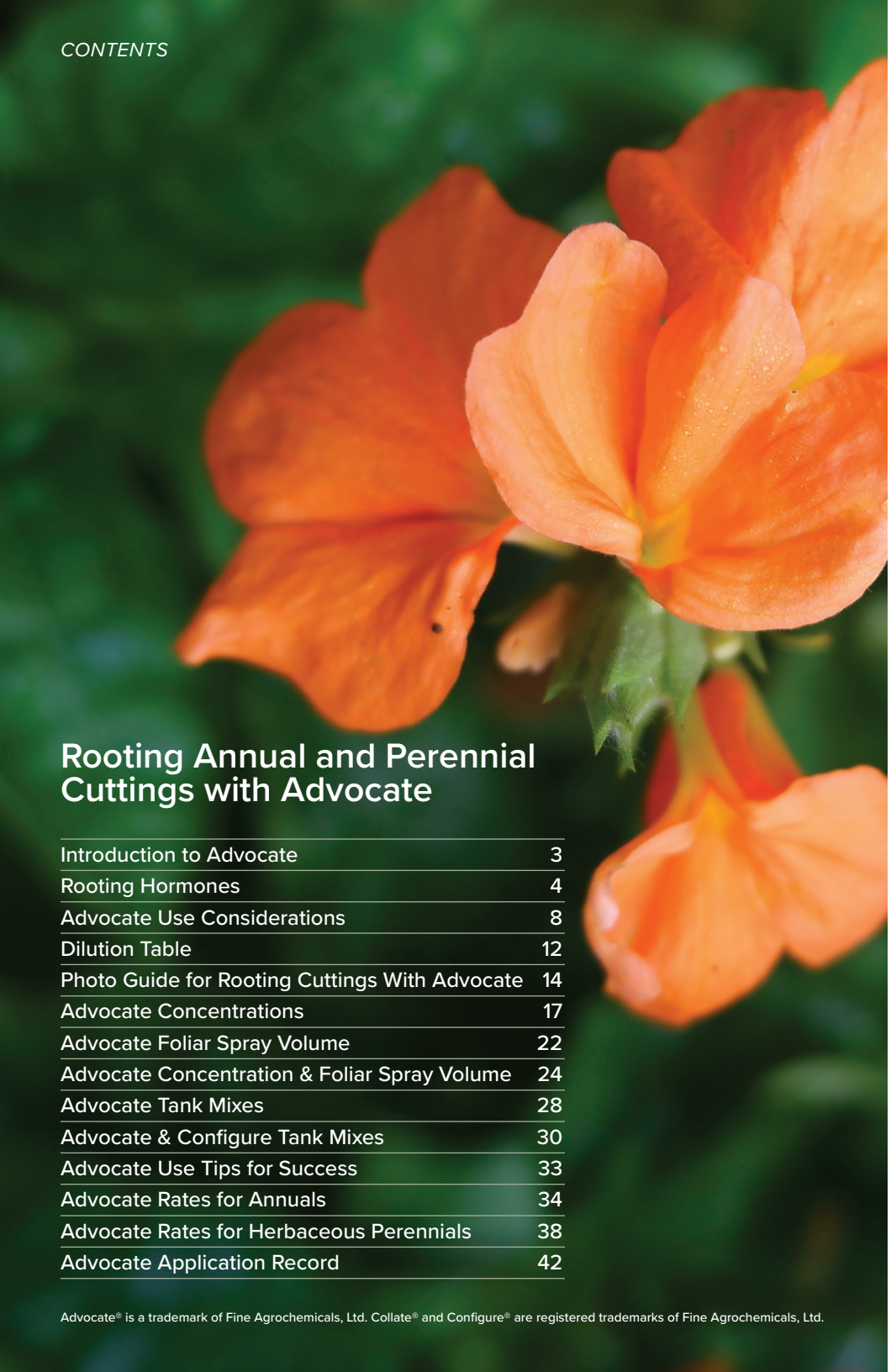
advocate®

# Rooting Annual and Perennial Cuttings with Advocate




Edited by Dr. W. Garrett Owen, The Ohio State University
Contributing authors: Dr. Christopher Currey, Iowa State University; Dr. Roberto Lopez, Michigan State University; and Dr. Brian Whipker, North Carolina State University.



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Plant growth regulators (PGRs) are valuable production tools for growers of ornamental plants. Specifically, PGRs are chemicals designed to control or promote growth, stimulate branching, abscise or promote flowering, or induce and promote adventitious rooting. These chemicals can be used to enhance the quality and marketability of containerized ornamental crops.

For many plant species and cultivars, vegetative cutting propagation is the main method of plant production. Rooting hormones are a valuable tool in the early stage of this production method, especially for plant species that have difficulty rooting. Advocate® is an effective rooting hormone for use on a wide range of annual bedding plants, herbaceous perennials and woody ornamentals. Advocate® contains the active ingredient indole-3-butyric acid, which is the most widely known auxin or plant hormone used for propagation. Advocate® can accelerate root initiation, promote and improve rooting uniformity, and aid in rooting of moderate to difficult-to-root plants. Furthermore, Advocate® is versatile, expanding application methods to also include foliar sprays.

This guide focuses on the use of Advocate® for production of annual bedding and herbaceous perennial plants. Information provided in this guide on Advocate® use is based on research trials conducted by Dr. W. Garrett Owen at The Ohio State University, Dr. Chris Currey at Iowa State University, Dr. Roberto Lopez at Michigan State University, and Dr. Brian Whipker at North Carolina State University. The guide provides growers with general guidelines for Advocate® foliar application rates on a wide range of annual bedding plants and herbaceous perennials.

Advocate® users should keep in mind that adventitious root initiation and formation will vary among cultivar and species propagated, propagation environmental conditions, and application method, therefore making it impossible to recommend specific rates for all plant species and individual grower operations. As such, growers should refer to the Advocate® label to determine the recommended rate for the plant to be treated and conduct their own in-house trials.

As part of Fine Americas' continuing support of the ornamental plant industry, it's proud to support the creation of this guide to provide instruction and information on the use of the rooting hormone Advocate®. This guide is one part of a series of guides sponsored by Fine Americas Inc. on the use of PGRs for ornamental plant production.

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# Improving Rooting With Auxin

By **Christopher J. Currey**, Extension Specialist, Floriculture and Hydroponic Food Crops—Iowa State University; and **W. Garrett Owen**, Extension Specialist, Floriculture and Nursery Crops—The Ohio State University



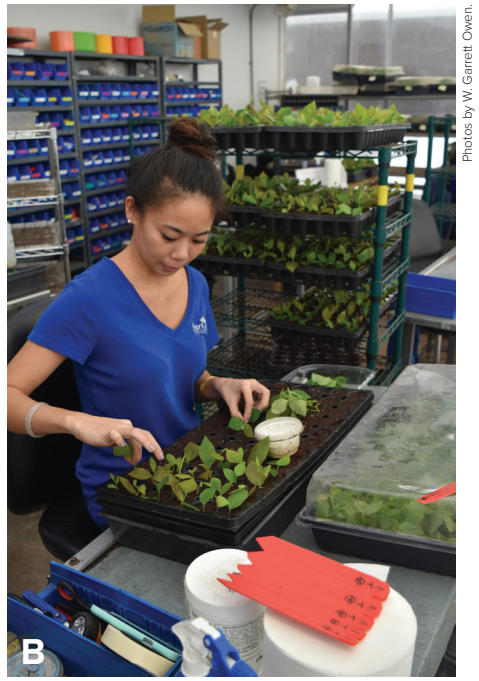

Figure 1. Advocate by Fine Americas, Inc. is a liquid rooting hormone formulation with 20% concentration of the active ingredient indole-3-butyric acid.

Auxin is one of the five primary plant hormones, along with abscisic acid, cytokinins, ethylene and gibberellic acid. There are numerous aspects of plant growth and development that auxin influences, including adventitious root development.

The discovery of auxins as plant growth regulating chemicals was a significant contribution to the field of plant science and more so to the commercial horticulture industry. Auxin is used to initiate and promote root development in cuttings of nearly every type of plant, from herbaceous to woody, temperate to tropical, or deciduous to evergreen. Rooting hormones containing auxin are essential for efficient and effective plant propagation in commercial greenhouse and nursery crop production. Advocate (20% indole-3-butyric acid, Fine Americas, Inc.; Figure 1) is a new rooting hormone in a liquid formulation that's unique among rooting hormones for its versatility in application. To better understand how Advocate is unique, a brief overview of rooting hormones may be helpful.

Auxin is a type of plant hormone and there are also several different types of auxins used in commercial horticulture. Indole-3-butyric acid, or IBA, is likely the most widely known and used auxin for plant propagation, but not the only one. Naphthalene acetic acid (NAA) is another popular auxin included in several rooting hormone formulations. While indole-3-acetic acid (IAA) is another biologically active auxin, it's not used commercially. Some commercial rooting







Photos by W. Garrett Owen.

Figures 2A to 2C. Basal dip application of a rooting hormone formulated with indole-3-butyric acid suspended in talcum powder or talc.

hormones contain compounds that are not auxin, with the intention that they promote plant growth and health. However, it's the auxin that's responsible for adventitious root development. Rooting hormones can accelerate root initiation, improve rooting uniformity, aid in rooting of moderate to difficult-to-root species, increase the number of roots produced per cutting, and ultimately reduce shrink and propagation time. Of course, when rooting hormones and other cultural practices are combined with optimal environmental conditions, results are high-quality, well rooted cuttings (liners).



Photo by W. Garrett Owen.

Figure 3. Foliar spray application of indole-3-butyric acid being applied 24 hours after azalea *(Rhododendron simsii)* cuttings were stuck and placed in the propagation environment.

Rooting hormones are sold in a variety of formulations, differing in active ingredients and concentrations, the carriers for the rooting hormones, and intended application method. One of the most common formulations is IBA suspended in talcum powder, or talc (Figures 2A to 2C). This is the most traditional formulation and is easy to apply as a dip; however, powder forms of rooting hormones are less effective than liquid rooting hormones applied at the same concentration. Furthermore, formulations with low concentration of auxins remain effective for one to two years and the stability of products at higher concentrations is very good for at least three years. Proper storage of the rooting hormone will also influence rooting results.

Liquid rooting hormone formulations are also available that have a combination of different auxins suspended in alcohol. These formulations are meant to be diluted with water to achieve the desired concentration and, like talc powder formulations, cuttings are dipped into the solution to apply it. While quick dips are easy and often result in uniform rooting, they can be labor intensive, dehydrate cuttings, and increase the risk of disease contamination.

There are several applications that may be used to apply rooting hormones. As already mentioned, dipping the basal end of cuttings into a rooting hormone is the most widely used approach to apply rooting hormones. These quick basal dips are done with both the powder and liquid formulations. For some cuttings, the ends are placed into a liquid solution and left to absorb the rooting hormone for an extended period of time, and these are referred to as "soaks." While this is a familiar and easy application method, it can be labor-intensive. Time can be saved if cuttings can be bunched, allowing numerous cuttings to be treated in a single dip.

Applying rooting hormones using foliar sprays (Figure 3) is a more efficient approach to treating cuttings compared to traditional basal dips. Many more cuttings can be treated in much less time when foliar sprays are used instead of dips to apply auxin. Foliar sprays are a labor-saving method compared to dips. Labor savings translate to less costs associated with the crop.

Advocate is the newest commercially available rooting hormone on the market and it's distinctly different from the other hormones available to producers. Advocate is a liquid formulation with a 20% concentration of the active ingredient, IBA. Furthermore, Advocate is formulated with the IBA in the acid form and not the potassium salt form, thereby making it more readily available and used by the cuttings. Compared to other liquid formulations, Advocate is more concentrated, reducing the amount of product that has to be handled and stored by commercial greenhouses, saving money for producers.

It's also important to know that while Advocate is in a liquid formulation, it's not like other liquid rooting hormone formulations. The other liquid rooting hormones are only intended for performing basal dips or basal soaks and, while Advocate can also be applied those ways, it can also be applied as a foliar spray. By applying Advocate to vegetative or leafy unrooted cuttings using a foliar spray, significant labor savings can be realized by eliminating the need to dip cuttings in rooting hormones before sticking. Furthermore, foliar sprays can be sprayed immediately after cutting stick, but are often applied 24-hours after cuttings are stuck and placed into the propagation environment. This allows the cuttings to rehydrate and reduces the likelihood of cutting damage.

