

Control Stem Length With Liner Dips

Purdue researchers share their best practices for controlling stem length of common foliage annuals using PGR liner dips.

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As you are getting ready to place your early plug and liner orders before winter, you may be reflecting on the incredible variety of spring annuals you are growing in your greenhouse. One of the biggest challenges in bedding plant production is controlling unwanted stretch or stem elongation. But how can you effectively control stem elongation of so many different species in a single greenhouse or in a combination container?

There are several techniques growers may use to control stem elongation. For instance, a warmer night air temperature than day air temperature creates a negative DIF (DIF is day temperature minus night temperature), which has been shown to minimize stem elongation. However, the effectiveness of a negative DIF varies with species. With today's high energy costs, it can be cost prohibitive.

Therefore, a more practical and economical tool is to treat each species with plant growth regulators (PGRs). Chemical PGRs are usually applied as foliar sprays to plants in packs or containers. However, some PGRs such as ancymidol (A-Rest, Abide), flurprimidol

(Topflor), paclobutrazol (Bonzi, Piccolo, Paczol, Downsize, Florazol) and uniconazole (Concise, Sumagic) are taken up by roots and have growth-regulating activity when applied to the growing substrate. Growers may apply substrate drenches containing these PGRs, which often result in increased control and uniformity in curbing stretch.

Dipping trays of rooted liners and plugs into a PGR solution, or liner dip, is a newer method of efficiently applying root-absorbed PGRs that controls stem elongation after transplanting. The use of liner dips allows growers to efficiently apply the required PGRs to a large number of plants. It can also give growers the ability to treat

individual plants with the PGR they need before combining them with other species or cultivars in a mixed container or basket.

While there is information about using liner dips on flowering annuals in both trade and scientific literature, little to no information is available for using liner dips with foliage annuals. We wanted to see if we could control stem length of several common foliage annuals that are used in combination planters and hanging baskets using PGR liner dips.

The Experiment

Trays of 'Royal Tapestry' alternanthera (*Alternanthera dentata*), 'Silver Falls' dichondra (*Dichondra argentea*), 'Silver Mist'

helichrysum (*Helichrysum petiolare*), 'Black Falls' and 'Marguerite' sweet potato (*Ipomoea batatas*), 'Goldilocks' lysimachia (*Lysimachia nummularia*), 'Emerald Lace' plectranthus (*Plectranthus oertendahlii*) and 'Variegata' vinca (*Vinca major*) were received from C. Raker and Sons (Litchfield, Mich.) and Four Star Greenhouses (Carleton, Mich.). Liners were dipped into trays filled with solutions containing 8, 16 or 32 ppm ancymidol (Abide; Fine Americas); 4, 8 or 16 ppm flurprimidol (Topflor);



Figure 1. 'Black Falls' (top row) and 'Marguerite' (bottom row) sweet potato six weeks after liners were dipped in solutions containing 0, 4, 8 or 16 ppm paclobutrazol for two minutes preceding planting.

SePRO); 4, 8 or 16 ppm paclobutrazol (Piccolo; Fine); 2, 4 or 8 ppm uniconazole (Concise; Fine); or deionized water (untreated control) for two minutes.

The day following chemical treatments, liners were planted in 4-inch round containers filled with a commercial soilless substrate composed of (by volume) 80 percent peat and 20 percent perlite. Plants were grown in a polyethylene-covered greenhouse under natural daylight with day and night temperature set points of 70°F and 67°F, respectively. Plants were fertilized with 200 ppm nitrogen from a balanced feed with each watering. Six weeks after treatments the length of the longest stem of each plant was recorded.

The Results

So what did we see? No PGR was effective in suppressing stem length of ‘Marguerite’ sweet potato (Figure 1) or ‘Silver Falls’ dichondra. Alternatively, every PGR at each concentration resulted in ‘Black Falls’ sweet potato plants with shorter stems compared to control plants (Figure 1).

Only ‘Variegata’ vinca dipped in 32 ppm ancymidol had shorter stems than control plants (Figure 2). ‘Emerald Lace’ plectranthus did not require any PGRs (Figure 3). Stem length of ‘Silver Mist’ helichrysum was only shorter than control plants when treated with 16 or 8 ppm flurprimidol or uniconazole, respectively (Figures 3 and 4). All PGRs, at different concentrations, were effective for controlling stem length of alternanthera and lysimachia (Figures 3 and 4).

In our experiment, we documented a variety of responses to different PGRs with the species we used. For example, we observed three general responses to PGR liner dips across species and cultivars used: 1) did not require chemical growth regulation (plectranthus); 2) were unaffected by most or all PGRs (dichondra, ‘Marguerite’ sweet potato, and vinca); or 3) were affected by each PGR at nearly every concentration (alternanthera, helichrysum, lysimachia



Figure 2. ‘Variegata’ vinca six weeks after liners were dipped in solutions containing 0, 8, 16 or 32 ppm ancymidol for two minutes preceding planting.

