



Controlling Amaryllis Height with Pre-Plant Bulb Soaks

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ONE OF THE DRAWBACKS OF PRODUCING AMARYLLIS IS THE LACK OF UNIFORMITY. THE FOLLOWING STUDY EVALUATES THE EFFECTIVENESS OF VARIOUS PGR APPLICATIONS AND METHODS.

Amaryllis (*hippeastrum*) is a popular bulb crop grown by greenhouse producers as pre-finished potted plants and marketed for major holidays, including Thanksgiving, Christmas and Mother's Day. Amaryllis are also often sold to consumers as dry bulbs in "bulb kits" that they can plant and grow at home. Amaryllis hybrids typically have large, stately flowers, available in colors of white, pink, red, orange, salmon and various bi-colors and bring welcomed color to any indoor environment, especially in the winter season.

Amaryllis are well suited for use as pot plants; however, one of the major drawbacks for commercial production is the lack of uniform growth and development. With a relatively fast rate of growth and development, the large flowerscapes often grow too tall, making the plants unstable, ultimately reducing their aesthetic appeal. Amaryllis producers and homeowners often pose the question of how best to reliably control flower height. Proper cultivar selection and proper culturing techniques (i.e. greenhouse forcing temperature, light quality and intensity, irrigation practices) can ideally control plant growth and development and can greatly assist in producing high quality potted plants. However, it can be difficult to control all these parameters. Plant growth regulators (PGRs) are often applied during greenhouse



Figure 1. Effects of 60-minute pre-plant bulb soaks in Piccolo (paclobutrazol) and Topflor (flurprimidol) on growth and development of amaryllis ‘Pamela’. Two replications are shown for each treatment. Treatments are L to R; control (water); 100 and 200 ppm Topflor and 100 and 200 ppm Piccolo.