The introduction of Advocate is providing commercial producers a new tool in their toolbox. In the following pages, additional information on how to be successful using Advocate will be presented, ranging from best management practices to research-based recommendations. Take full advantage of the benefits of Advocate in your young plant programs today. ■

# Considerations for Using Advocate

By **Christopher J. Currey**, Extension Specialist, Floriculture and Hydroponic Food Crops—Iowa State University, and **W. Garrett Owen**, Extension Specialist, Floriculture and Nursery Crops—The Ohio State University

Advocate (20% indole-3-butyric acid, Fine Americas, Inc.) is a plant growth regulator—specifically, a rooting hormone used to promote and hasten rooting of greenhouse and woody ornamental cuttings. What distinguishes Advocate from other rooting hormones is its versatility. Advocate can be applied like traditional rooting hormones, using a basal dip to treat cuttings. However, it can also be applied as a foliar spray to cuttings after they're stuck. Cuttings can also be soaked or totally immersed in Advocate. Regardless of which application method is used, there are several considerations for using Advocate.

Advocate is a liquid formulation that allows the product to be easily measured, mixed and applied (see Advocate Dilution Table on page 12). A major advantage to commercial growers is that Advocate can be applied as a foliar spray to cuttings once they've been stuck and placed in the propagation area (Figure 1). Using foliar sprays to apply rooting hormones to cuttings can save significant labor compared to dipping cuttings. The labor savings and ease of applying foliar sprays provide advantages for growers.

Figure 1. Advocate (20% indole-3-butyric acid) can be applied as a foliar spray to cuttings once they've been stuck and placed in the propagation area.

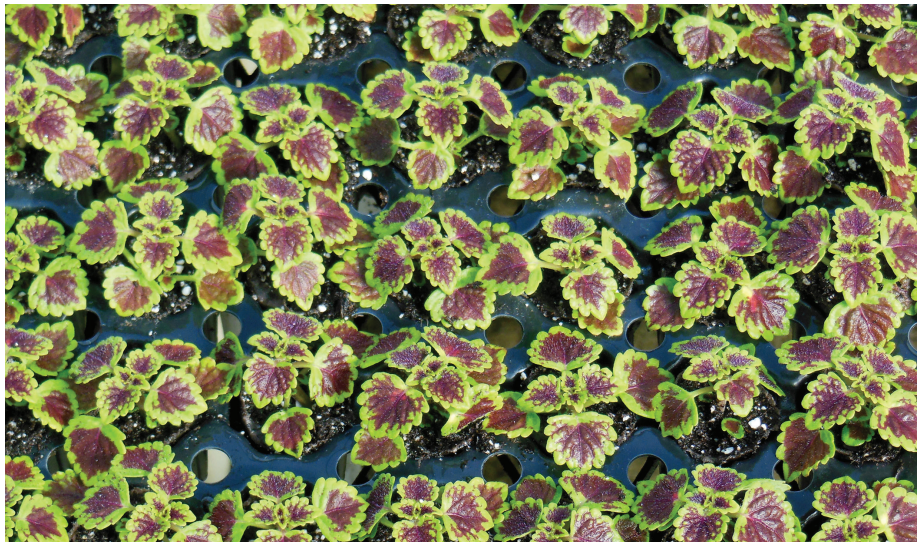


Photo by W. Garrett Owen.



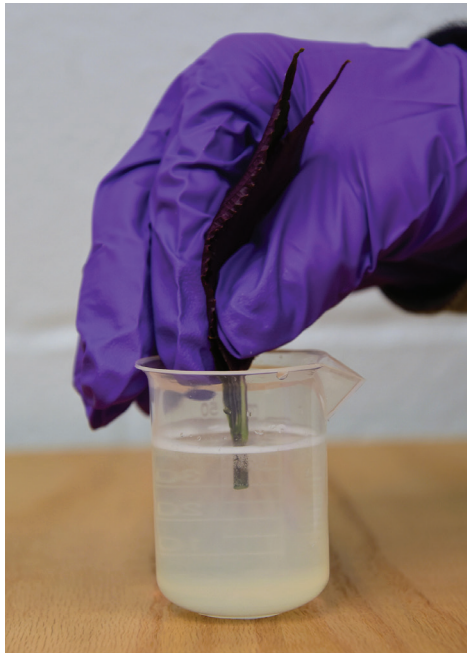


Figure 2. The basal end of a vegetative cutting dipped in a solution of Advocate (20% indole-3-butyric acid) before being placing in a propagation tray.



Figure 3. Woody ornamental cuttings left in a solution of Advocate (20% indole-3-butyric acid) to soak for 12 to 48 hours so that the cuttings absorb the auxin.

Photos by W. Garrett Owen.

There are a few key points to remember to get the most out of Advocate sprays. First, foliar sprays of Advocate are for application to leafy cuttings. This technique is not for use on dormant deciduous cuttings without foliage and these types of cuttings are better suited for basal dips. The application volume for applying Advocate as a foliar spray is 2 qt. of solution per 100 sq. ft. of growing area. However, heavier volumes (up to 4 or 6 qts. per 100 sq. ft. of growing area) can be used for greater effect. The excess solution can run down to the base of the cutting and enhance root promotion. For further information on the recommended rates of Advocate and Advocate tank mixes, refer to Table 1 for annual floriculture crops and Table 2 for herbaceous perennials.

While the ability to apply Advocate as a foliar spray is one of the primary benefits of this product, there are other application methods that can be used, too, including total immersion or quick soak method, as well as both quick basal dips and extended basal soaks. Leafy cuttings can also be totally immersed in Advocate solution prior to sticking. See Advocate label for basal dip and basal soak recommendations for cuttings.

Consider trialing immersion rates. This can allow for more Advocate to be taken up by cuttings. While the Advocate solution can be reused in between batches of the same lot of cuttings, preparing fresh solutions with each new lot







Photos by W. Garrett Owen.

Figure 4 A & B. Evaluating root growth during in-house trials will help determine the best application method and concentration of Advocate (20% indole-3-butyric acid) to use for your crops.

of cuttings helps minimize the spread of any diseases between different lots of cuttings.

In addition to sprays and total immersion, Advocate works well when applied the traditional way, dipping the basal end of cuttings (Figure 2). Basal applications work for dormant woody cuttings that will go into storage after treatment or herbaceous cuttings that are stuck immediately after dipping. Simply mix solutions to the desired concentration as previously outlined, immerse up to 1 in. (2 to 3 cm) of the basal ends of cuttings into the Advocate solution, then either stick cuttings or place back into storage.

Basal dip time can be extended to promote rooting for species that are more recalcitrant to root, such as some herbaceous perennials and woody ornamentals. Basal soaks are performed just like a traditional basal dip, but cuttings are left for 12 to 48 hours to allow the cuttings to absorb the Advocate (Figure 3). For these long soaks, be sure to use lower concentrations compared to concentrations used for regular, quick dips. As with the total immersion application method, Advocate solutions can be reused for different batches within the same lot, but solutions should be changed for different lots of cuttings.

The concentration of Advocate used will depend on application method (i.e., foliar sprays versus basal dips), as well as factors affecting crop growth, including cultivar, season, cutting quality and growing environment. Small-scale in-house testing prior to large-scale use will help determine the best results. The suggested rates on the label, as well as those suggested in this guide, should be trialed under your specific production conditions. Evaluating root growth (Figures 4A and 4B) and monitoring for phytotoxicity will help determine the best rates for your crops. Use the lowest concentration that provides the desired rooting results without any phytotoxicity or leaf twisting symptoms. Keeping records over time and documenting your results with Advocate will help further refine the most appropriate concentrations for your crops.

Advocate has the potential to be integrated into other spray applications for young plant propagation, including fungicides, insecticides and fertilizers. However, it's important to determine the compatibility with other compounds you're interested in tank mixing it with and a detailed procedure is outlined on the label. Furthermore, consider adding an adjuvant with Advocate to help achieve uniform spray coverage and movement into the substrate. Adding an adjuvant may also be beneficial when tank mixing Advocate with other chemicals. Tank mixes of Advocate and any other products used for propagation of plant cuttings must be mixed thoroughly and applied within one day of mixing. Proper agitation of these tank mixes must be maintained to assure proper dispersal of Advocate and other materials in the mix.

In addition to more details on using Advocate, remember plant growth regulators are classified as pesticides. All USDA recordkeeping, Worker Protection Standard rules and use restrictions apply when using Advocate. Be sure to review the label for specific information on the personal protective equipment, restricted entry interval, and other safety precautions related to Advocate and how to use the product effectively. ■

## Advocate Dilution Table

| PPM | ml/L | ml/gal | fl. oz. gal. |
|---|---|---|---|
| 25 | 0.114 | 0.43 | 0.014 |
| 50 | 0.228 | 0.86 | 0.029 |
| 80 | 0.365 | 1.38 | 0.046 |
| 100 | 0.457 | 1.73 | 0.058 |
| 150 | 0.685 | 2.59 | 0.087 |
| 200 | 0.913 | 3.46 | 0.116 |
| 250 | 1.14 | 4.32 | 0.146 |
| 300 | 1.37 | 5.18 | 0.175 |
| 400 | 1.83 | 6.91 | 0.233 |
| 500 | 2.28 | 8.64 | 0.292 |
| 600 | 2.74 | 10.37 | 0.350 |
| 700 | 3.20 | 12.10 | 0.409 |
| 800 | 3.65 | 13.83 | 0.467 |
| 900 | 4.11 | 15.55 | 0.525 |
| 1,000 | 4.57 | 17.28 | 0.584 |
| 1,250 | 5.71 | 21.60 | 0.730 |
| 1,500 | 6.84 | 25.90 | 0.875 |
| 2,000 | 9.14 | 34.60 | 1.169 |
| 2,500 | 11.41 | 43.21 | 1.461 |
| 5,000 | 22.83 | 86.41 | 2.921 |
| 10,000 | 45.66 | 172.83 | 5.844 |

## Appendix/Helpful Conversions

**Volume**

1 quart (qt.) = 32 fluid ounces (fl. oz.)
1 gallon (gal.) = 4 qt. = 128 fl. oz.
1 fl. oz. = 30 milliliters (ml)
1 gal. = 3785 ml = 3.785 liters
1 cup = 48 teaspoons
1 tablespoon = 3 teaspoons
1 fl. oz. = 2 tablespoons = 6 teaspoons

**Concentration**

1% = 10,000 parts per million (ppm)
1 ppm = 1 milligram (mg) per liter ($mg \cdot L^{-1}$)





## Advocate Application Method

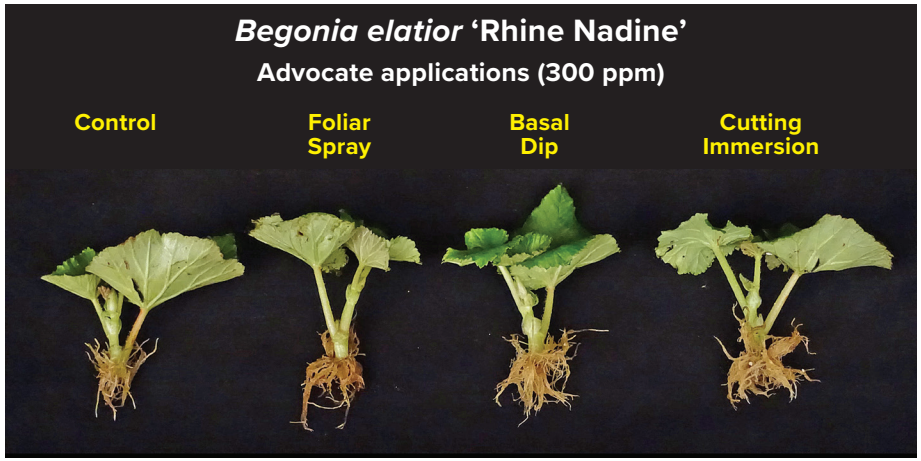



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Begonia × hiemalis* Rhine Nadine (*Elatior begonia*) cuttings were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and daily light integral of 10 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (control) or received a 300 ppm foliar spray at a volume of 2 qt. per 100 sq. ft., basal dip or were immersed in solution of Advocate. Photo taken 28 days after spray application.

