Special Research Report #429: Postproduction

Ethylene Sensitivity of Flowering Potted Plants

T.A. Nell, Professor and Chairman, and R.T. Leonard, Scientific Research Manager
Department of Environmental Horticulture, University of Florida, Gainesville, FL

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

A major problem influencing the longevity of flowering potted plants is exposure to ethylene. Exposure can occur during transport, storage, and under conditions at retail. Ethylene can cause flowers to wilt, shatter, fail to open or abscise, and cause buds and leaves to yellow or drop. One goal of this project was designed to test the role that genetics (variety) has on ethylene sensitivity of several flowering potted plant species. Varieties that are insensitive or less sensitive to short-term ethylene exposure would provide an easy and efficient way to eliminate ethylene damage. A second goal was to test the effects of EthylBloc® (1-MCP) in preventing ethylene injury and determined the duration of the effects.

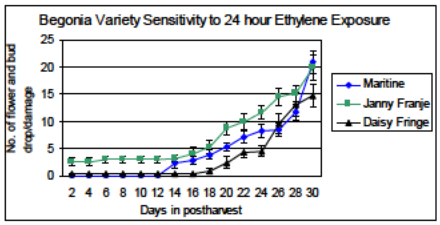
METHODS

Plants were treated at the marketable stage with 1 ppm ethylene for 24, 48 or 72 hours. Plants were placed in a sealed glass chamber using a continuous flow of ethylene or air (control). The temperature during exposure was 70±2˚F at a light level of 10 µmol $s^{-1}m^{-2}$ from cool white fluorescent lights for 12 hours/day. Subsequently, plants were maintained at (70±2˚F and 10 µmol $s^{-1}m^{-2}$ for 12 hrs/day) for postharvest evaluations.

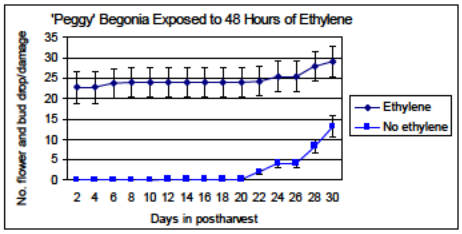
RESULTS

Elatior Begonia

Begonia varieties 'Maritine' and 'Daisy Fringe' were very tolerant to short-term (24 hr) ethylene exposure, while 'Janny Frange' produced limited responses.



Exposure for 48 hours of 1 ppm ethylene caused 30 to 40% of the flowers to drop. Once removed from the ethylene source, the flowers ceased dropping and buds continued to develop and open under the postharvest conditions.



EthylBloc® was very effective in protecting plants from ethylene. When exposed to 1 ppm ethylene for 24 hours after treatment. the protection lasted from 7-10 days. When plants were exposed to continuous 1 ppm ethylene, EthylBloc® was effective for 4 days.

Photo 1. Elatior Begonia 'Carnival' treated with EthylBloc® and then exposed to 1 ppm ethylene for 24 hrs. Duration (from left to right) 4, 7, 10 and 13 days later.

Calendiva

Eight varieties of Calendiva were tested for ethylene sensitivity. All of them were extremely sensitive to short-term (24 hour) exposure. The only variety difference was when the damage occurred. For the variety colors Orange, Purple, Pink/Purple,

Dark Pink, Charm Red, and Red the floret petals folded inward and closed within 2-3 hours after removal from ethylene. For the White and White with Pink varieties, the damage was delayed for 5-7 days and the flowers died prematurely.

Photo 2. Ethylene response was immediate for Dark Pink calendiva (right), while it took several days for symptoms on White with Pink variety (left).

Ornamental Pepper

Ornamental Pepper was found to be sensitive to ethylene, but the extent of the response depended on the length of the exposure time. Flowers dropped after 24 hours of exposure, while the fruit and leaves were unaffected.

Photo 3. Short-term (24 hrs) ethylene exposure induced only flower drop (right) on Ornamental Pepper.

No ethylene Ethylene

With exposure times of 48 and 72 hours, flower, leaf and fruit drop occurred. The longer the exposure time the more extensive the damage.

Photo 4. Exposure to ethylene for 48 hours induced flower, leaf and fruit drop on Ornamental Pepper.

Potted Roses

Potted Parade® rose varieties differed in their response to 1 ppm ethylene for 24 hours. Varieties differed in their reaction time, the plant part affected (buds verses flowers) and the amount of damage observed.

Table 1. Response of potted roses to 24 hours of 1 ppm ethylene.

Variety	Sensitivity
Bianca	Flowers
Charming	Non-sensitive
Cherry	Buds
Claudia	Flowers/Buds
Denise	Flowers/Buds
Fiesta	Non-sensitive
Julie	Flowers
Lady	Non-sensitive
Mistral	Buds
Monica	Flowers/Buds
New Heidi	Buds
Nicoline	Buds
Sterling	Flowers/Buds

For most varieties, it took several days before the effects of ethylene were evident. Short lasting varieties were found to be sensitive to ethylene while most long lasting varieties were tolerant. All rose varieties were sensitive to longer exposure times.

CONCLUSIONS

The reaction to ethylene depends on species, variety, concentration, duration of exposure and temperature during exposure. In all of the crops evaluated, EthylBloc® provided excellent protection from ethylene injury but the effectiveness decreased over time.

Minimize ethylene injury by:

* Avoiding ethylene sources
* Treating with EthylBloc®
* Shipped cool (32-35°F)
* Avoid all plant stresses
* Keep shipping time to a minimum.

IMPACT TO THE INDUSTRY

Identifying varieties that are insensitive or less sensitive to short-term ethylene exposure provides consumers with high quality, long lasting plants. Also, it provides breeders with information to consider in their breeding programs.

For Additional Information Contact:
tnell@mail.ifas.ufl.edu