GROWERTALKS

Features

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PGRs: Control Your Quality

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Plant growth regulators (PGRs) are most commonly utilized by growers for controlling stem elongation, which results in shorter plants. However, PGRs are also used to encourage rooting, promote stem elongation, abort flower buds and for promoting branching. Many growers have improved the quality and performance of their liners by using plant growth regulators to promote or inhibit plant growth and developmental responses.

There's much information on using growth regulators for controlling plant height. This article addresses the use of PGRs for the promotion of root and lateral shoot development, the inhibition of flowering and their effects on shoot elongation. Our focus is how growers can utilize PGRs in liner production to build better starter plants.

Rooting

We often don't think of using growth regulators in the rooting process, but growers commonly use auxins to promote root development on cuttings and auxins are a type of PGR. While many plants don't require the use of a rooting hormone to uniformly and promptly root, other plants benefit greatly.

Figure 1. Verbena Lanai Upright Bright Rose with a 500 ppm Florel and 2,500 ppm B-Nine application.
Figure 2. Pansy Cool Wave Yellow with 500 ppm of Florel and 100 ppm of Configure 1 and 3 weeks after transplant.
Figure 3. Potunia with and without B-Nine and Florel overspray.

We compiled two tables (Table 1 and Table 2) showing our thinking on the benefit of using rooting hormones on various species of annuals and herbaceous perennials.

Species listed under the Low category are plants that root so readily that a rooting hormone isn't needed and/or provides little value. Plants listed under the Medium category will root without using rooting compounds, but will generally root faster or more uniformly if an auxin treatment is provided. Finally, annuals and perennials listed in the High category are species that are more difficult to root and there's higher value of using rooting hormones.

Rooting hormones are most commonly applied as a dip to the basal ends of the cuttings using either powder or liquid forms of auxins, such as IAA, IBA, KIBA or NAA, or as a foliar spray with the auxin generally being derived from KIBA. The basal dip application concentrations for annuals generally range between 1,000 and 1,500 ppm. Perennial rates are typically higher and range between 500 and 2,000 ppm. Spray application concentrations for both annuals and perennials typically range between 50 and 300 ppm.

The exact application rate for both basal dip and spray applications varies widely by plant species and its ability to root. While not common for annual cuttings, some perennial species, such as lithodora, root much better when they're dipped in a KIBA solution in the 1,000 to 2,000 ppm concentration range prior to sticking. Such cuttings should be rinsed just after sticking and prior to drying to avoid phytotoxicity.

Lateral shoot development

When transplanting liners, it's advantageous to utilize liners that are both compact and well branched. Growers obtain compact plants either by using PGRs, trimming the liners prior to transplanting or a combination.

Historically, ethephon under the trade name of Florel (also available as Collate and Verve) has been used to promote branching in various plants. Effective application rates for ethephon on the plants responsive to it typically range between 300 to 500 ppm. Research has shown that ethephon by itself isn't always effective at promoting branching with many plant species.

In recent years, the cytokinin benzyladenine (Configure or RiteWay) has been shown to promote basal and lateral branches in a wide range of annuals and perennials. In fact, benzyladenine has become the industry standard for promoting branches on a wide range of perennial species. Effective application rates for benzyladenine on plants responsive to it ranges between 100 to 600 ppm.

In 2010, the tank mixture of ethephon and daminozide (B-Nine or Dazide) was applied to verbena by Maury Mairs and Patty Loosigian at Battlefield Farm in Virginia. The results of this application were amazing—the liners were well branched and compact without a mechanical pinch (Figure 1). Subsequent trial applications of 500 ppm ethephon in combination with 2,500 ppm daminozide gave positive and similar results on many other species.

Since then, it's become a standard practice by many growers to apply this tank mix to all liners once the plants have roots that have reached the edge of the media in the liner cell. Applications should NOT be made before the cuttings have rooted, as Florel has been shown to delay rooting. The application volume should be sufficient to wet the foliage completely without drenching the soil (typically 1.5 qts. per 100 sq. ft. is sufficient).

It's not clear why the tank mix of ethephon and daminozide is so much more effective in promoting branching

than when either PGR is applied independently. After observing the response of numerous plants to the ethephon and daminozide tank mixture, the question has been asked if ethephon mixed with other growth regulators is synergistic. When ethephon is mixed with the cytokinin benzyladenine, a similar synergistic response has been observed (Figure 2).