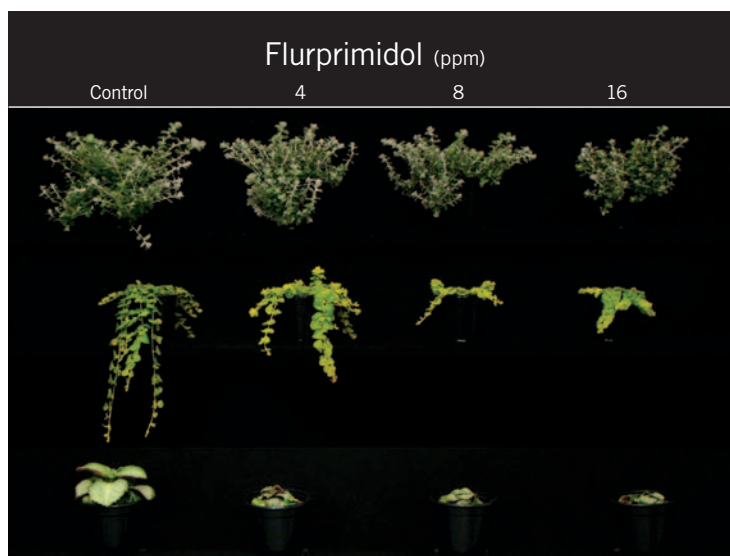


Figure 3. ‘Silver Mist’ helichrysum (top row), ‘Goldilocks’ lysimachia (middle row), and ‘Emerald Lace’ plectranthus (bottom row) six weeks after liners were dipped in solutions containing 0, 4, 8 or 16 ppm flurprimidol for two minutes preceding planting.



Figure 4. ‘Royal Tapestry’ alternanthera (top row), ‘Goldilocks’ lysimachia (middle row) and ‘Silver Mist’ helichrysum (bottom row) four weeks after liners were dipped in solutions containing 0, 2, 4 or 8 ppm uniconazole for two minutes preceding planting.

and 'Black Falls' sweet potato).

Species and cultivar clearly interact with PGR active ingredients and concentration to affect stem length. Additionally, the variation between cultivars of the same species (i.e. sweet potato) underscore the importance of conducting in-house PGR trials to develop effective protocols for applying PGR liner dips to control stem length of herbaceous foliage annuals.

Using Liner Dips In Your Greenhouse

So what does this mean for you and your crop production? Liner dips can clearly be an effective PGR application strategy for aggressive foliage and flowering bedding plants. However, before dipping your liners or plugs into PGR solutions, get a clear idea of what you want out of your liner dips.

For instance, are you treating liners that will be planted individually in containers that will eventually be planted in a landscape, or are you treating liners that will be part of a mixed container planting? If you are treating plants that will eventually be

planted in the landscape, you may be interested in a lower PGR concentration that will "hold" stem elongation until plants are placed in the landscape. Alternatively, for those plants that are going to be planted in a mixed container or basket, a higher PGR concentration that will slow or stop excessive elongation when the container is brought home by the consumer (Figure 5).

Once you have identified what you want your dips to do for you, there are a few steps you can take to ensure success. First, identify the PGR you want to use and the desired concentration for that PGR. For a "hold" application, you'll want to use concentrations that would be lower than those necessary for a "slow" or "stop" application.

Second, water your plugs and liners a day or so before you plan on applying the liner dips. This will ensure more uniform substrate moisture leading to more uniform uptake and subsequent control. If a plug tray or liner is too dry, too much PGR solution will be absorbed, resulting in too much suppres-



Figure 5. Example of a hanging basket planted with an aggressive species (sweet potato vine) and a less aggressive species (calibrachoa). The sweet potato vine has outgrown the calibrachoa in the basket. The sweet potato vine could have been treated with a PGR liner dip before transplant to suppress vigor, resulting in a more balanced basket.

sion of growth. Alternatively, if a plug tray or liner is completely saturated, not enough PGR solution will be absorbed and you will not get enough control. Lastly, be sure to time your dip. Dipping plugs or liners in PGR solutions for 30 seconds to up to two minutes has been shown to be an appropriate range for application time. Treatments less than 30 seconds will not provide you with much control, while dips over two minutes may provide excessive control.

Takeaways

Next time you grow annuals from plugs or liners, consider using liner dips. They are an effective method for treating a wide variety of species and cultivars during a season in which variety in the greenhouse can be overwhelming. This research was conducted in the Northern U.S. during late spring. Rates will vary based on location and time of year.

Be sure to do some in-house trialing with the plant material and PGRs you use to identify which PGRs and concentrations work for the plants you grow. **GG**

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