Technical Services
TRAINING GUIDE

Berger

Produce the Best Poinsettias

AN ARTICLE BY :
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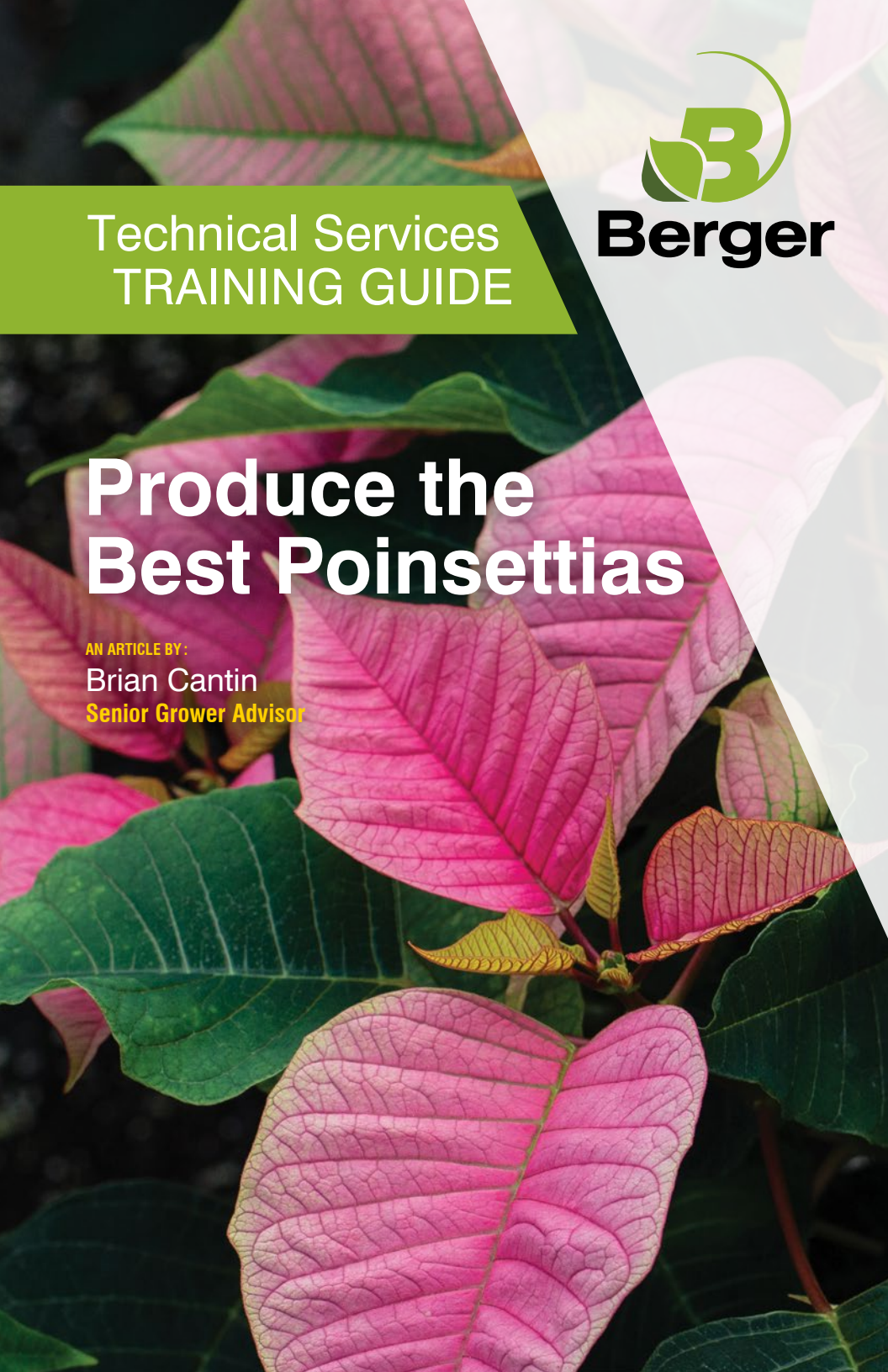

Your Expert

Brian Cantin graduated from the University of Guelph with a Honors Science Degree in Environmental Horticulture. He majored in Plant Physiology, with a minor in Plant Protection (plant pathology and plant entomology).

