GROWERTALKS

Features

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Growth Control on the Low

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Chemical PGRs are commonly used to produce compact and attractive bedding plants. Although PGRs are often a cost-effective method of controlling excessive growth, certain species may not be labeled due to the concern of overregulation or phytotoxicity. Growers are therefore presented with a dilemma: produce untreated plants that may be too tall or risk applying a PGR that can potentially lead to foliar or floral damage. Nutrient restriction has long been known to limit plant growth, but few studies have given specific recommendations applicable to floriculture production.

A study at NCSU investigated whether restricting phosphorus (P) fertilization could result in growth control comparable to plants grown with PGRs. As discussed in our previous article in the June issue of GrowerTalks, bedding plants produced in typical peat-based substrates only required 5 to 13 ppm P (12 to 30 ppm P2O5) to maximize growth. This means growers can use rates below this range to limit growth. The issue is this range is already very low and going too low can easily result in the development of P deficiency symptoms.

Research results

In our study, two cultivars each of New Guinea impatiens (*Impatiens hawkeri*) and angelonia (*Angelonia angustifolia*) were grown using five fertilizers that varied by P rate (0, 2.5, 5, 10 and 20 ppm). Nitrogen (N) and potassium (K) remained constant at 150 ppm each with fertilizer applied at every irrigation. Half of the plants grown with each P rate were treated with paclobutrazol halfway through the production period. The New Guinea impatiens received a spray application of 7.5 ppm paclobutrazol, while the angelonia received a drench. A P rate of 20 ppm combined with a PGR application was used to represent typical production practices. This treatment was then compared with all other treatments to determine which treatments had similar growth.

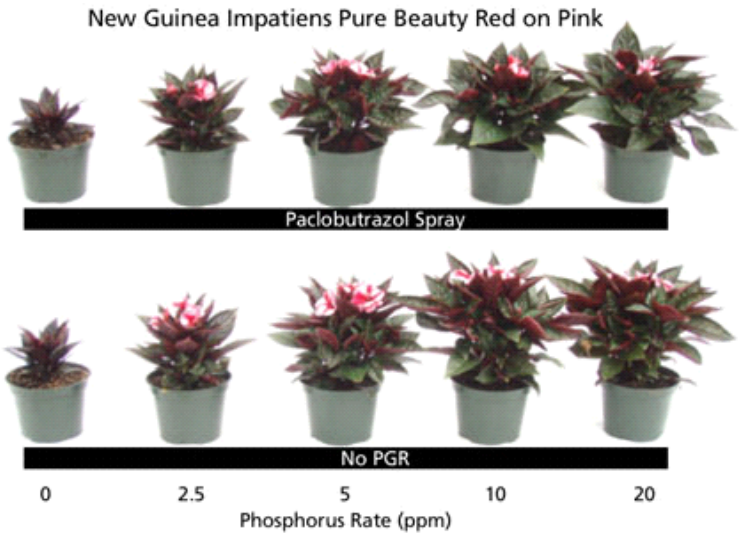

Figure 1. Pure Beauty Red on Pink New Guinea impatiens plants grown with (above) and without (below) a spray application of paclobutrazol. Each set of plants was grown with 0 to 20 ppm P.

Differences in growth were demonstrated in a side-by-side comparison (Figure 1). New Guinea impatiens Pure Beauty Red on Pink plants increased in size as the P rate increased, up to 10 ppm. Plants grown with 10 and 20 ppm P were similar in size. Plants grown without P were significantly stunted and didn't reach flowering. Symptoms of P deficiency were present on this dark-leafed cultivar, but were much more pronounced on the light-leafed Tamarinda Dark Red (Figure 2). Additionally, you can see that plants grown with a PGR were more compact than plants grown with the same P rate and no PGR (Figure 1).

Figure 2. Tamarinda Dark Red New Guinea impatiens grown without P (left) were significantly stunted compared to healthy plants grown with sufficient P (right) and displayed classic symptoms of P deficiency on the lower leaves.

