# Use of Growth Regulators in Production

**Rod Ackerman and Harlan Hamernik**
Bluebird Nursery, Inc., P.O. Box 460, Clarkson, Nebraska 68629

## INTRODUCTION

This paper in no way promotes or recommends the use of chemical growth regulators, but rather offers an overview and insight into their potential uses and/or limitations. When considering growth regulators for plant production, the legal aspects (label restrictions, etc.) and environmental concerns must be taken into consideration.

The effect of any growth regulator is dependent on the method of application, health and vigor of the plant being treated, and the environmental influences during application as well as the cultural and environmental conditions after application. When we mention the term growth regulators, we are referring to chemical or environmental condition that will influence or modify the normal growth characteristics of a plant. The most important growth regulators currently employed at the nursery are cultural rather than chemical. They include:

- Watering (water can be a great growth inhibitor when employed by a skilled grower).
- Temperature (low temperature to reduce growth rates and or to keep certain plants dormant vs. higher temp to increase vegetative growth)
- Light (depending on the crop being grown day-length modifications can be used to induce or inhibit blooming, induce or inhibit dormancy, lengthen or shorten vegetative growth, etc.).
- Fertilizer modifications (increasing the ppm nitrogen can in some cases be used to increase vegetative growth and inhibit flowering, while reducing the ppm of phosphates can be used to reduce internode length).

A word of caution, any of these environmental modifications when used to the excess can cause severe crop damage. Experience, observation, and the skills of a good grower are the keys to successful plant culture and plant growth modification through environmental and/or chemical means.

## CHEMICAL GROWTH REGULATORS AND THEIR USE FOR MODIFYING PLANT GROWTH

**Auxins (NAA, IBA, etc.)**. This is perhaps the most widely used group of chemical growth regulators in the nursery business. Auxins are commonly used in either a liquid or powder form to induce or promote root development on vegetative shoots and rapid cell growth in tissue culture. In nature, auxins also influence or help to maintain apical dominance. To increase lateral bud break, we need to reduce or inhibit the effects of the naturally occurring auxins. This can be accomplished through; pinching, cutting back, and chemical applications. Atrinal and Atrimmec promote lateral shoot development in some crops, but whether they actually inhibit or compete with the naturally occurring auxins is questionable.

**Cytokinins (Zeatin, PBA, and BAP)**. A group of plant hormones which promote lateral shoot development and to some extent cell division. Though they are rarely used in "normal" plant production they are widely used in tissue culture, and certain specialized methods of daylily, hosta, and orchid propagation. Cytokinins can also be used to promote branching in plants, but to my knowledge, cytokinins are only registered for research and not commercial greenhouse production.

**Gibberellins (GA)**. A group of naturally occurring plant hormones produced by both plants and disease/symbiotic fungi. The primary mode of action of gibberellins is through the stimulation of cell elongation and to a lesser extent cell division resulting in increased internode length, leaf size, and in certain cases, flower size. The use of gibberellins for the production of a finished crop is limited by the weakened stems (increased internode length), yellowing, and occasional deformation of the foliage. However, gibberellins can be used in the production of standards, stimulation of a spring-like flush of growth for cutting production, to help break winter dormancy in certain plants, and as a germination aid for certain cactus and woodland wildflowers. Low doses applied at 2-week intervals to test blocks appears to work the best for us until a proper dosage for the entire group can be determined. The effects of GA varies according to the crop, time of year, and dosage. Thus, the proper dosage and number of applications must be determined individually for your crop and conditions. A word of caution, too much GA may result in a weak plant and during GA-induced growth spurts, the plants typically exhibit an increased need for nitrogen and to a lesser extent iron (if these needs are not met, yellowish plants will result). At the nursery, we have found that GA can be used to bring certain plants out of dormancy earlier without increasing day length or temperature (*Campsis*, *Coreopsis*, etc., particularly those plants whose dormancy is day-length dependent). GA can also be used to induce a spring-like flush of growth on such plants as, *Phlox, Scabiosa, Buddleja, Heuchera*, and just about anything we have ever tried it on. Care must be taken when working with plants with normally long internodes and things like *Ajuga*. GA can be lethal if too much is used.

**Ethylene (Ethephon/Florel).** Ethylene has long been known to have profound effects on certain plants, such as the induction of flowering in certain bromeliads, inhibition or damage to flowers in other plants, stunted and/or yellowish growth, etc. When used properly, ethylene or Ethephon (a liquid acid that produces ethylene when absorbed by the plant) can be used to inhibit flowering in certain plants (*Impatiens*, *Scabiosa*, *Pelagonium*, certain begonias, etc.), reduce internode length, and increase branching. With some on-site research specific to your conditions and crop it appears that Ethephon might be very useful in the maintenance of stock plants, increased branching, and flower inhibition and/or stimulation. A word of caution, ethylene tends to magnify the negative effects of environmental conditions such as water stress, cool temperatures, etc. The use of Florel is currently restricted by its label.

Other chemical growth regulators such as B-Nine (daminozide), Cycocel (chlormequat choride), A-rest (ancymidol), Bonzi (paclobutrazol), Sumagic (uniconazole), are very crop specific in their actions and great care must be used when applying (mixing, application method, uniformity, etc.) or more damage will result than benefits obtained.

## LITERATURE CITED

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