Subsequently, Mr. Cantin took on a greenhouse research position with the Brooks Horticultural Research centre in Brooks, Alberta. During his tenure, he continued post-graduate studies, majoring in soil sciences and substrates, at the University of Alberta and Texas A&M University.

After his studies, Mr. Cantin took a position with the R&D division of the Alberta Gas Trunk line. He collaborated with other associates to design and develop waste heat greenhouses that could harness the energy from pumping stations. Once greenhouses in Princess and Joffre Alberta were built, he continued to manage two waste heat projects.

Mr. Cantin was then hired by Yoder as Head Grower and Manager of Technical Support. While at Yoder, he conducted applied research, which eventually turned into a consulting business, Applied Techniques.

Today, Mr. Cantin is a grower advisor at Berger, transforming his vast background in horticulture into inestimable value for the company's customers. He helps customers to resolve their cultivation challenges and improve their growing practices. Mr. Cantin also ensures that all client trials are conducted with the highest of Berger's standards.

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Chapter N° 1

Floral Initiation to Flowering

For poinsettias, the time of natural floral initiation is centered on the period between September 18th and 27th.

As long as the day length is not altered artificially, cultivars will flower in 7 to 10 weeks after initiation, depending on the response group of the particular cultivar.

Floral initiation is triggered by a critical photoperiod of 12 to 12.5 hours, combined with night temperatures below 70°F. The actual date when this occurs can be affected by environmental conditions. Cloudy days and cool nights will result in earlier floral initiation while bright warm days can result in delayed floral initiation.

Temperature

At the time of floral initiation, night temperatures should be reduced to between 68 and 70°F. Night temperatures above 73°F can delay flowering. After floral initiation, flower development is a continuous process culminating with anthesis, that is, the shedding of the first visible pollen from the flowers (cyathia).

The progressive stages of flower development can be identified by several visible indicators. The stage when first flower bud (cyathium) is visible to the eye is termed simply visible bud. First colour refers to the stage when the green bracts show the first colour change as they transition toward their final colour. Generally speaking, with night temperatures at 70°F, floral initiation occurs at 14 to 18 days after the start of short days (SD), first colour at 30 to 32 days after SD, visible bud at 35 to 39 days after SD, and anthesis at 54 to 59 days after SD.

The average daily temperature after the appearance of bract colour is critical to bract development. Daily temperatures of 68 to 70°F are needed during this period to maximize bract size. If possible, try to avoid temperatures above 75°F, which can result in very large but soft bracts that are more susceptible to post-harvest problems.

Watering

As days become shorter and light quality diminishes, it is very easy to overwater plants at a time when their transpiration rate is reduced. Stay on top of weather forecasts and make an attempt to water according to the weather. In particular, try to avoid heavy watering just prior to extended dull, cold periods.

Fertilization

Shortly after flower initiation, a poinsettia's demand for fertilizer is reduced as the plant transitions from vegetative growth to flower and bract development. Monitor salt levels closely and avoid allowing them to climb too high prior to this transition.

After the pinch, 30% of the total nitrogen should be in the ammonium form to facilitate optimal leaf expansion. By the end of September, the plants should have reached their desired growth and leaf expansion; at this point, ammonium-N should be reduced to 15% of the total nitrogen, a level that supports mid- to late-season growth while avoiding post-harvest quality issues.

Growth Regulators

Even though the rapid growth phase after pinch is complete, there is still a potential for stretching during weeks 40 to 44. To keep the plants within the desired range for final height, try to establish a method of monitoring growth prior to this period of optimal bract expansion. Avoiding applications of plant growth regulators (PGR) during this final stage of bract development is often recommended, so as not to reduce bract size. However, if tall plants warrant an application of PGRs during this period, use of modified methods or application of specific PGRs should be considered.

Diseases

Understanding latent infections is essential to addressing common diseases of poinsettia such as botrytis and powdery mildew. A latent infection is one that is hidden, inactive or dormant until the right conditions exist. Latent fungal infections of plants occur with no visible symptoms until the spores germinate under the right conditions.