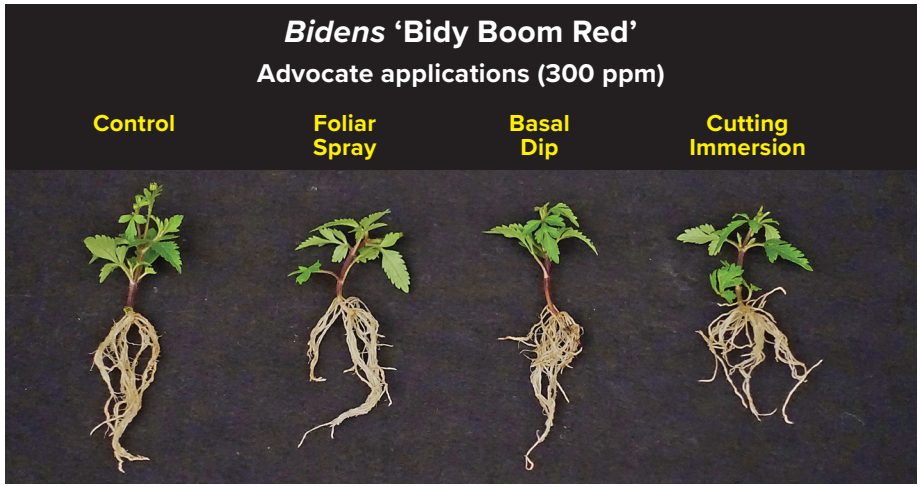



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Bidens ferulifolia* Bidy Boom Red were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and daily light integral of 10 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (control) or received a 300 ppm foliar spray at a volume of 2 qt. per 100 sq. ft., basal dip or were immersed in solution of Advocate. Photo taken 28 days after spray application.

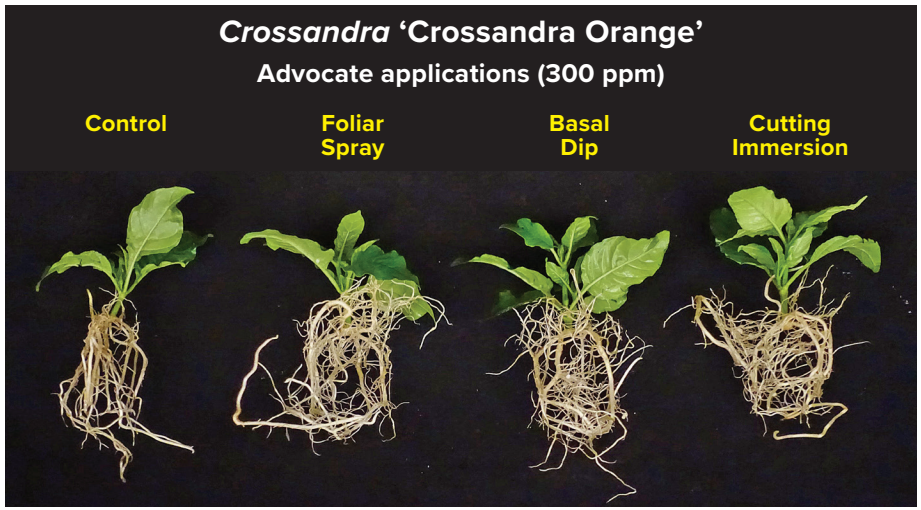



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Crossandra infundibuliformis* Crossandra Orange (firecracker flower) were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and daily light integral of 10 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (control) or received a 300 ppm foliar spray at a volume of 2 qt. per 100 sq. ft., basal dip or were immersed in solution of Advocate. Photo taken 28 days after spray application.

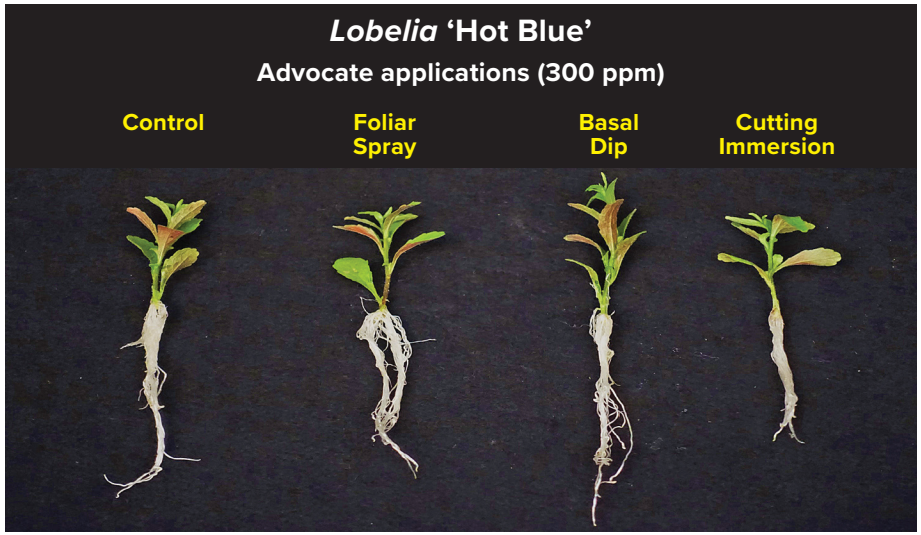



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Lobelia erinus* Hot Blue were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and daily light integral of 10 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (control) or received a 300 ppm foliar spray at a volume of 2 qt. per 100 sq. ft., basal dip or were immersed in solution of Advocate. Photo taken 28 days after spray application.

## Advocate Application Method *continued*

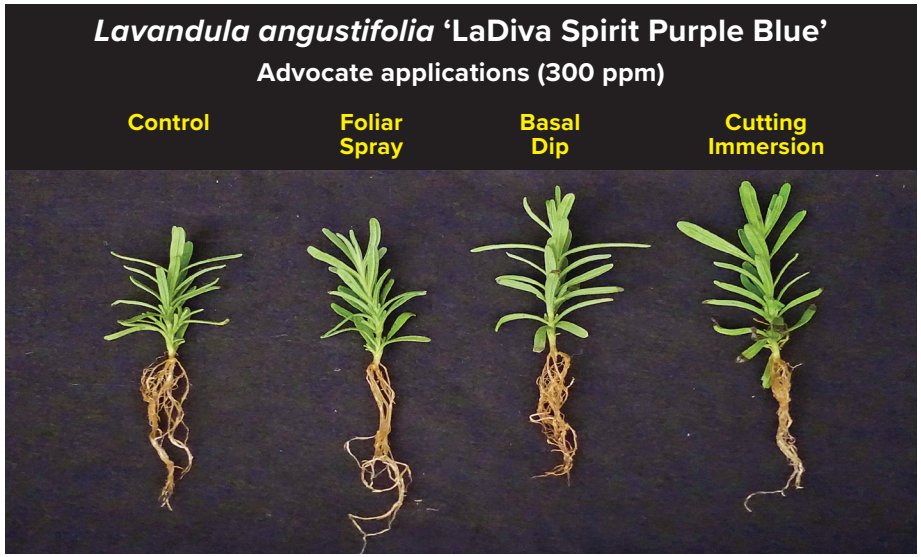



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Lavandula angustifolia* LaDiva Spirit Purple Blue were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and daily light integral of 10 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (control) or received a 300 ppm foliar spray at a volume of 2 qt. per 100 sq. ft., basal dip or were immersed in solution of Advocate. Photo taken 28 days after spray application.



## Advocate Concentrations

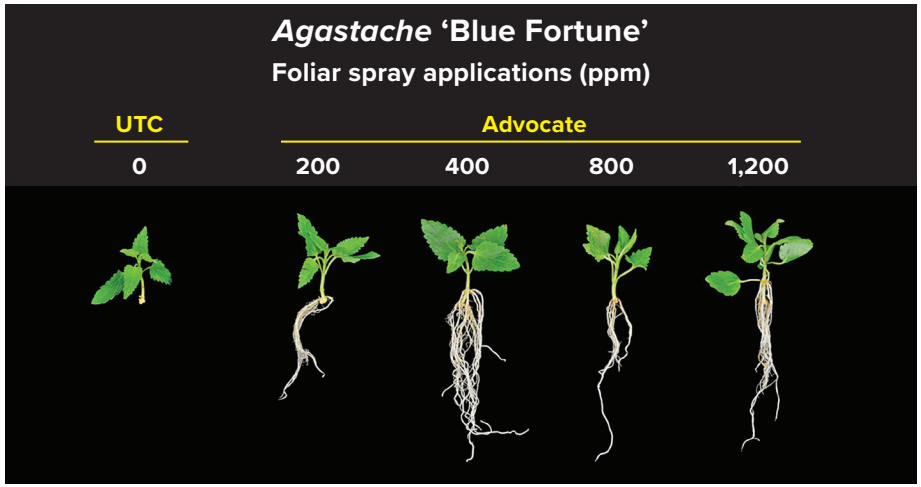



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Agastache foeniculum* Blue Fortune (anise hyssop) were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 sq. ft. Photo taken 21 days after spray application.

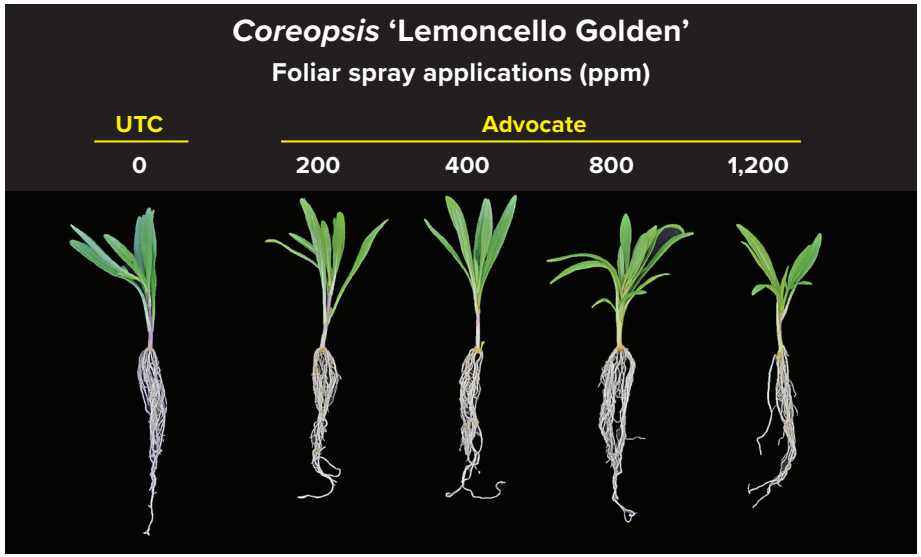



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Coreopsis auriculata* Lemoncello Golden (lobed tickseed) were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 sq. ft. Photo taken 21 days after spray application.

## Advocate Concentrations *continued*

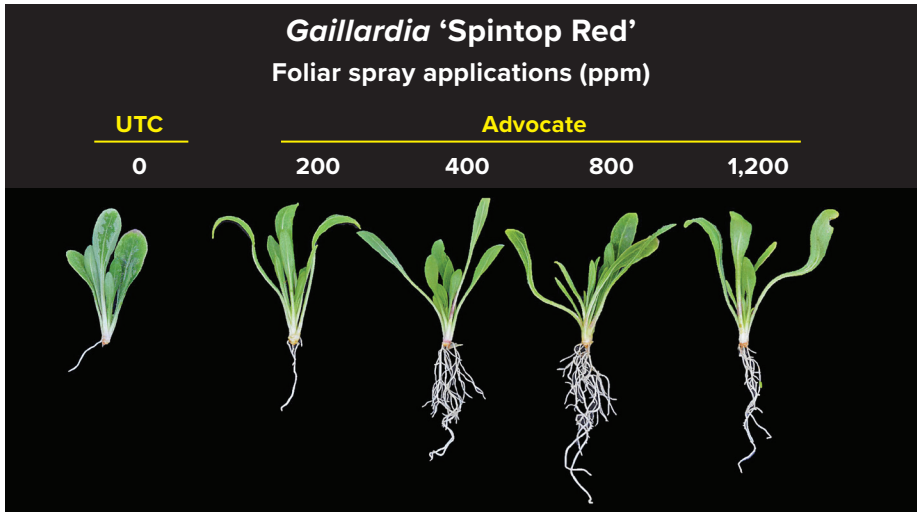



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Gaillarida aristata* Spintop Red (blanketflower) were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 square feet. Photo taken 21 days after spray application.