Plant heights at the end of the experiment were compared using a growth plateau model similar to the one discussed in the June article. This comparison was made by plotting the growth curves for PGR-treated and untreated plants next to each other. Let's consider the model for New Guinea impatiens Pure Beauty Red on Pink (Figure 3)—in this model, you can see that plants grown without a PGR reached a maximum height of 20 cm with 10 ppm P. Plants treated with paclobutrazol reached a maximum height of 6 in. (17 cm) using 9.5 ppm P.

By following the horizontal line from the PGR-treated plateau, you can see that this line intersects with the untreated line at almost exactly 5 ppm P. This means that the maximum height of plants treated with paclobutrazol was similar to untreated plants grown with 5 ppm P.

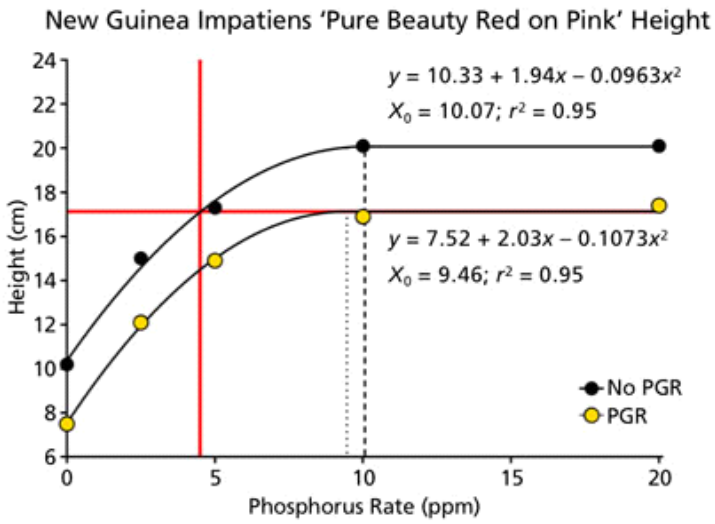

Figure 3. Growth plateau model for height of New Guinea impatiens Pure Beauty Red on Pink plants grown with or without a PGR application. Where the red lines intersect indicates the P rate at which the height of untreated plants was the same as the maximum height of PGR treated plants.

Optimal P rates for height control were similar among species and were lower than current recommendations for greenhouse bedding plant production. The optimal rates for height control in New Guinea impatiens were approximately 4 to 5 ppm P (~ 9 to 12 ppm P2O5) when fertilizing at every irrigation, while angelonia required concentrations as low as 3 ppm P (~ 7 ppm P2O5). Lowering rates below this rate resulted in significantly smaller plants that were severely stunted and displayed varying symptoms of P deficiency. These symptoms included reddening and necrosis of the lower foliage, and floral inhibition in New Guinea impatiens.

Knowing optimal P rates for growth control gives growers more options when deciding upon growth management strategies. It's important to remember that growth regulation using conventional PGRs and low P fertilization can be used together to limit plant growth. Used in conjunction, growers may be able to limit PGR overdoses while still maintaining high quality production practices.

Plants grown with 20 ppm P and a paclobutrazol application had similar height to plants grown with ~ 5 ppm P (~ 12 ppm P2O5) and no PGR. Lower P fertilization provided significant growth control when compared to using PGRs with a higher P rate that would be more commonly used in commercial production. Although ~ 5 ppm P worked well for the species grown in this study, it's important to remember that not all plants can grow well with such low P rates. As discussed in the previous article, ornamental peppers required at least 10 ppm P (~23 ppm P2O5) to prevent deficiency symptoms from developing. This higher P requirement is likely due to the heavy fruiting of this species. As a rule of thumb, heavily flowering or fruiting plants should be provided with slightly higher P rates than plants with smaller or fewer flowers or fruit.

In conclusion, many ornamental species grown in soilless substrates achieve maximum growth with about 5 to 15 ppm P (~ 12 to 35 ppm P2O5) applied as a constant liquid feed. By limiting P rates to 3 to 5 ppm P, you can produce similar sized plants to those grown with a higher P rate and a PGR application. If you're interested in implementing a low P fertilization regiment, be aware that some crops may still require a higher P rate. Small adjustments to the P rate may be able to clear up problems as they arise, but coming in with a one-time application of a higher P fertilizer (i.e., 20-10-20) might be necessary. Make sure to scout for deficiency symptoms, as your crops will let you know if you've gone too low! **GT**

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