

**Using Pageant Intrinsic Fungicide
to Improve Cold Tolerance
by Paul Pilon**



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This is the second of a series of articles that covers using Pageant Intrinsic fungicide for plant health purposes. This feature covers cold tolerance research with Pageant and how growers may be able to utilize Pageant Intrinsic fungicide for this benefit.

Freeze Events

In 2009 and 2010, I performed a couple of studies looking at different application rates and intervals of applying Pageant to various annuals prior to exposing the plants to a cold event. An upright freezer was used to remove the field heat and to provide the freeze event.

The plants were subjected to four hours with temperatures of 34 to 38° F to remove the field heat. Then the plants were exposed to four hours of temperatures below freezing (28 to 32° F). This procedure was intended to simulate a frost event.

In most instances, the amount of cold injury observed between Pageant treated plants and untreated plants were similar and the benefits of using Pageant to improve cold tolerance appeared inconclusive. However, the main reason for the inconclusive results was the use of an upright freezer to deliver the freeze event. The temperature of the air coming out of the air inlet inside the freezer was 15 to 20 degrees below freezing (32° F) and the temperatures along the back wall of the freezer were significantly colder than in other areas of the freezer. Therefore, injury was observed on all plant varieties and treatments due to where they were physically located inside the freezer during the cold event.

Although, cold injury was observed on all of the varieties tested, an interesting observation was made following the cold event. In most instances, plants treated with Pageant Intrinsic fungicide prior to the freeze event recovered from the cold stress faster than the untreated plants. This was visually evident as plants treated with Pageant began to resume growth and unfold new leaves earlier than untreated plants.



New Guinea Impatiens 'Super Sonic Pink'

Compared to untreated plants (left), containers sprayed with Pageant Intrinsic fungicide (right) recovered from cold stress faster. Treated plants resumed growing normally quicker and had better leaf expansion than untreated plants. The treated plants were sprayed once with Pageant Intrinsic fungicide using the rate of 12.0 oz per 100 gallons; the treatment was applied one day before the cold event. The image was taking 8 days after cold exposure.

Cold Protection During Shipping

During the winter in 2010, I performed two trials where I treated liners with Pageant 1-2 days prior to boxing and providing a freeze event. The trial was set up to simulate what would occur at a shipping warehouse and the conditions the plants might experience during shipping prior to being delivered to growers. The boxes of plants were put on pallets and placed outside where the temperatures were below freezing. It took several hours for the temperatures inside the boxes to fall below 32° F.

In the first trial, the temperatures inside the boxes were below 32° F for 3 hours and 28 minutes and between 26 to 27° F for 77 minutes. No cold injury was observed on Calibrachoa or Lobelia which were treated with Pageant; there was a slight amount of cold injury present on the untreated plants. A slight amount of cold injury was observed on Lantana and Ipomoea; however, the untreated plants had moderate to severe injury symptoms. The other two varieties in this trial exhibited no injury on the treated or untreated plants.

The amount of cold injury observed was less than expected as many plant varieties didn't exhibit injury symptoms on either the treated or untreated plants. After the study was completed, I learned that the trial plants were all treated with Pageant one week before I made my application; therefore, the untreated control plants were not control plants at all.

This trial was repeated using plants which were not previously treated with Pageant. In the second trial, the boxes were exposed to two different durations of cold exposure.

Half of the boxes received temperatures below 32° F for 125 minutes (with 83 minutes being below 30° F) inside the boxes. Under this duration of cold, there were no significant differences between treated and untreated plants as most of the varieties did not have any cold injury or only had a slight amount of injury symptoms following exposure to freezing temperatures.

The remaining half were exposed to below 32° F for over 8 hours (6 hours and 12 minutes were below 30° F) inside the boxes. There was more injury observed with the extended time cold was provided. Five of the eight varieties exhibited similar amounts of injury between the untreated and Pageant treated plants. Pageant treated plants of Lobelia had no injury - untreated plants had slight injury symptoms. Fuchsia treated with Pageant had no injury, compared to moderate injury symptoms on the untreated plants. Although there were moderate injury symptoms on New Guinea Impatiens treated with Pageant, the untreated plants had severe injury symptoms.

Similar to the observations made following the first set of cold studies described above, it was very noticeable that the plants treated with Pageant prior to the cold stress recovered quicker than the untreated plants.

Cold Summary

Based on what I've learned from these trials and with observations I've made where growers have used Pageant prior to cold events, there have been enough instances to tell me that Pageant Intrinsic fungicide does improve the ability for many plants to tolerate freezing temperatures in certain situations. However, it can be hard to duplicate cold events since no two freezes are identical (they differ in temperature and duration). Additionally, plant genetics and other environmental and physiological factors may also affect the results.

Growers should be aware of the ability of Pageant to improve a plant's ability to tolerate cold temperatures and more importantly how it helps them recover from this type of stress. However, there are no guarantees that it will work in every situation. Therefore, keep this tool in your back pocket, use it as an insurance policy that may or may not provide the amount of protection you need, and know that even if cold injury is experienced that Pageant will help the plants to recover in the days that follow.

Based on my experiences, it is best to spray Pageant Intrinsic fungicide at 12 oz per 100 gallons at least 1 to 2 days before the anticipated cold event. Applying Pageant in this manner would also be a good strategy to protect plants when moving crops from inside greenhouses to outside beds or when removing the poly from Quonset or coldframe structures in the spring.

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