the result is condensation of moisture within the shipping boxes—a flashpoint for the growth of botrytis. By contrast, maintaining the "cold chain" as flowers are shipped keeps botrytis at a minimum.

In 2008, Floralife® introduced a product called TransportCARE™ Paper that helps to reduce the spread of botrytis during shipping. TransportCARE™ works by slowly releasing chlorine dioxide, a gas that acts on botrytis in the way that chlorine bleach acts on a variety



Here is a partial list of flowers susceptible to botrytis infection. Use extra care in handling these. In general, flowers and varieties with very soft, tender tissues are especially at risk for infection, while waxy flowers from tropical, humid climates, like anthuriums, stephanotis, and tuberose, are more resistant. But any flower can be infected if sufficiently stressed.

agapanthus	larkspur
anemones	liatris
asters	lilies (some varieties)
astilbe	limonium
baby's breath	ranunculus
bells of Ireland	roses
carnations	snapdragons
chrysanthemums	statice
celosia	stock
delphinium	sunflowers
gerberas	
hydrangea	



'Freedom' roses, control group with signs of botrytis



'Freedom' roses treated with Floralife® TransportCARE™ Paper

*Botrytis is often called "gray mold." It is indeed a fungus that can manifest as a gray, dense fuzz, found on the inside of bunches of flowers when they are first unpacked. More commonly, however, florists realize their flowers are infected with botrytis when the petals develop patches of browning that quickly turn into crisp dead tissue, as seen in the photo at left above. This photo shows the "control" group for an experiment with a product called Floralife® TransportCARE™ Paper, introduced about four years ago, that significantly reduces the spread of botrytis infection during the shipment of cut flowers in boxes. The paper is impregnated with compounds that release chlorine dioxide gas when subjected to humidity; chlorine dioxide is an oxidizing agent known to be effective in discouraging the growth of botrytis. The roses in the photo at right above show the benefits of treatment with the product, seven days after they were taken out of their shipping boxes. At the retail level, other simple measures can help keep botrytis at bay.*

of microbes, without producing any byproducts that could be unsafe for humans or the environment. The paper is used to wrap the cut flowers or foliages, or to line the boxes, and the gas is released in response to water or humidity, so that the very condition that would tend to encourage the growth of botrytis triggers the antidote. Studies have found that the product was effective in reducing the number of new, developing botrytis colonies by 85%. It should be noted that TransportCARE™ probably will not eliminate an existing botrytis infection, and its effectiveness is time-limited for transport or storage periods of a week or less.

**In the shop, keep flowers dry** above the water level in the bucket or vase. Mix processing solutions with cold water to avoid condensation developing inside sleeves and wraps. Avoid adding floral solution to a bucket or vase in a way that splashes the flowers. Never spritz flowers as they go into the cooler. Avoid temperature fluctuations that would promote condensation on the flowers.

**Keep cooler floors dry.** "Yes, you want high relative humidity in your cooler (85-99%)," says Gay Smith, technical consulting manager for Chrysal Americas. "But you get it

from the solution in your buckets," which should of course be spanking clean and sanitized. "If you've got water on the floor, leaves and green bits become germination factories for botrytis spores. It's also possible to walk spores into the cooler from other areas of the store on the bottom of your shoes. Puddles on the floor provide the moisture needed and your shoes introduce the spores, creating a perfect storm for infection."

### Leave breathing room in your buckets.

Botrytis spores float from petal to petal, looking for the moisture needed to germinate. They spread more easily when flowers are crammed together. Conversely, when you leave enough space between the flowers, it also makes it easier for excess moisture to evaporate.

**Avoid mechanical damage to flowers.** As noted earlier, damaged flowers—broken laterals, bruised petals, torn leaves—are more vulnerable to botrytis infection. Mechanical damage also causes flowers to produce more ethylene, so you have two good reasons to avoid it. Remove damaged stems altogether, or carefully trim away damaged parts with a clean, sharp knife.

If you see guard petals on a rose that ap-

pear to be infected with botrytis, should you remove them? Yes—but don't assume that you have thereby rid the rose of all infection. Where you go from there depends on the appearance of the flower and the use to which it will be put.

**Work clean.** By observing the sanitation protocols that help prevent the growth of stem-plugging bacteria (see this column in the April 2011 issue of *Flowers&*), you will also be discouraging the spread of botrytis. General cleanliness counts, too. Sweep your floors and clean your work counters frequently. "People think once they've swept up and put everything in the trash can, they're OK," notes Gay Smith, "but you also need to keep the can covered and empty it often. Remember that botrytis produces airborne spores, floating around. I've never heard of anyone doing this, but it would make sense, once a month at least, to dip your broom in your bucket cleaning solution to kill off some of those airborne spores."

There's no "silver bullet" for botrytis, but good shop practices will reduce the conditions that encourage botrytis to grow. 🌿