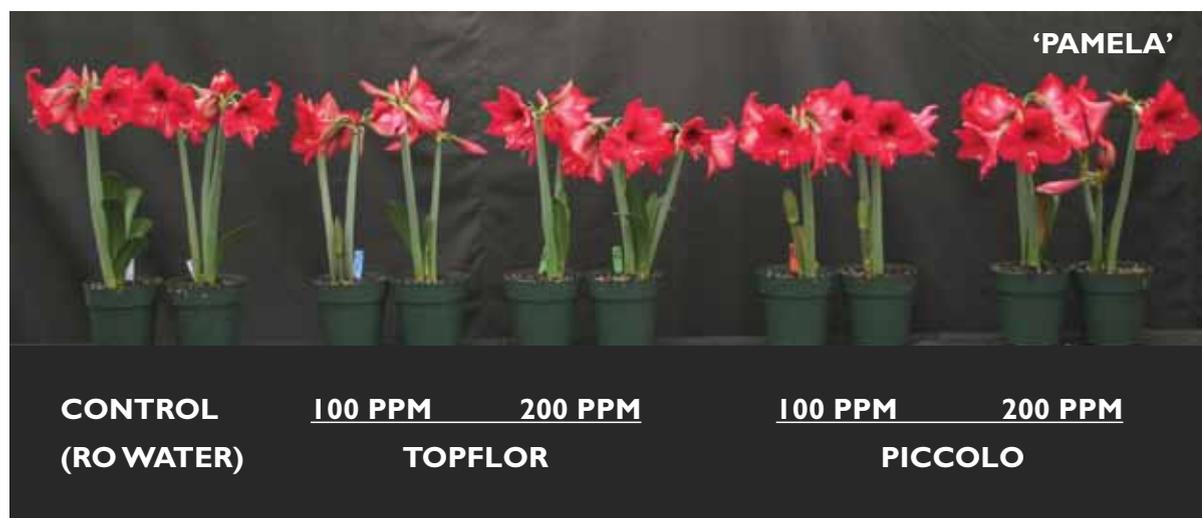
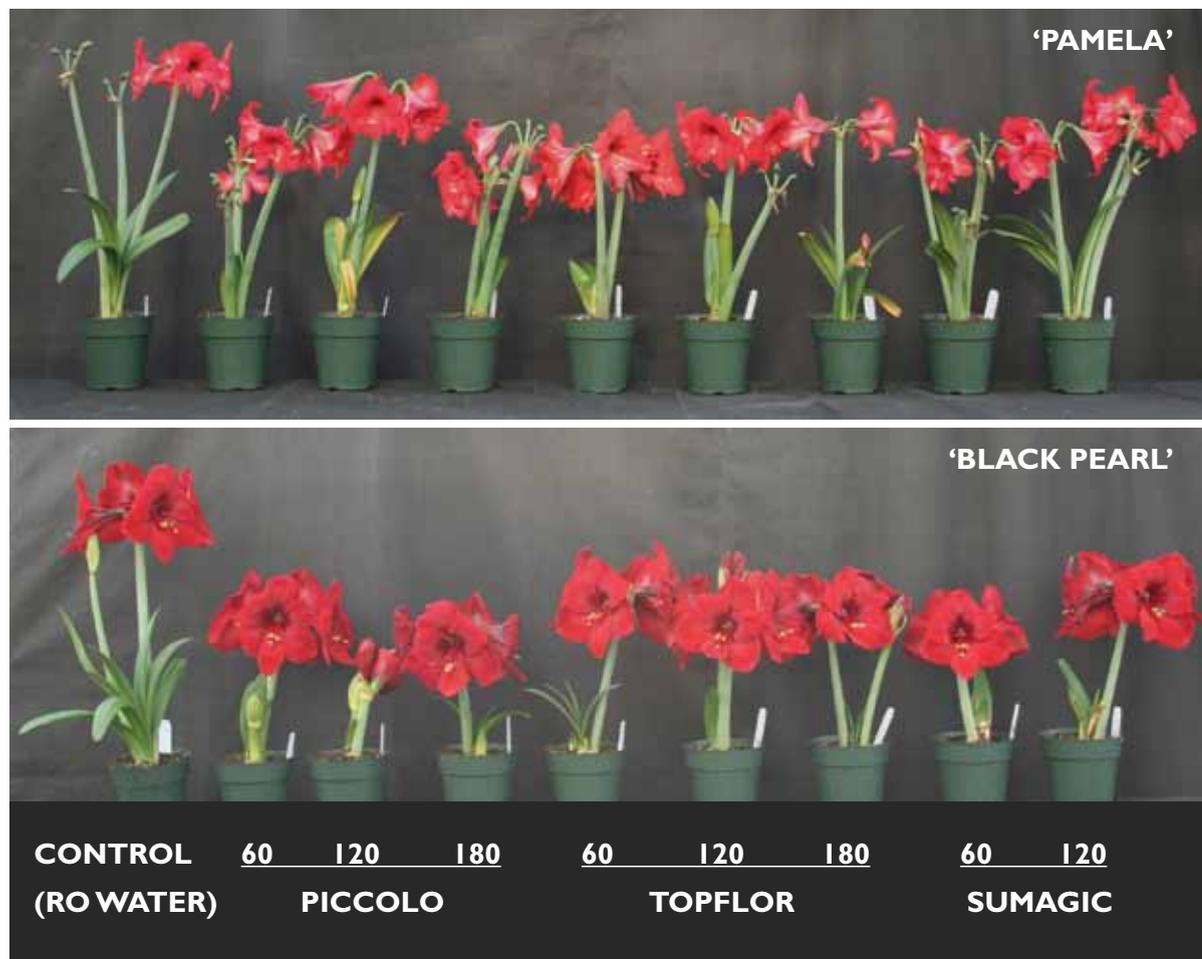


Figure 2. Effects of 60-, 120-, and 180-minute pre-plant bulb soaks in 100 ppm Piccolo (paclobutrazol), 100 ppm Topflor (flurprimidol) and 25 ppm Sumagic (uniconazole) on growth and development of amaryllis ‘Pamela’ and ‘Black Pearl’. Treatments are L to R; control (water), Piccolo 60, 120, and 180 minutes; Topflor 60, 120, and 180 minutes; Sumagic 60 and 120 minutes.



production to aid in controlling growth and development and to achieve a quality marketable product with many species.

PGRs are typically applied as sprays or media drenches. However, bulbous crops have the ability to be submerged in PGR solutions before planting (bulb dip or soak). This method is advantageous as it can reduce labor costs and reduced PGR efficacies associated with substrate component drench applications, such as bark, can be avoided. Success in controlling plant height using pre-plant bulb soaks have been observed in several other bulb crops, including hyacinth, lily, tulip and narcissus.

There is little information about PGR use and regulating amaryllis growth. As a part of an ongoing collaborative research project with Kansas State University and Cornell University, several experiments with objectives of evaluating different PGR application techniques, chemicals and treatment durations, to control height in amaryllis have been conducted. Specific objectives were 1) to evaluate the effectiveness of different PGRs and rates for pre-plant bulb soak and media drench applications, and 2) to evaluate the effects of pre-plant soaking time (duration) of amaryllis bulbs on subsequent growth and development.