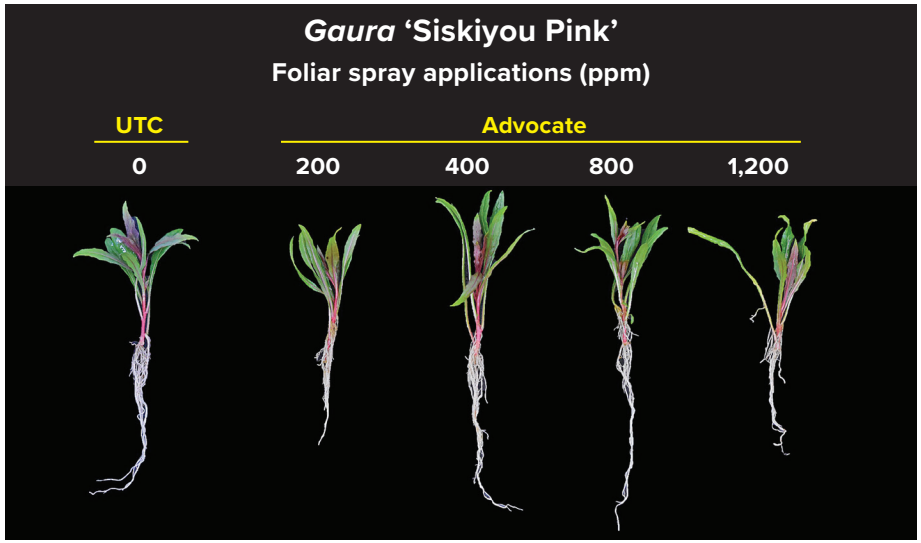



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Gaura lindheimeri* Siskiyou Pink (wandflower) were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 sq. ft. Photo taken 21 days after spray application.

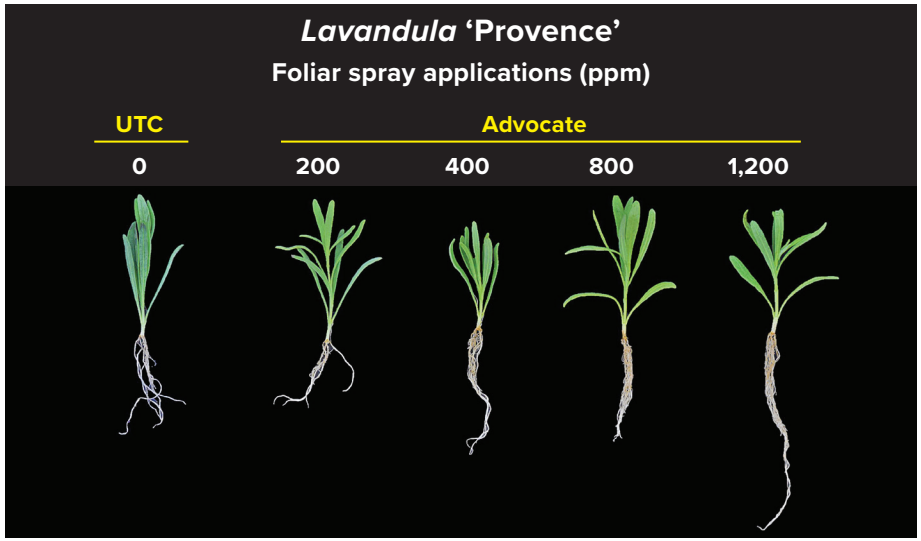



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Lavandula × intermedia* Provence were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 sq. ft. Photo taken 21 days after spray application.

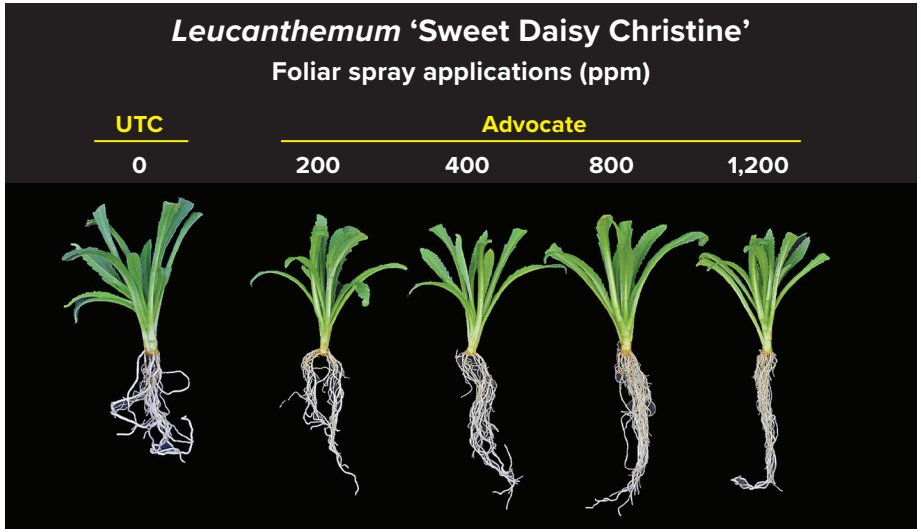



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Leucanthemum maximum* Sweet Daisy Christine (Shasta daisy) were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 sq. ft. Photo taken 21 days after spray application.

## Advocate Concentrations *continued*

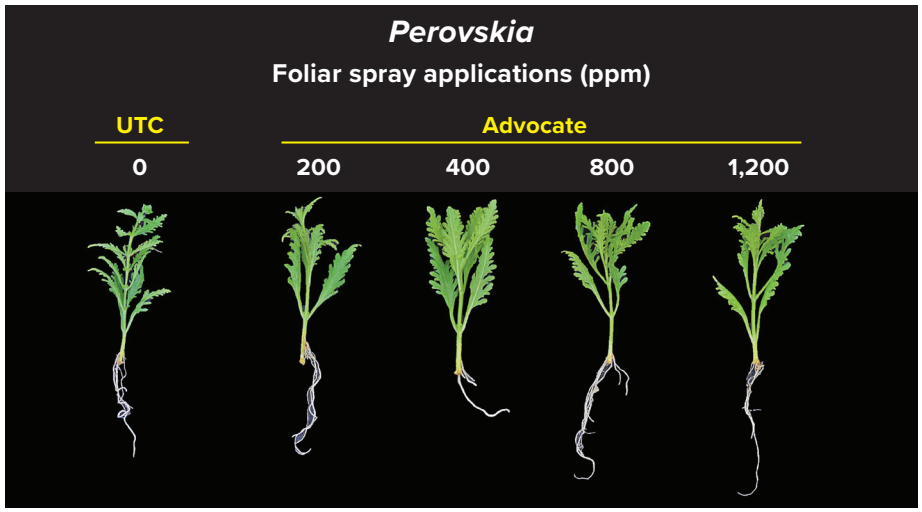



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Perovskia atriplicifolia* (Russian sage) were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 sq. ft. Photo taken 21 days after spray application.

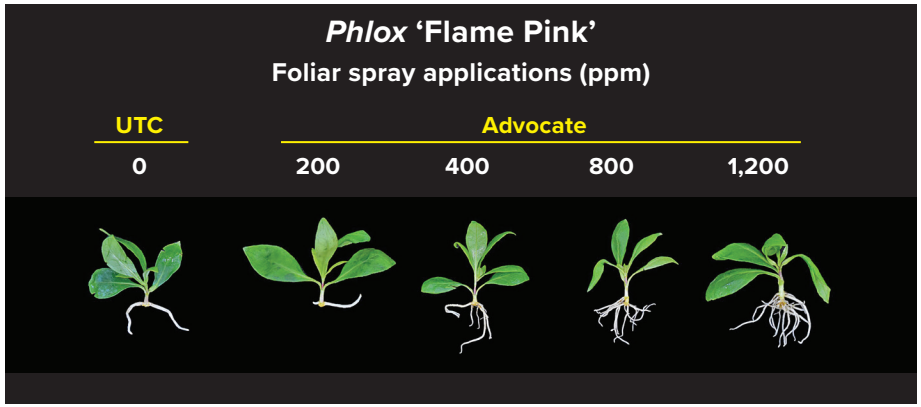



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Phlox paniculata* Flame Pink (garden phlox) were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$ Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 sq. ft. Photo taken 21 days after spray application.

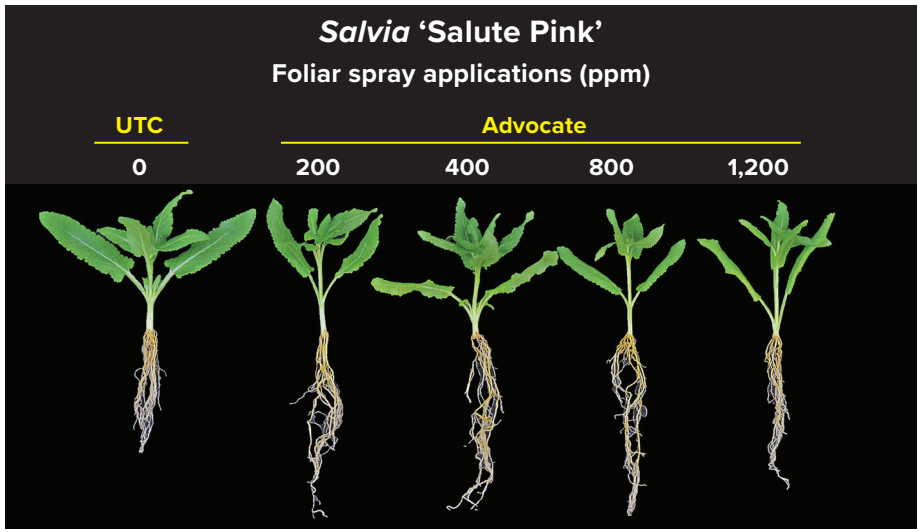



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Salvia nemorosa* Salute Pink (perennial sage) were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 sq. ft. Photo taken 21 days after spray application.

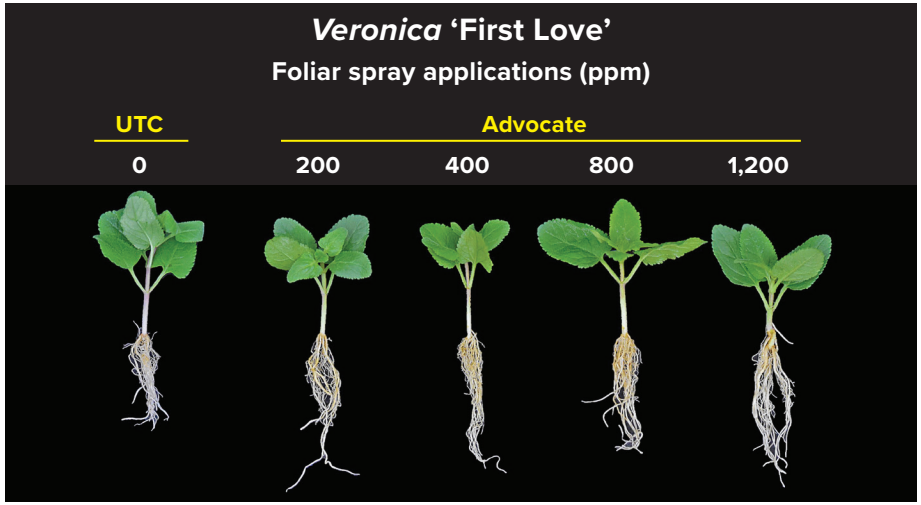



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Veronica longifolia* First Love (speedwell) were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a foliar spray of Advocate at 200, 400, 800 or 1,200 ppm at a volume of 2 qt. per 100 sq. ft. Photo taken 21 days after spray application.