Flowering

Most growers propagate the majority of their annuals and perennials using unrooted cuttings (URCs). With many plant species, the URCs arrive in the vegetative form; however, there are some species that flower readily and the cuttings are often received with various stages of flower buds already present. For example, zonal geranium cuttings generally arrive with flower buds present on the URCs. Ethephon is effective at aborting flowers in geraniums, but applying ethephon to stock plants so vegetative cuttings could be shipped is problematic, as it results in residual ethylene release by the cuttings during shipment and subsequent leaf chlorosis.

Therefore, plant species where the cuttings arrive with flowers already present or that readily initiate flowers—such as zonal geraniums, double flowering impatiens and petunia—often benefit from ethephon applications during the liner phase. The tank mixture of ethephon and daminozide on these crops has been very advantageous at promoting branching, reducing plant height and also aborting the flowers (Figure 3).

Shoot elongation to assist in pinching

Pinching of some species, such as osteospermum, is problematic, as the growing tip or meristem is located low in the leaves. Workers often miss a percentage of plants when pinching and mechanical mowing can result in excessive leaf removal.

One option is to promote shoot elongation to make the pinching process easier. Gibberellins are hormones that promote cell elongation and, therefore, shoot elongation. GA4+7 (Fascination or Fresco) can be applied to promote elongation about five days before the desired pinch date to assist with pinching. Rates used on annuals, such as osteospermum and poinsettia, typically are 5 to 10 ppm.

Improving the success of PGRs during liner production

The majority of the research that we've participated in indicates that each plant species (and sometimes cultivars within the same species) responds differently to branching compounds and the rates that have been applied. Research results also indicate that multiple applications of lower rates usually provide slightly better results than when a single higher rate application is applied.

Greater results are also obtained when these products are applied to plants that are actively growing with roots at least visible on the outside of the root ball. Branching compounds should be applied using a sufficient application volume (usually 1.5 to 2.0 qts. per 100 sq. ft. of production space) and at a time of day where the spray solution can remain on the leaves for at least four hours. Always test small blocks of plants before making applications over an entire crop and apply PGRs according to the directions on each product's label. GT

Table 1

Annual Species

Benefit of using rooting hormone in propagation

Abutilon Low
Alternanthera Medium
Angelonia Medium
Argryanthemum Medium
Bacopa Medium
Begonia - hiemalis Medium
Begonia - Reiger Medium
Begonia - Rex Medium
Bidens Medium
Bougainvilla Medium
Brachycome Medium
Bracteantha High
Calibrachoa High on certain cultivars
Calocephalus Medium
Chamaesyce hypericifolia (Euphorbia) Medium
Cleondendrom Medium
Coleus Low
Crossandra Medium
Cuphea Medium
Dahlia High
Diascia Low
Dipladenia Medium
Dracaena High
Fuchsia Medium
Gazania Medium
Geranium - Regal High
Geranium - Zonal Medium
Helichrysum Medium
Heliotropium Low
Impatiens - Double Low
Impatiens - New Guinea Low
Ipomoea Low
Lobularia Medium
Lophospermum Medium
Mandevilla High
Nemesia High
Osteospermum High
Oternaria Medium
Pedilanthus Medium
Perricalis High
Petchoa Low
Petunia Low
Phlox drummondii High
Plectranthus Low
Plumbago Medium

Poinsettia High
Portulaca Low
Pseuderanthemum Medium
Santolina Medium
Scaevola High
Scoparia Medium
Setcreasea Low
Torenia Medium
Verbena Low
Vinca (Catharanthus) Medium
Vinca major Medium

Table 2

Perennial Species

Benefit of using rooting hormone in propagation

Achillea Low
Ajuga Low
Artemesia Medium
Artemesia - Silver Mound Low
Baptisia High
Buddleia Medium
Campanula Medium
Caryopteris Medium
Ceratostigma Medium
Coreopsis Medium
Delosperma Medium
Dianthus High
Erysimum Medium
Euonymus Medium
Eupatorium Medium
Euphorbia High
Gaillardia Low
Galium Low
Geranium Medium
Gypsophila High
Hedera Medium
Helenium Low
Heliopsis Medium
Heuchera High
Hibiscus Medium
Hydrangea High
Hypericum Medium
Iberis High
Lamium Low
Lantana Bandana
(maybe others) Medium
Lavender Medium
Leucanthemum Medium

Lithodora diffusa High
Lobelia Medium
Lysimachia Low
Malva Medium
Monarda Low
Nepeta Low
Pachysandra Low
Penstemon Medium
Perovskia Low
Phlox paniculata Medium
Phlox subulata Medium
Rosemary Medium
Salvia Medium
Scabiosa Medium
Sedum Low
Thymus Low
Veronica Low
Vinca Minor Medium
Viola Medium

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