Experimental Design

Amaryllis bulbs of three different cultivars, ‘Black Pearl’ (30/32 cm), ‘Pamela’ (26/28 cm) and ‘Vera’ (30/32 cm) were supplied by a domestic bulb supplier. In all experiments, one bulb was planted per 6-inch pot in a peat-based media (Sungrow LC1) with the nose of the bulb at or just below the media surface. Plants for all experiments were grown in glasshouses at constant 70° F under natural daylengths. Data collected included flower stem height and days to flower, in which flowering was defined when one to two flowers were fully open.

Experiment one. ‘Pamela’ bulbs were soaked for 60 minutes in treatments that consisted of water (control), 100- and 200-ppm Topflor (flurprimidol) and Piccolo (paclobutrazol). After treatment, bulbs were removed from the PGR solution and allowed to air dry for 10 minutes and then planted.

Experiment two. ‘Pamela’ bulbs were planted as previously described and after three weeks of growth, when growth averaged ~10 cm, a 120 ml PGR media drench was evenly applied to each pot. Treatments consisted of water (control), 6 mg active ingredient per pot of Piccolo or Topflor, and 0.4 mg active ingredient per pot of Sumagic (uniconazole).

Experiment three. ‘Black Pearl’, ‘Pamela’ and ‘Vera’ were pre-plant soaked in PGRs. Treatments consisted of control (water), 60, 120 and 180 minute soaks of Piccolo (100 ppm),

Topflor (100 ppm) and 60 or 120-minute soaks of Sumagic (25 ppm). After treatment, bulbs were allowed to air-dry for 10 minutes, then planted.

Experiment Results

Experiment one. Pre-plant bulb soaks were effective for both Topflor and Piccolo tested on 'Pamela' (Figure 1). There was no difference between the PGR types for effectiveness in controlling flower stem height. A dose response was observed for both PGRs in reducing flower stem height, with greater control with 200-ppm treatments. However, flower stem heights were not significantly different between PGR concentrations within each PGR. The number of days to flower was not affected by any treatment.

Experiment two. Media drenches had no effect on flower stem height. In addition, days to flower were not affected.

Experiment three. Nearly all PGR bulb soaks reduced flower stem height compared with the controls, although not always significantly. Overall, 'Black Pearl' and 'Vera' were more responsive to soak treatments than 'Pamela' with greater flower stem height reduction (Figures 2 and 3). For 'Black Pearl' and 'Vera', flower height was significantly shorter for all soak durations compared to the control. There did not appear to be any consistent differences between soak lengths; that is, bulbs soaked for 180 minutes did not produce significantly shorter flower stems than those that were soaked for 60 minutes.

Statistically, no significant delay in flowering was observed between the control and PGR soak treatments. However, Topflor bulb soaks (60, 120 or 180 minutes) tended to increase flowering time between six and nine days for both 'Pamela' and 'Black Pearl', compared to controls. Bulbs soaked for 180 minutes in Piccolo for both 'Pamela' and 'Black Pearl' increased time to six days compared to controls.

Conclusion

Media drenches had no affect on reducing flower stem

Figure 3. Effects of 60-, 120- and 180-minute pre-plant bulb soaks in 100 ppm Topflor (flurprimidol) (top photo) or 100 ppm Piccolo (paclobutrazol) (bottom photo) on growth and development of amaryllis 'Vera'. Treatments are L to R; control (water), 60, 120, and 180 minutes.



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height. In order for media drenches to be effective, it is imperative that the plant has developed an active root system. Based on observations through these studies, we hypothesize that the relatively quick growth of the flower buds (and emergence of leaves) with limited new

root growth, little chemical absorption occurs and is a major reason for the lack of flower height control.

The results obtained from these experiments demonstrate that pre-plant bulb soaks at 100 ppm for at least 60 minutes are effective in reducing flower stem height in



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amaryllis. Bulb soaks of higher PGR concentrations and soaks longer than 60 minutes did not provide significant additional flower height control. At the rates used, Piccolo and Topflor were slightly more effective than Sumagic at controlling flower stem height in 'Black Pearl', while no differences were found between PGRs with 'Pamela'. It also was observed in the second bulb soak experiment (experiment three) that soaks longer than 60 minutes caused a slight delay in flowering of at least three to nine days for several treatments. While most were not statistically significantly different, in a practical sense, this flowering delay could affect marketing of amaryllis, as flowering bulb crops have a short shelf life and often have a very specific target market date.