In the case of botrytis, the fungal spores (conidia) serve as the initial inoculum. After landing on the surfaces of the plant, the conidia can remain dormant for at least three weeks before germinating.

In the fall, these fungal diseases can move into the crop unnoticed, a situation that warrants manipulation of heating and ventilation to dry the greenhouse atmosphere at the end of the day. As a grower, I am often reminded of the old adage: "Pay a little now in heat and ventilation, or pay a lot later in fungicides and plant loss."

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Chapter N° 2

Reducing Bract Edge Burn in Poinsettias

The month of October begins with the transition from vegetative growth to bract and flower development in poinsettias.

Cultural and environmental practices should now be directed towards reducing bract edge burn (BEB), a marginal edge necrosis that colored bracts are particularly susceptible to. As with many plant maladies, to wait until the symptoms are visible creates an unmanageable situation. Bract edge burn can be triggered by various environmental factors as well as cultural practices. Water stress, temperature fluctuations, light intensity, fertilizer regimes, and the percentage of relative humidity can all contribute to BEB. This is a plant disorder in which early preventative measures help to reduce BEB. In this article, rather than expand on the causes of this disorder, it would be better served to focus on the remedial action, i.e., sufficient calcium uptake to support healthy cell wall development.

We often assume that adequate levels of calcium have accumulated early in the season in both media and the tissue. This assumption is based on the fact that transpiration rates are higher, since temperatures, humidity, and light intensity are all conducive to calcium uptake by the roots. One has to remember that the plant takes up calcium by means of mass water flow. If the poinsettia is not actively transpiring due to prolonged periods of cool cloudy weather, the uptake and mobility of calcium to young developing tissue is minimized. Under these conditions, even though calcium is present in adequate levels in the root environment, due to its lack of mobility, the plant will not take up sufficient calcium. Mass water flow driven by high transpiration rates is the driving force behind calcium mobility.

Focusing on the issue of calcium in regard to BEB, three causes of this bract disorder are as follows:

1. **Low media pH leads to rapid leaching of calcium resulting in low levels of this element in the media;**
2. **High levels of magnesium in the media will block the uptake of calcium;**
3. **Prolonged periods of cool cloudy weather along with high humidity create low transpiration rates preventing the uptake and movement of calcium.**

Solutions

• Fertilize plants adequately so as to get enough calcium. Avoid ammonium levels greater than 30% throughout October. Too much ammonium creates soft, rapid growth that can cause BEB.

• Do not apply too much magnesium. Under normal conditions, the ratio of calcium to magnesium should be at least 3:1.

• Grow plants in a low humidity environment, especially under low light conditions. Provide adequate air circulation by using horizontal air flow fans.

• Many articles on BEB have recommended calcium sprays so as to direct this immobile element to the target area. i.e., young developing bracts. Materials used for sprays should be selected for purity to avoid damage to the foliage. A laboratory grade calcium chloride dihydrate ($CaCl_2 \cdot 2H_2O$) has worked well in the past. Calcium sprays will also thicken up epidermal cells reducing the incidence of Botrytis.

[1](BEB*= bract edge burn)

Chapter N° 3

Toning Poinsettias for Post-Harvest Quality

The month of November focuses on bract expansion and cyathia development.

Regardless of the region that you grow in, days are becoming shorter, light intensity has decreased, and the growth rate of the plants has slowed down when compared to growth activity during weeks 31 – 39. With this in mind, cultural and environmental practises will have to be adjusted to compensate for this slower growth and to enhance the quality of the bracts.

Many years ago, large oversized bracts were the trademark of quality until bract edge burn became a post harvest headache. Temperature wise, avoid producing soft growth. Bracts that are grown too warm along with high humidity will be too lush and are more prone to shipping related problems.

Growers should now review their water management practises, realizing that overwatering in November is conducive to plant loss from root rot pathogens. At this stage of growth, provide an adequate drying cycle to the media to maintain a strong root system and to begin the toning process of the poinsettia that is so crucial to post harvest quality. In cool dark weather, it's better to water in the early morning than late in the day so plants are drying going into the night.

