BALL TECH ON DEMAND™

Ball Seed®

TECH TRAINING:
PLANT GROWTH REGULATORS—GA BIOSYNTHESIS INHIBITORS

Plant growth regulators (PGRs) are essential tools for controlling plant height and improving overall crop quality. One of the most widely used classes of PGRs includes those that inhibit gibberellic acid (GA) biosynthesis. GA is a key hormone responsible for stem elongation, and without using PGRs to control growth, plants may become stretched and develop poor canopy structure. Proper use of GA biosynthesis inhibitors helps growers produce compact, high-quality plants.

Tip 1: Understand the Chemistry

- GA inhibitors block sites in the GA biosynthesis pathway.
- Many GA inhibitors block the same step in the pathway and thus should *not* be applied together (to prevent overdose).
- Some combinations of different chemical groups (e.g., daminozide + chlormequat) can provide a synergistic effect.

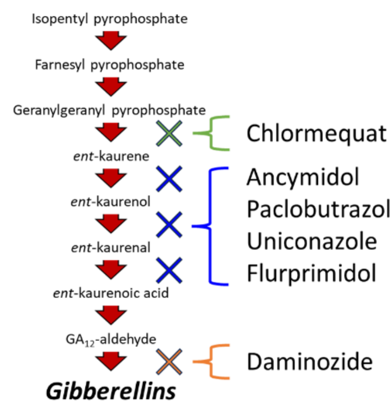

Fig 1. Demonstration of the GA biosynthesis pathway and the sites of action for various active ingredients.

Tip 2: Match Activity to Crop Requirements

- Some PGRs are more "active" than others, meaning a relatively low rate will still yield high response.
- Low-activity chemistries like daminozide (B-Nine) are more forgiving and only work via foliar absorption.
- High-activity chemistries like paclobutrazol (Bonzi) or uniconazole (Sumagic) are absorbed through roots and leaves, so the application method matters.
  - Be cautious with stronger chemistries—small errors in rate or timing can cause stunting or delay.

Tip 3: Get the Application Rate and Timing Right

- Use GA inhibitors preventatively—*stretch cannot be reversed*.
  - Avoid late, high-rate applications. It's often better to make more frequent earlier, lighter applications.
- PGR-overdose can stall plants, requiring time for plants to grow out *or* a GA application (of Fresco or Fascination) to reverse the effects of the overdose.
  - ***Warning!*** Frequently switching between applications of GA inhibitors and GA is not advisable and can yield undesirable growth.
- Use resources like the *GrowerTalks* Annual PGR Guide and Perennial PGR Guide to select products and rates.
- Use the PGR Mix Master App from e-GRO to help with mixing rates.

Fig 2. Examples of several floriculture species grown with increasing rates of paclobutrazol from left to right.

DEEPER DIVE: THE WHY

GA Biosynthesis Inhibitors. Gibberellin biosynthesis inhibitors, also called cell elongation inhibitors, are the most widely used class of plant growth regulators in commercial floriculture production. These compounds reduce stem elongation by disrupting the production of gibberellic acid (GA), a hormone that promotes cell expansion and internode elongation. Active ingredients within this group include ancymidol, chlormequat chloride, daminozide, flurprimidol, paclobutrazol and uniconazole. While they all serve a similar purpose, each differs in its activity level, effects on specific crops, plant uptake and specific site of action within the GA biosynthesis pathway. These active ingredients are categorized into three groups, each blocking a different point in the pathway: Group A (chlormequat chloride), Group B (ancymidol, paclobutrazol, uniconazole, flurprimidol), and Group C (daminozide). This classification helps explain why combinations like chlormequat chloride and daminozide are commonly tank-mixed—they act on different sites in the pathway and provide a synergistic effect.

Chemical Activity. Understanding the relative activity or strength of each active ingredient is essential for choosing the correct rate and application method. Products containing paclobutrazol (Bonzi) and uniconazole (Sumagic) are highly active, meaning small volumes are very effective, but also have higher risk of overdose and plant stunting. On the other hand, lower-activity products such as daminozide (B-Nine) and chlormequat chloride (Altercel) require higher volumes for effective control but offer greater margin for error. Some PGRs are absorbed only through foliar tissue, while others are taken up through both the leaves and roots. This distinction makes application method and substrate conditions important considerations when planning a PGR application.

Application Timing. Timing PGR applications is essential to yield the most desirable results. First, they must be applied *prior* to internode elongation as size cannot be reduced. Secondly, applications must be made with regard to environmental conditions and plant health at the time of application. For instance, making the application under sunny conditions can cause phytotoxicity while applications made when the substrate is dry can excessively stunt the plant and delay the crop.

Environmental Considerations. PGR efficacy is highly influenced by the environmental conditions and plant health status at the time of application. Applications made when plants are wilted, under-fertilized or exposed to extreme heat or light are more likely to cause phytotoxicity or overly severe responses. Foliar applications should be made in the morning or later in the afternoon when light levels are relatively low and humidity is high to slow the evaporation and drying of spray droplets. This enhances PGR absorption and maximizes efficacy.

Non-Chemical Growth Control. Manipulation of cultural practices can also be used to obtain compact plants. Temperature manipulation techniques such as DIF (the difference between day and night temperatures) or DIP (a controlled temperature dip at dawn) can be effective at suppressing stretch. Water and nutrient restriction are sometimes used to keep plants compact, but this requires careful monitoring to avoid stress symptoms like excessive wilting or nutrient deficiencies. Choosing fertilizers higher in nitrate nitrogen and lower in phosphorus can also help promote compact growth.

For more information, check out these additional resources:

GrowerTalks 2025-26 Plant Growth Regulator Guide for Annuals
GrowerTalks 2024-25 Growth Regulators for Containerized Herbaceous Perennial Plants