## Advocate Foliar Spray Volume

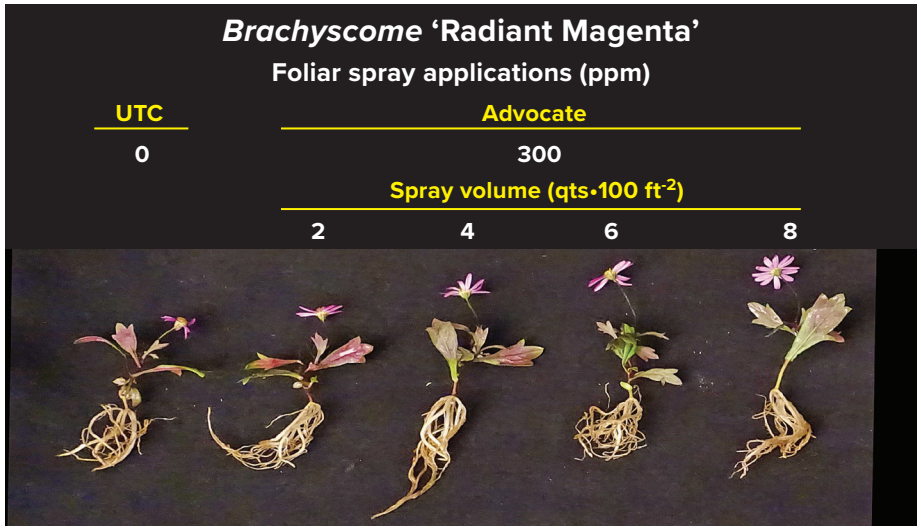



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Brachyscome* sp. Radiant Magenta were rooted in a greenhouse with an air temperature of 72F 22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and daily light integral of 10 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 300 ppm foliar spray of Advocate at a volume of 2, 4, 6 or 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

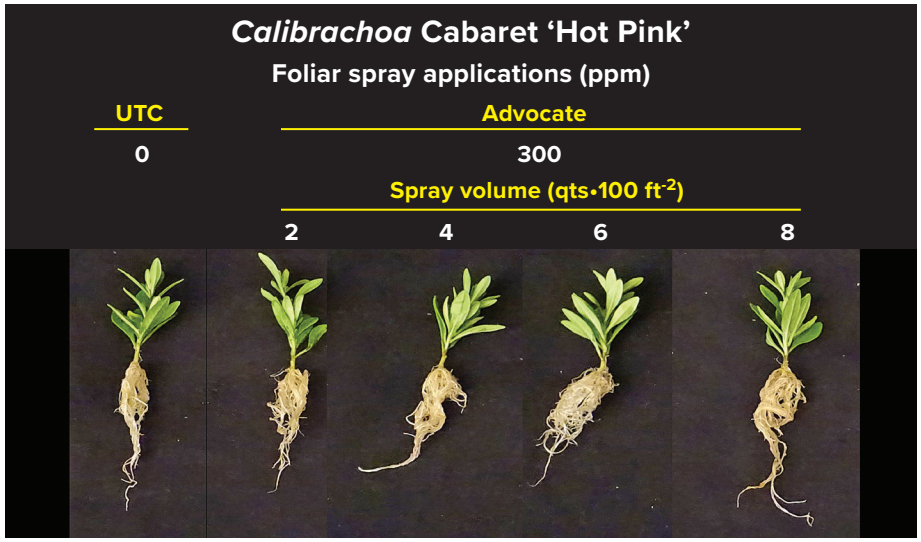



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Calibrachoa* sp. Cabaret Hot Pink were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and daily light integral of 10 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 300 ppm foliar spray of Advocate at a volume of 2, 4, 6 or 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.



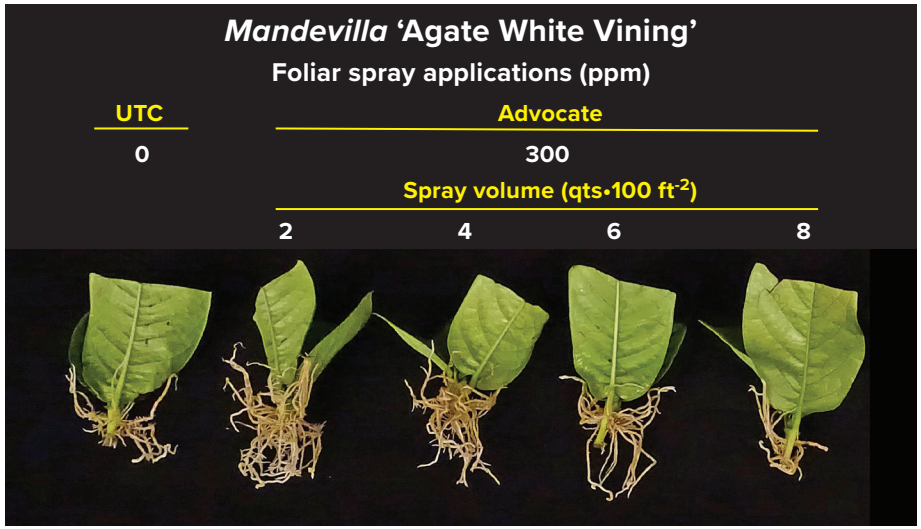



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Mandevilla sanderi* Agate White Vining (Brazilian jasmine) were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and daily light integral of 10 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 300 ppm foliar spray of Advocate at a volume of 2, 4, 6 or 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

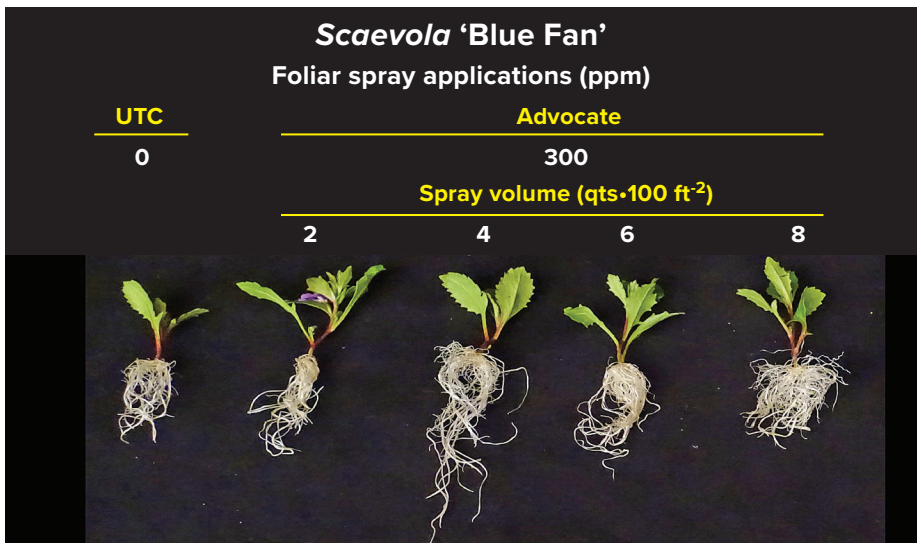



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Scaevola aemula* Blue Fan (fan flower) were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and daily light integral of 10 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 300 ppm foliar spray of Advocate at a volume of 2, 4, 6 or 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

## Advocate Concentration and Foliar Spray Volume

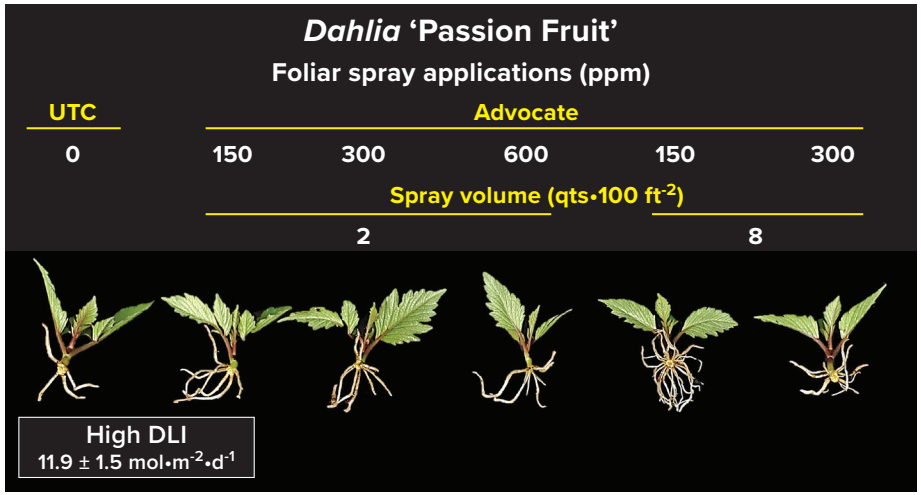



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Dahlia pinnata* Passion Fruit were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and under a high daily light integral (DLI) of 11.9 ± 1.5 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 150, 300 or 600 ppm foliar spray of Advocate at a volume of 2 qt. per 100 sq. ft. or 150 or 300 ppm at a volume of 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

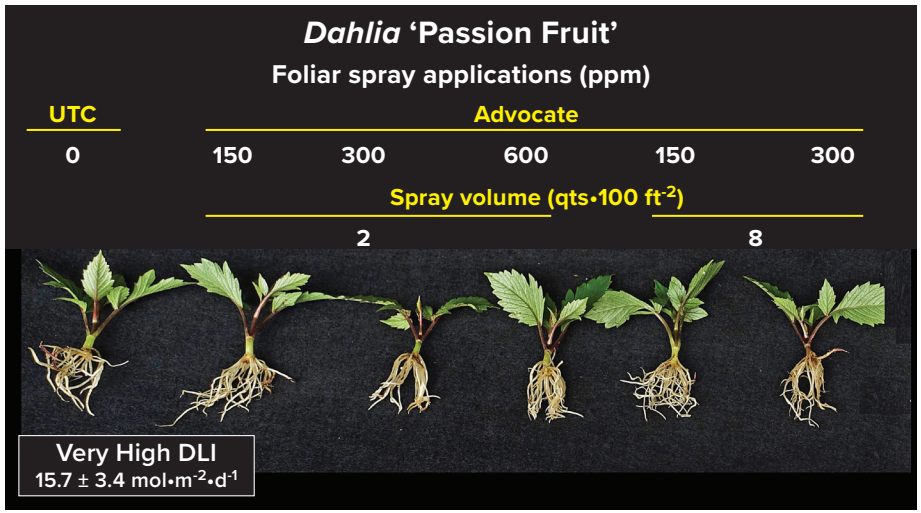



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Dahlia pinnata* Pasion Fruit were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and under a very high daily light integral (DLI) of 15.7 ± 3.4 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 150, 300 or 600 ppm foliar spray of Advocate at a volume of 2 qt. per 100 sq. ft. or 150 or 300 ppm at a volume of 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

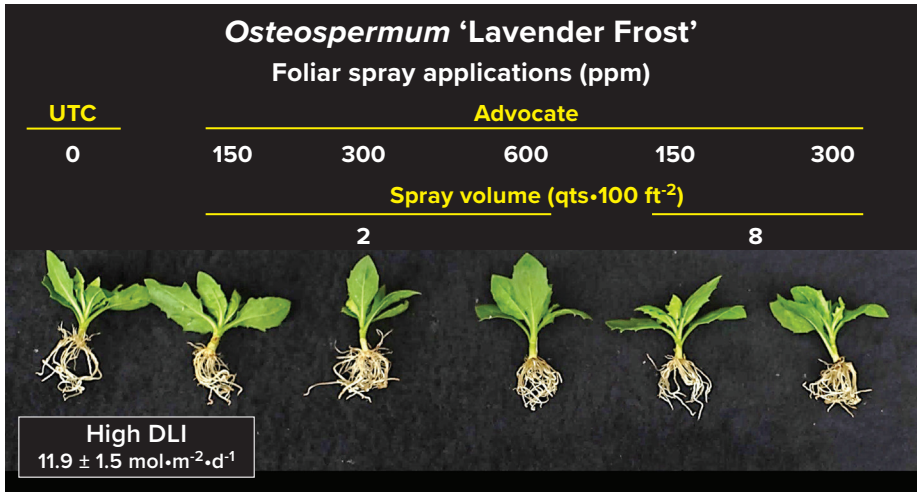



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Osteospermum ecklonis* Lavender Frost (African daisy) were rooted were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and under a high daily light integral (DLI) of 11.9 ± 1.5 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 150, 300 or 600 ppm foliar spray of Advocate at a volume of 2 qt. per 100 sq. ft. or 150 or 300 ppm at a volume of 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