Fertilizer Program

Review your fertilizer program and make adjustments according to the shift in growth rate. During this stage of growth, the fertilizer program needs to shift away from ammoniacal nitrogen to nitrate nitrogen forms of nitrogen. Poinsettias are now forming bract color and expansion which still require fertilization but as we approach mid-November, the overall level of fertilization needs to be reduced. At this time it is important to monitor media EC and pH to ensure the crop is not stressed. Gradually reducing the soluble salts in the media greatly reduces the incident of root damage especially under a drier regime. A combination of high salts and poor calcium uptake during bract expansion is part of the reason for BEB (bract edge burn). In regards to this plant malady, I would be remiss not to remind you, that practises to reduce BEB are still very important during this period of bract expansion. If you have already begun a spray program of calcium chloride you should continue this practise on a weekly basis to supply adequate calcium to expanding tissue. Before I move unto reviewing humidity management, one must also remember that poinsettias have a higher requirement for molybdenum. Continue to monitor the level of Mo in the soil and the tissue.

By mid to late November, poinsettia quality can be jeopardized by well-intentioned practises such as conserving energy costs. In the process of conserving energy, ventilation is minimized which reduces air movement and increases relative humidity. Calcium content in the tissue is most critical during bract expansion to reduce the incidence of BEB. The amount of calcium actually taken up by the bracts is not only influenced by the supply of Ca in the media but more importantly by the water movement into the roots, through the plant and transpired out of the leaves. High relative humidity inhibits transpiration and calcium movement through the plant. As weather conditions become more inclement, plants are now competing for space, and air movement through the plant canopy is reduced. Make an effort to reduce humidity by venting and heating even on cold overcast days. Trying to conserve too much energy during this period of bract expansion can create conditions conducive to latent infections of botrytis and/or powdery mildew. As the old adage goes, "Pay now or Pay later", ideally keep the relative humidity below 75%; realistically make the best attempt at humidity control that you can afford.

Chapter N° 4

Finishing the Crop

As we approach the month of December, hopefully everything we have done up to this time has prepared the poinsettia for the final stage of its growth cycle.

Bract development is near completion, the root system is healthy and well established, and the size, tone and colour of the leaves have been optimized by a sound fertilization program.

The ideal growing conditions associated with rapid leaf unfolding, good leaf expansion, extensive root development and efficient nutrient uptake are gradually phased out as winter approaches. Any hopes of sizing up undersized plants are diminishing quickly as temperatures continue to drop and daylight continues to weaken in the north. Any attempt to optimize growth near the end of the crop by providing additional heat or increasing the concentration of fertilizer can actually jeopardize post-harvest quality. From now on, everything we do should be directed towards preparing the poinsettias for the stress of shipping and the retail environment.

Fertilizer and irrigation practices should now be geared towards reducing the EC of the substrate which will lower the salt content to levels that are more conducive to post-harvest quality. A word of caution, however: stopping your feed program too early can lead to premature yellowing and dropping of the lower leaves in the retail setting. A safer approach is to gradually drop fertilizer levels to 80–100 N (nitrate based) for the last two to three weeks. This must be done with close monitoring of EC levels during this final period of growth before shipping. Many problems, like bract edge-burn and root loss, can be avoided by simply leaching out high salts and gradually reducing the fertilizer.

Moving onto climate control, the goal now is to tone and condition both the leaf canopy and the root environment to optimize survival during the shipping process and the harsher conditions of retail environments. As the cold season has progressed, the plants have filled in and the lack of space has created a thick, crowded leaf canopy. Keep the air dry and constantly circulating throughout the canopy as much as possible to reduce any humidity that would be conducive to disease outbreaks. As shipping begins, watering should be done on demand, based on the daily shipping routine, rather than on a fixed schedule. Keep a close eye on the condition of the roots, as they can be subject to overwatering during the shipping process. A saturated pot placed in a pot cover can definitely create a deleterious microclimate in a dark, sealed shipping box! Botrytis development on the bracts and cyathia during shipment can be a problem if latent infections are not controlled during production or if moisture condenses on the bracts prior to or during shipping. Just watch how fast condensation accumulates on the plastic sleeve when a poinsettia is left on a greenhouse bench in the afternoon sun.