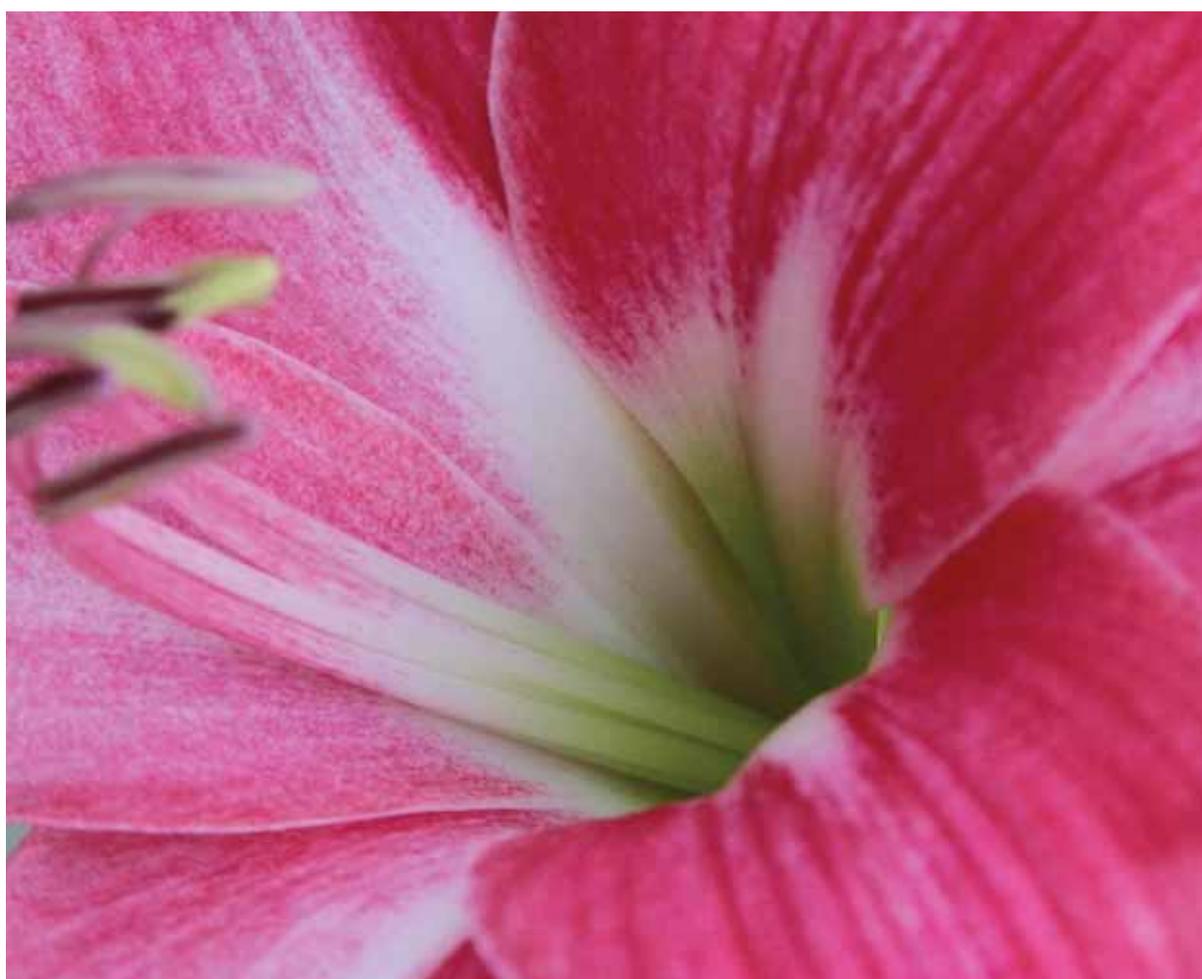
Variability is the best word to describe the growth and development of amaryllis. During greenhouse forcing, flower stem development is not always easily predicted. The use of

growth regulators appears to be cultivar specific. Moreover, PGR use and effectiveness in controlling flower stem height does not only vary between cultivars, but can also vary within a cultivar. It is advised that growers test a small portion of a crop with any PGR application and maintain accurate records under their greenhouse conditions before applying to a large crop of amaryllis. Further research on amaryllis pre-plant bulb soaks with other popular cultivars would be beneficial and is ongoing. 

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