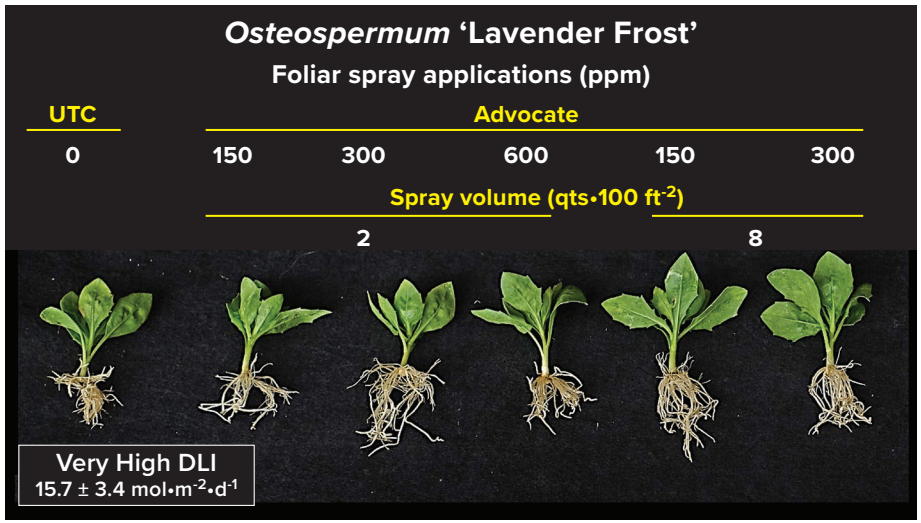



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Osteospermum ecklonis* Lavender Frost (African daisy) were rooted were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and under a very high daily light integral (DLI) of 15.7 ± 3.4 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 150, 300 or 600 ppm foliar spray of Advocate at a volume of 2 qt. per 100 sq. ft. or 150 or 300 ppm at a volume of 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

## Advocate Concentration and Foliar Spray Volume *continued*

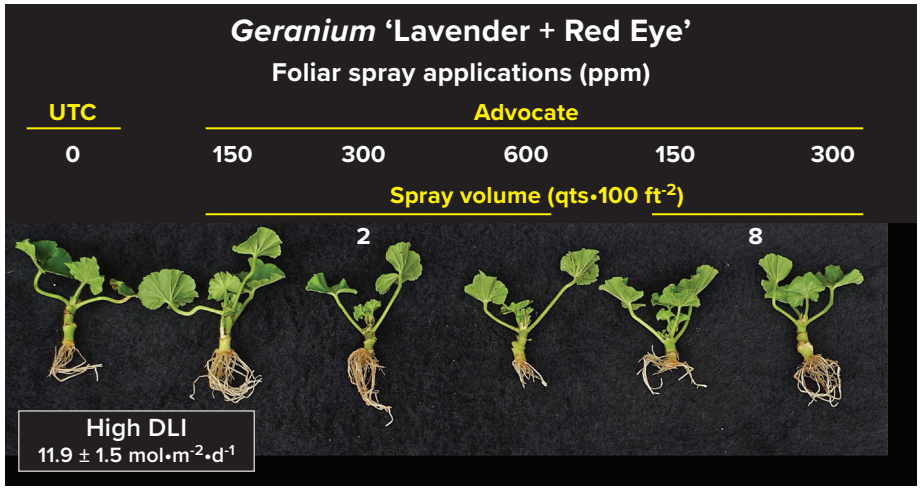



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Pelargonium × hortorum* Lavender + Red Eye (zonal geranium) were rooted were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and under a high daily light integral (DLI) of 11.9 ± 1.5 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 150, 300 or 600 ppm foliar spray of Advocate at a volume of 2 qt. per 100 sq. ft. or 150 or 300 ppm at a volume of 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

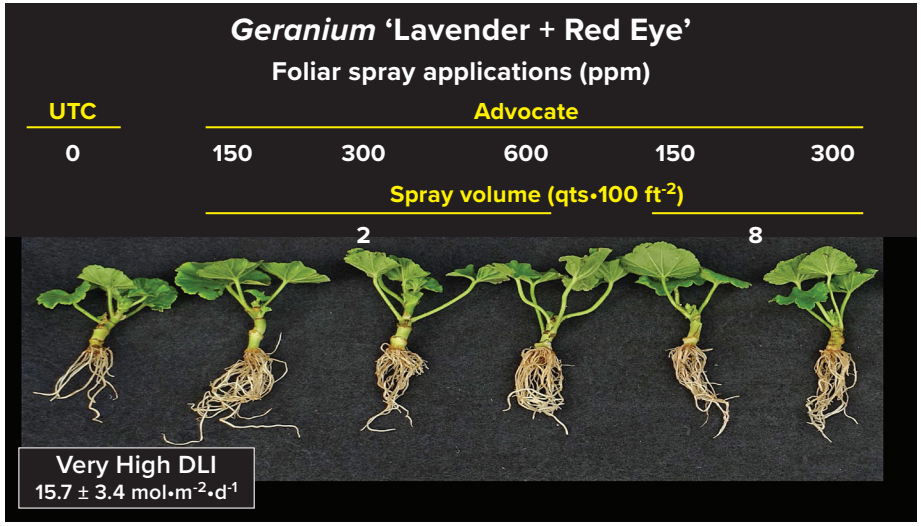



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Pelargonium × hortorum* Lavender + Red Eye (zonal geranium) were rooted were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and a under a very high daily light integral (DLI) of 15.7 ± 3.4 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 150, 300 or 600 ppm foliar spray of Advocate at a volume of 2 qt. per 100 sq. ft. or 150 or 300 ppm at a volume of 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

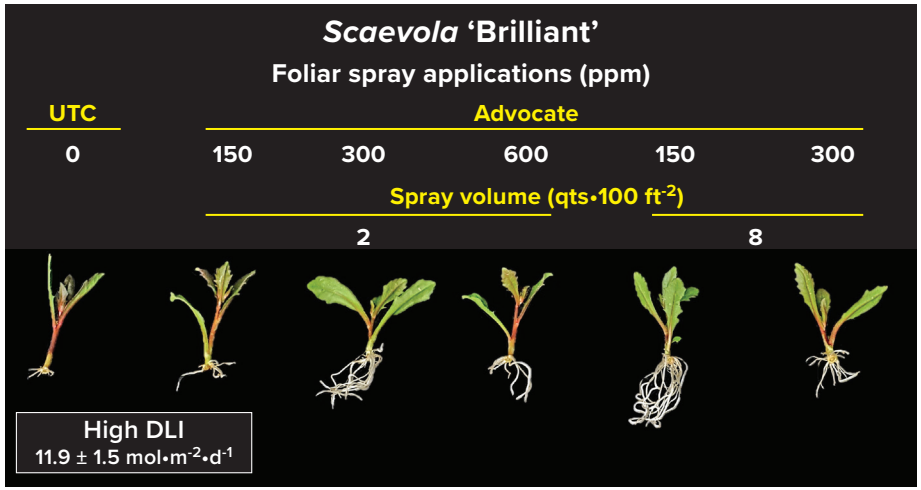



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Scaevola aemula* Brilliant (fan flower) were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and a under a high daily light integral (DLI) of 11.9 ± 1.5 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 150, 300 or 600 ppm foliar spray of Advocate at a volume of 2 qt. per 100 sq. ft. or 150 or 300 ppm at a volume of 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

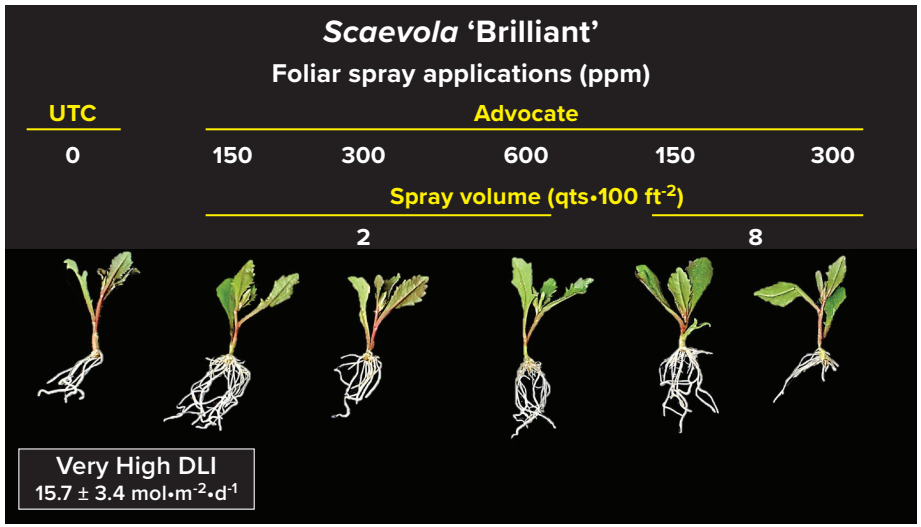



Photo: Dr. Roberto G. Lopez, Michigan State University.

Cuttings of *Scaevola aemula* Brilliant (fan flower) were rooted in a greenhouse with an air temperature of 72F (22C), root-zone temperature of 75F (23C), a vapor pressure deficit of 0.3 kPa and a under a very high daily light integral (DLI) of 15.7 ± 3.4 mol•m$^{-2}$•d$^{-1}$. Cuttings either did not receive (UTC) or received a 150, 300 or 600 ppm foliar spray of Advocate at a volume of 2 qt. per 100 sq. ft. or 150 or 300 ppm at a volume of 8 qt. per 100 sq. ft. Photo taken 28 days after spray application.

## Advocate and Collate Tank Mixes

### *Calibrachoa* 'Blue Sky 2019'

**Foliar spray applications (ppm)**

| UTC | Advocate | 200 ppm Advocate + Collate | | | |
|---|---|---|---|---|---|
| 0 | 200 | 50 | 100 | 200 | 500 |

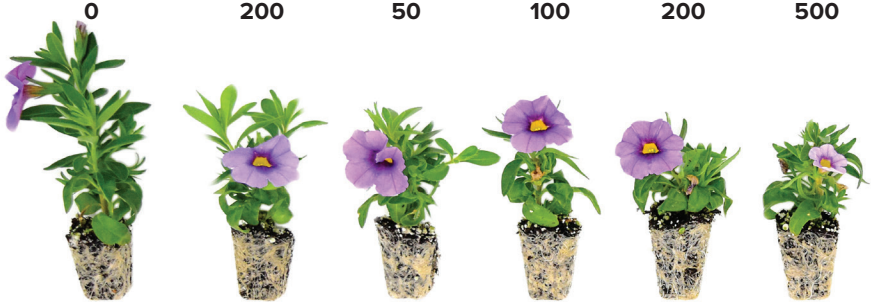


Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Calibrachoa* sp. Blue Sky 2019 were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 $mol \cdot m^{-2} \cdot d^{-1}$. After one day in the propagation environment, cuttings either did not receive (UTC) or received a foliar spray of 200 ppm Advocate at a volume of 2 qt. per 100 sq. ft. After 10 days of propagation, cuttings either received no additional treatment (UTC or 200 ppm Advocate) or a tank mix foliar spray of 200 ppm Advocate and 50, 100, 200 or 500 ppm Collate (ethephon) at a volume of 2 qt. per 100 sq. ft. Photos taken 28 days after tank mix application.

### *Coleus* 'Main Street Michigan Avenue'

**Foliar spray applications (ppm)**

| UTC | Advocate | 200 ppm Advocate + Collate | | | |
|---|---|---|---|---|---|
| 0 | 200 | 50 | 100 | 200 | 500 |



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Coleus* sp. Main Street Michigan Avenue were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 $mol \cdot m^{-2} \cdot d^{-1}$. After one day in the propagation environment, cuttings either did not receive (UTC) or received a foliar spray of 200 ppm Advocate at a volume of 2 qt. per 100 sq. ft. After 10 days of propagation, cuttings either received no additional treatment (UTC or 200 ppm Advocate) or a tank mix foliar spray of 200 ppm Advocate and 50, 100, 200 or 500 ppm Collate (ethephon) at a volume of 2 qt. per 100 sq. ft. Photos taken 28 days after tank mix application.