As for temperature control, if the crop is maturing too fast and lowering the temperature is warranted, make sure to continue to heat and vent the greenhouse sufficiently to eliminate high humidity and provide good air circulation. On the other hand, if the timing of the crop is on schedule, lowering the temperature will help intensify bract colour, as many varieties have a tendency to fade if finished too warm.

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Applications of Bonzi

I would be remiss if I neglected to mention applications of Bonzi late in the season. Unseasonably bright and warm weather can often create undesirable spurts of growth. In the past, growers have had varying results with late-season applications of Bonzi. I cannot overemphasize the importance of focusing on the amount of active ingredient applied per pot (mg of active ingredient /pot) rather than on the concentration (ppm) of the drench solution. At any given ppm level, the application of diffrent volumes will affect plant growth at different extents. Incorrect volume measurements can lead to uneven results. It also goes without saying that reading the label is essential in order to avoid applying Bonzi at the wrong time or under the wrong conditions, such as under dry or wet soil conditions.

Recording Data

In conclusion, I have always been an advocate of good recordkeeping. Poinsettias are definitely a crop that benefits from recording valuable data. Records that monitor cultivar response, crop timing, fertilizer rates, response to PGRs and root health status are all valuable sources of information. Records of this type can be used to improve crop performance and scheduling of future crops. Without good recordkeeping, the grower may be doomed to repeat past mistakes.

5 Chapter N° 5 Post Harvest Requirements

As poinsettia growers, we cannot neglect practices that increase the post-production longevity of the plants we grow. The main objective is to produce a quality poinsettia at the proper stage of development.

From mid-November until shipping, concerns such as fertilizing, watering, plant environment, root health, maturity and sleeving can all have profound effects on post-harvest quality once purchased by consumers.

Fertilizer Rates and Watering

Before plants are shipped, fertilizer salts should be reduced, but not to the point where fertilizer applications are totally eliminated. Monitoring salt levels throughout crop production allows the grower to respond to salt levels and reduce the rate by ½ or ¼ that used during early production. Root loss and bract edge burn can be avoided by gradually lowering the salts and reducing nitrogen feeding to 80–100 ppm. Water management during this final stage can often take a back seat to the frantic necessity of getting orders filled. Stay on top of watering to avoid letting conditions become too wet as multiple orders move through the same greenhouse over the course of the day. Saturated pots that are then placed into a pot cover can only drain into the pot cover itself. This moisture can create problems in closed boxes, as it provides the perfect environment for Botrytis to multiply and for Pythium to induce root loss.

Plant Environment

Weather conditions are usually deteriorating as we approach the end of the crop, and if we do not adjust to those changes many plants can be ruined in the last weeks before shipping. The poinsettias are often crowded at this point and thus more sensitive to Botrytis and other pathogens. Whenever possible, try to keep the air dry and circulating through the plant canopy. Heating and venting to reduce humidity is an added cost, but one that is much lower than the cost of losing a crop to Botrytis or powdery mildew.

Root Health

As mentioned earlier, during this final phase of poinsettia production, the hectic pace of packing and shipping can result in irregular watering practices. Root health should be monitored closely throughout the last 3 to 4 weeks of production. A fungicide drench may be warranted.

Maturity

Poinsettias have a much longer post-harvest life if sold when pollen is first visible. Cyathia that have shed all their pollen are past their prime and have less aesthetic appeal for the consumer. On the other hand, red cultivars will not achieve their full color if shipped at an immature stage. The maturity date for sales is definitely affected by the average daily temperature, so regulating day and night temperatures will help target the ideal maturity date, that is, the moment when the poinsettia are in prime condition regarding bract colour and visible pollen.

Sleeving

Sleeve plants for the shortest period of time possible so as to reduce epinasty. Try to avoid sleeving plants on a Friday for shipment on the following Monday, as plants left in a sleeve for too long will become droopy. The sleeving process itself should be done in a manner that allows the sleeved plants to be removed from the greenhouse as soon as possible. I have seen sleeved plants left on benches exposed to the sun, resulting in a build-up of condensation inside the sleeves and thus creating a humid atmosphere in the boxes, again conducive to the spread of Botrytis.