### *Petunia* 'Surprise Blue'

**Foliar spray applications (ppm)**

| UTC | Advocate | 200 ppm Advocate + Collate | | | |
|---|---|---|---|---|---|
| 0 | 200 | 50 | 100 | 200 | 500 |

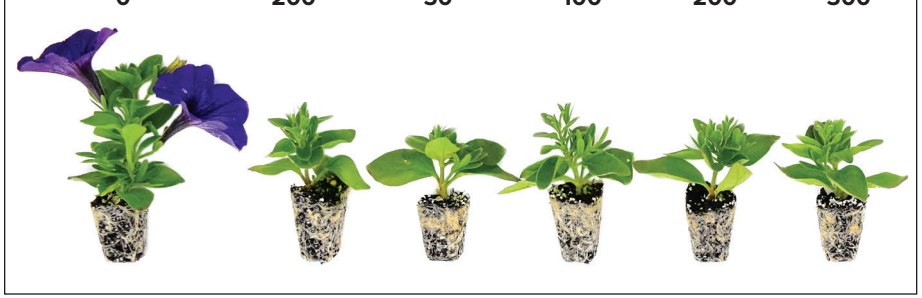


Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Petunia × hybrida* Surprise Blue were rooted in a greenhouse with an air temperature of 73F (22C), root-zone temperature of 73F and daily light integral of 12 $mol \cdot m^{-2} \cdot d^{-1}$. After one day in the propagation environment, cuttings either did not receive (UTC) or received a foliar spray of 200 ppm Advocate at a volume of 2 qt. per 100 sq. ft. After 10 days of propagation, cuttings either received no additional treatment (UTC or 200 ppm Advocate) or a tank mix foliar spray of 200 ppm Advocate and 50, 100, 200 or 500 ppm Collate (ethephon) at a volume of 2 qt. per 100 sq. ft. Photos taken 28 days after tank mix application.



## Advocate and Configure Tank Mixes

### *Calibrachoa* 'Aloha Kona Dark Red'

**Foliar spray applications (ppm)**

| UTC | Advocate | 200 ppm Advocate + Configure | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | 200 | 50 | 100 | 200 | 300 | 400 | 600 | 800 |



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Calibrachoa* sp. Aloha Kona Dark Red were rooted in a greenhouse with an air temperature of 70F (21C), root-zone temperature of 73F (22C) and daily light integral of 12 $mol \cdot m^{-2} \cdot d^{-1}$. After one day in the propagation environment, cuttings either did not receive (UTC) or received a foliar spray of 200 ppm Advocate at a volume of 2 qt. per 100 sq. ft. After 12 days of propagation, cuttings either received no additional treatment (UTC or 200 ppm Advocate) or a tank mix foliar spray of 200 ppm Advocate and 50, 100, 200, 300, 400, 600 or 800 ppm Configure (benzyladenine) at a volume of 2 qt. per 100 sq. ft. Photos taken 21 days after tank mix application.

### *Fuchsia* 'Dark Eyes'

**Foliar spray applications (ppm)**

| UTC | Advocate | 200 ppm Advocate + Configure | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | 200 | 50 | 100 | 200 | 300 | 400 | 600 | 800 |



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Fuchsia hybrida* Dark Eyes were rooted in a greenhouse with an air temperature of 70F (21C), root-zone temperature of 73F (22C) and daily light integral of 12 $mol \cdot m^{-2} \cdot d^{-1}$. After one day in the propagation environment, cuttings either did not receive (UTC) or received a foliar spray of 200 ppm Advocate at a volume of 2 qt. per 100 sq. ft. After 12 days of propagation, cuttings either received no additional treatment (UTC or 200 ppm Advocate) or a tank mix foliar spray of 200 ppm Advocate and 50, 100, 200, 300, 400, 600 or 800 ppm Configure (benzyladenine) at a volume of 2 qt. per 100 sq. ft. Photos taken 21 days after tank mix application.

### *Gaura* 'Siskiyou Pink'

**Foliar spray applications (ppm)**

| UTC | Advocate | 200 ppm Advocate + Configure | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | 200 | 50 | 100 | 200 | 300 | 400 | 600 | 800 |



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Gaura lindheimeri* Siskiyou Pink (wandflower) were rooted in a greenhouse with an air temperature of 70F (21C), root-zone temperature of 73F (22C) and daily light integral of 12 $mol \cdot m^{-2} \cdot d^{-1}$. After one day in the propagation environment, cuttings either did not receive (UTC) or received a foliar spray of 200 ppm Advocate at a volume of 2 qt. per 100 sq. ft. After 12 days of propagation, cuttings either received no additional treatment (UTC or 200 ppm Advocate) or a tank mix foliar spray of 200 ppm Advocate and 50, 100, 200, 300, 400, 600 or 800 ppm Configure (benzyladenine) at a volume of 2 qt. per 100 sq. ft. Photos taken 21 days after tank mix application.

### *Lamium* 'Red Nancy'

**Foliar spray applications (ppm)**

| UTC | Advocate | 200 ppm Advocate + Configure | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | 200 | 50 | 100 | 200 | 300 | 400 | 600 | 800 |



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Lamium maculatum* Nancy Red (deadnettle) were rooted in a greenhouse with an air temperature of 70F (21C), root-zone temperature of 73F (22C) and daily light integral of 12 $mol \cdot m^{-2} \cdot d^{-1}$. After one day in the propagation environment, cuttings either did not receive (UTC) or received a foliar spray of 200 ppm Advocate at a volume of 2 qt. per 100 sq. ft. After 12 days of propagation, cuttings either received no additional treatment (UTC or 200 ppm Advocate) or a tank mix foliar spray of 200 ppm Advocate and 50, 100, 200, 300, 400, 600 or 800 ppm Configure (benzyladenine) at a volume of 2 qt. per 100 sq. ft. Photos taken 21 days after tank mix application.

## Advocate and Configure Tank Mixes *continued*

### *Petunia* 'Surprise Purple Dance'

**Foliar spray applications (ppm)**

| UTC | Advocate | 200 ppm Advocate + Configure | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | 200 | 50 | 100 | 200 | 300 | 400 | 600 | 800 |



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Petunia × hybrida* Surprise Purple Dance were rooted in a greenhouse with an air temperature of 70F (21C), root-zone temperature of 73F (22C) and daily light integral of 12 $mol \cdot m^{-2} \cdot d^{-1}$. After one day in the propagation environment, cuttings either did not receive (UTC) or received a foliar spray of 200 ppm Advocate at a volume of 2 qt. per 100 sq. ft. After 12 days of propagation, cuttings either received no additional treatment (UTC or 200 ppm Advocate) or a tank mix foliar spray of 200 ppm Advocate and 50, 100, 200, 300, 400, 600 or 800 ppm Configure (benzyladenine) at a volume of 2 qt. per 100 sq. ft. Photos taken 21 days after tank mix application.

### *Verbena* 'Empress Flair Red'

**Foliar spray applications (ppm)**

| UTC | Advocate | 200 ppm Advocate + Configure | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | 200 | 50 | 100 | 200 | 300 | 400 | 600 | 800 |



Photo: Dr. W. Garrett Owen, The Ohio State University.

Cuttings of *Verbena canadensis* Empress Flair Red were rooted in a greenhouse with an air temperature of 70F (21C), root-zone temperature of 73F (22C) and daily light integral of 12 $mol \cdot m^{-2} \cdot d^{-1}$. After one day in the propagation environment, cuttings either did not receive (UTC) or received a foliar spray of 200 ppm Advocate at a volume of 2 qt. per 100 sq. ft. After 12 days of propagation, cuttings either received no additional treatment (UTC or 200 ppm Advocate) or a tank mix foliar spray of 200 ppm Advocate and 50, 100, 200, 300, 400, 600 or 800 ppm Configure (benzyladenine) at a volume of 2 qt. per 100 sq. ft. Photos taken 21 days after tank mix application.





# Advocate Use Tips for Success

By **W. Garrett Owen**, Extension Specialist, Floriculture and Nursery Crops—The Ohio State University,
& **Roberto G. Lopez**, Extension Specialist, Floriculture & Hydroponic Food Crops—Michigan State University

When using Advocate (20% indole-3-butyric acid) to root cuttings, consider the following tips for success:

## Application Method

- Advocate can be applied as a foliar spray, basal dip or soak, and for entire cutting immersion.
- Phytotoxicity can occur on some species and cultivars with a cutting immersion.

## Application Timing

- Apply Advocate at cutting stick or 24 hours after cutting stick.
- Do not apply to wilted or stressed cuttings.

## Concentrations

- Trial rates starting at 200 to 300 ppm Advocate at a volume of 2 qt. per 100 sq. ft.
- For annuals and herbaceous perennials, do not exceed 800 ppm Advocate.
- Epinasty or twisting leaves may occur above 800 ppm Advocate.

## Foliar Spray Volume

- Spray volume of 2 qt. per 100 sq. ft. is effective for most species.
- For difficult-to-root species and under undesirable rooting conditions, spray volumes up to 8 qt. per 100 sq. ft. may be more effective at lower concentrations.
- High spray volumes in combination with a high spray concentration can inhibit rooting in some species and cultivars.

## Tank Mixes

- Tanks mixes of Advocate and Collate, or Advocate and Configure can be effective for rooting and controlling growth during cutting propagation.
- Apply tank mixes after root initiation or around 10 days.
- Apply 200 ppm Advocate and trial rates starting at 50 ppm Collate at a volume of 2 qt. per 100 sq. ft.
- Apply 200 ppm Advocate and trial rates starting at 50 ppm Configure at a volume of 2 qt. per 100 sq. ft. Do not exceed 600 ppm Configure.
- An adjuvant may be needed to achieve uniform coverage.
- Proper agitation of tank mixes must be maintained to assure proper product dispersal.
- Apply tank mixes of Advocate and other products within one day of mixing.

## Species & Cultivars

- Variation among species and cultivars may occur regarding the level of efficacy and potential injury.
- Always trial species and cultivars to determine best concentration.

## Environmental Conditions

- Propagation environment conditions may influence rooting success.
- Where applicable, provide optimal light, air and root-zone temperatures, humidity, misting, and nutrition for rooting success.

# Recommended Rates for Advocate Use and Advocate Tank Mixes with Floriculture Crops in Greenhouses

**W. Garrett Owen**, Extension Specialist, Floriculture and Nursery Crops—The Ohio State University
**Roberto Lopez**, Extension Specialist, Floriculture & Hydroponic Food Crops—Michigan State University
**Brian E. Whipker**, Extension Specialist, Floriculture Crops—North Carolina State University
**Christopher J. Currey**, Extension Specialist, Floriculture and Hydroponic Food Crops—Iowa State University

This table lists trial rates of Advocate and tank mixes of Advocate and plant growth regulators for greenhouse crops. Read the Advocate label for a complete listing of use and precautions. Rooting success can vary depending on several environmental and cultural factors, including plant type, cutting size, leaf orientation and turgidity, cultivar, propagation environmental conditions, and application timing, volume, and concentration.

When using Advocate for the first time, it's best to trial the rate on a few cuttings prior to spraying the entire crop. Keep accurate records and adjust rates for your location. Unless noted, all foliar sprays of Advocate applied once using 0.5 gal. (2 qt.) per 100 sq. ft. of bench area and applied within 24 hours after sticking unrooted cuttings.

## Annual Floriculture Crops

Table 1. Trial results of Advocate foliar spray applications to promote adventitious root formation of annual bedding plant unrooted cuttings. Tank mixes of Advocate and plant growth regulators trialed to control growth and induce branching.

| Botanical Name | Cultivar | Purpose | Chemical(s) | Rate(s) | Remarks / Precautions | Region(s) |
|---|---|---|---|---|---|---|
| *Begonia × hiemalis* (Elatior Begonia) | Rhine Nadine | Rooting | Advocate | 300 ppm | Similar rooting to basal dip and cutting immersion. | North |
| *Bidens ferulifolia* (Bidens) | Bidy Boom Red | Rooting | Advocate | 300 ppm | Similar rooting to basal dip and cutting immersion. | North |
| *Brachyscome* sp. (Brachyscome) | Radiant Magenta | Rooting | Advocate | 300 ppm | Volume of 6 to 8 qts. per 100 sq. ft. increased rooting. | North |
| *Calibrachoa* sp. (Calibrachoa) | Aloha Kona Dark Red | Rooting | Advocate | 200 to 400 ppm | Recommended rates. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 400 ppm | Apply at 200 ppm 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Controlled liner height and stimulated branching. | Mid-South |
| | Blue Sky 2019 | Rooting and growth control | Advocate + Collate | 200 ppm + 50 ppm | Apply at 200 ppm 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Collate. Controlled liner height. | Mid-South |
| | Cabaret Hot Pink | Rooting | Advocate | 300 ppm | Volume of 6 to 8 qt. per 100 sq. ft. increased rooting. | North |
| *Coleus* sp. (Coleus) | Main Street Michigan Avenue | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and growth control | Advocate + Collate | 200 ppm + 50 ppm | Apply at 200 ppm 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Collate. Controlled liner height. | Mid-South |
| *Crossandra infundibuliformis* (Firecracker flower) | Crossandra Orange | Rooting | Advocate | 300 ppm | Similar rooting to basal dip and cutting immersion. | North |
| *Evolvulus glomeratus* (Evolvulus) | Hawaiian Blue Eyes | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 300 ppm | Apply at 200 ppm 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Stimulated lateral branching. Trial rates. | Mid-South |
| *Dahlia pinnata* (Dahlia) | Passion Fruit | Rooting | Advocate | 150 to 300 ppm | Under low light: Apply 150 ppm at a volume of 8 qt. per 100 sq. ft.<br><br>Under high light: Apply 150 ppm at a volume of 2 to 8 qt. per 100 sq. ft. | North |

# Annual Floriculture Crops *continued*

| Botanical Name | Cultivar | Purpose | Chemical(s) | Rate(s) | Remarks / Precautions | Region(s) |
|---|---|---|---|---|---|---|
| *Fuchsia hybrida* (Fuchsia) | Dark Eyes | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 400 ppm | Apply at 200 ppm 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Controlled liner growth. No lateral branching stimulated. Trial rates. | Mid-South |
| *Lantana camara* (Lantana) | New Gold | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 400 ppm | Apply 200 ppm Advocate 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Controlled liner growth. No lateral branching stimulated. Trial rates. | Mid-South |
| *Lobelia erinus* (Lobelia) | Hot Blue | Rooting | Advocate | 300 ppm | Foliar sprays are more effective than basal dip or cutting immersion. | North |
| *Mandevilla sanderi* (Brazilian jasmine) | Agate White Vining | Rooting | Advocate | 300 ppm | Volume of 2 to 4 qt. per 100 sq. ft. increased rooting. | North |
| *Osteospermum ecklonis* (African daisy/ osteospermum) | Margarita Rioja Red | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 400 ppm | Apply 200 ppm Advocate 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Controlled liner growth and stimulated lateral branching. | Mid-South |
| | Lavender Frost | Rooting | Advocate | 300 ppm | Under low light: Apply 300 ppm at a volume of 2 to 8 qt. per 100 sq. ft.<br><br>Under high light: Apply 150 ppm at a volume of 8 qt. per 100 sq. ft. | North |
| *Pelargonium × hortorum* (Zonal geranium) | Lavender + Red Eye | Rooting | Advocate | 150 to 300 ppm | Under low light: Apply 150 to 300 ppm at a volume of 2 qt. per 100 sq. ft. or 150 ppm at a volume of 8 qt. per 100 sq. ft.<br><br>Under high light: Apply 150 ppm at a volume of 2 qt. per 100 sq. ft. | North |
| *Petunia × hybrida* (Petunia) | Surprise Blue<br>Surprise Purple Dance | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | Surprise Blue | Rooting and growth control | Advocate + Collate | 200 ppm + 50 ppm | Apply at 200 ppm 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Collate. Controlled liner height and stimulated lateral branching. | Mid-South |
| | Surprise Purple Dance | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 300 ppm | Apply 200 ppm Advocate 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Controlled liner growth and stimulated lateral branching. | Mid-South |
| *Scaevola aemula* (Fan flower) | Brilliant | Rooting | Advocate | 150 to 600 ppm | Under low light: Apply 300 ppm at a volume of 2 qt. per 100 sq. ft. or 150 ppm at a volume of 8 qt. per 100 sq. ft.<br><br>Under high light: Apply 150 at a volume of 2 to 8 qt. per 100 sq. ft. | North |
| | Blue Fan | Rooting | Advocate | 300 ppm | Volume of 6 to 8 qt. per 100 sq. ft. increased rooting. | North |
| *Verbena canadensis* (Verbena) | Empress Flair Red | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 400 ppm | Apply 200 ppm Advocate 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Controlled liner growth and stimulated lateral branching. | Mid-South |

# Recommended Rates for Advocate Use and Advocate Tank Mixes with Herbaceous Perennials

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This table lists trial rates of Advocate and tank mixes of Advocate and plant growth regulators for greenhouse crops. Read the Advocate label for a complete listing of use and precautions. Rooting success can vary depending on several environmental and cultural factors, including plant type, cutting size, leaf orientation and turgidity, cultivar, propagation environmental conditions, and application timing, volume and concentration.

When using Advocate for the first time, it's best to trial the rate on a few cuttings prior to spraying the entire crop. Keep accurate records and adjust rates for your location. Unless noted, all foliar sprays of Advocate applied once using 0.5 gal. (2 qt.) per 100 sq. ft. of bench area and applied within 24 hours after sticking unrooted cuttings.

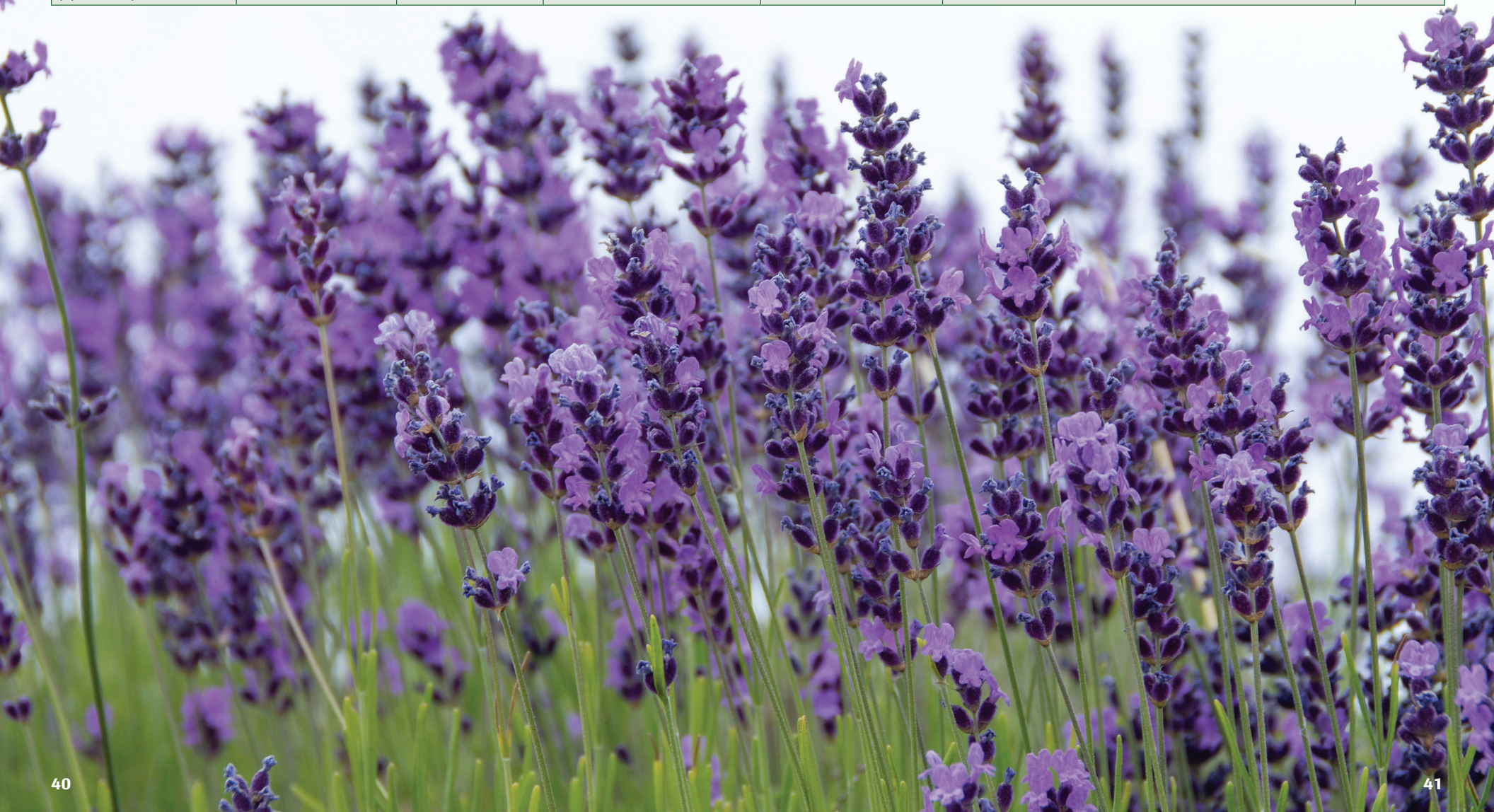
## Herbaceous Perennials

Table 2. Trial results of Advocate foliar spray applications to promote adventitious root formation of herbaceous perennial unrooted cuttings. Tank mixes of Advocate and plant growth regulators trialed to control growth and induce branching.

| Botanical Name | Cultivar | Purpose | Chemical(s) | Rate(s) | Remarks / Precautions | Region(s) |
|---|---|---|---|---|---|---|
| *Agastache foeniculum* (Anise hyssop) | Blue Fortune | Rooting | Advocate | 200 to 400 ppm | Recommended rates. | Mid-South |
| *Coreopsis auriculata* (Lobed tickseed) | Limoncello Golden | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| *Coreopsis verticillate* (Threadleaf coreopsis) | Moonbeam | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 400 ppm | Apply 200 ppm Advocate 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Rates of Configure up to 400 ppm did not control growth control or stimulate lateral branching. Trial rates. | Mid-South |
| *Gaillarida aristata* (Blanketflower) | Spintop Red | Rooting | Advocate | 400 ppm | Recommended rate. | Mid-South |
| *Gaura lindheimeri* (Wandflower) | Siskiyou Pink | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 600 ppm | Apply 200 ppm Advocate 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Rates up to 600 ppm can be used after conducting your own trial. Controlled liner growth and stimulated lateral branching. | Mid-South |
| *Lamium maculatum* (Deadnettle) | Nancy Red | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | 200 ppm + 50 to 400 ppm | Apply 200 ppm Advocate 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Rates of Configure up to 400 ppm controlled liner growth. No branching stimulated. Trial rates. | Mid-South |
| *Lavandula angustifolia* (Lavender) | LaDiva Spirit Purple Blue | Rooting | Advocate | 300 ppm | Similar rooting to basal dip and cutting immersion. | North |
| *Lavandula x intermedia* (Lavender) | Provence | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| | | Rooting and induce lateral or basal branching | Advocate + Configure | | Apply 200 ppm Advocate 24 hours after cutting stick and again at 10 days after cutting stick, but as a tank mix with Configure. Rates of Configure up to 400 ppm controlled liner growth. No branching stimulated. Trial rates. | Mid-South |

## Herbaceous Perennials *continued*

| Botanical Name | Cultivar | Purpose | Chemical(s) | Rate(s) | Remarks / Precautions | Region(s) |
|---|---|---|---|---|---|---|
| *Leucanthemum maximum* (Shasta daisy) | Sweet Daisy Christine | Rooting | Advocate | 200 to 400 ppm | Recommended rates. | Mid-South |
| *Perovskia atriplicifolia* (Russian sage) | | Rooting | Advocate | 200 ppm | Recommended rate. | Mid-South |
| *Phlox paniculata* (Garden phlox) | Flame Pink | Rooting | Advocate | 200 to 400 ppm | Recommended rates. | Mid-South |
| *Salvia nemorosa* (Perennial sage) | Salute Pink | Rooting | Advocate | 200 to 400 ppm | Recommended rates. | Mid-South |
| *Veronica longifolia* (Speedwell) | First Love | Rooting | Advocate | 200 to 400 ppm | Recommended rates. | Mid-South |



# Advocate Application Record

| Application Date | Plant | Location (Greenhouse or Bench) | Cutting Stick Date | Advocate Concentration | Solution Volume Applied (quarts per 100 sq. ft.) | Propagation Environmental Conditions (Daily light integral, root-zone and air temperature, relative humidity, or VPD) | Observational Notes |
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