Chapter N° 6

Pinch to the Start of Short Days

Pinching poinsettias can often become so routine that one forgets several important prerequisites to the process:

1. Always make sure that the plants have developed sufficient roots toward the outside of the potting media. Insufficient root development can cause the developing breaks to grow slowly or develop unevenly, reducing the number of viable breaks.

2. It is important to control growth prior to pinching to keep the internodes short on the chassis of the pinched plant. Keeping internodes short fosters even bract height, with all the bracts above the green canopy. Controlling growth during propagation and pre-pinch will favour development of the desired stacked form of the plant chassis. Managing the distance between leaves, combined with a timely pinch, creates a saleable plant with all the bracts at the same level.

3. The timing of the pinch has major ramifications on the quality of the finished plants. Allowing about seven to fourteen days with long light between pinching and the start of short days provides enough time for development of adequate shoot length and proper bract display. The vigour and growth habit of different cultivars will dictate whether to increase or decrease the number of long days after pinch and prior to the start of short days. The time between pinch and the start of short days greatly affects the final height and overall size of the plant. Calculate the ideal moment to pinch relative to the start of short days so the desired number of leaves (appropriate for the pot size) have time to develop.

Two Pinching Techniques

Pinching techniques are described as a hard or soft pinch. A hard pinch involves removal of several leaves and the growing point. This type of pinch tends to produce rapid breaks of even length. Using this technique results in fewer problems with dominant shoots. A soft pinch, where only the growing tip is removed, tends to produce breaks more slowly due to the apical dominance effect of the immature leaves left on the established cutting. If for some reason a soft pinch is carried out, then leaves should also be removed to produce more uniform breaking action.

The number of flowers per pot is dictated by how many nodes (leaves) are left on the stem after pinch. One must take into consideration that the lowest one or two nodes may not contribute to a full complement of bracts at the time of flowering. On the other hand, leaving too many nodes (i.e., more than 7 or 8) results in too many branches and stem breakage when the plants are sleeved and shipped.

Prevent After Pinch Stress

Stressful conditions before and after pinch – such as high temperatures, high light and low humidity – can be detrimental to the development of breaks. Misting the plants, providing shade and wetting down floors (if feasible in your greenhouses), are recommended to prevent post-pinch stress.

Post-pinch fertilization coincides with a phase of rapid growth. In the past, poinsettias have been considered a high fertility crop. In my opinion, light-leaf cultivars do indeed fit into this category; however, the newer dark-leaf cultivars are very efficient in their utilization of nitrogen and require lower nutrient levels. Thus, in general, light-leaf varieties require more nitrogen than dark-leaf varieties. Success with poinsettias relies on raising the initial fertility quickly, then knowing when to taper the fertility towards the end of the crop. Each phase of growth will dictate the optimal ratio of nitrate-N to ammonium-N to achieve rapid vegetative growth, floral initiation and post-harvest quality.

It is important to be pro-active and monitor pH and soluble salts on a regular basis to avoid jeopardizing the crop. Calcium and magnesium should be monitored by media analysis, because they are both very important nutrients in poinsettia production.

Temperature

The rate of poinsettia growth is primarily influenced by the average daily temperature. Modulating temperature can be used to determine the number of leaves unfolded per week, providing a better idea of how many leaves will unfold overall and the corresponding number of internodes that will become part of your height control program. When feasible, try to keep night temperatures in the low 70's until three weeks after pinch. This creates sturdy, compact growth with stronger branches.

Growth Regulators

Monitoring and managing leaf internode length should begin immediately after pinch. Allowing the first and second internodes to stretch will result in weaker stems and will jeopardize achieving the overall height you were targeting for a saleable plant. There are many PGR products available and my only advice at this time is to read the label properly, including proper application methods and any precautionary notes on phytotoxicity and environmental conditions that can reduce product performance.

« Success with poinsettias relies on raising the initial fertility quickly, then knowing when to taper the fertility towards the end of the crop. »

Berger

Good quality poinsettias demand detailed attention to growing conditions over a long period of time. You owe it to yourself and to the consumer to ensure good post-production longevity. After all, a happy customer is a return customer.

Brian Cantin, Senior Grower Advisor

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