

OHP PGR SOLUTIONS[®]



GREENHOUSE & NURSERY PRODUCTION

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PGR

GENERAL USES and OVERVIEW

Plant Growth Regulators (PGRs) are plant hormone enhancers or disruptors. They can be man-made or naturally derived. Plant hormones play many roles in a plant's growth, such as root or shoot growth, flower development, fruiting, leaf drop, coloration and seed set. Many of these functions are still unknown and processes still await discovery.

Commercial horticultural PGRs have been in use since the 1960s. Most of the older PGRs worked by disrupting cell division and at times, produced undesirable responses in plants. In the past 10 to 15 years, new and better PGRs have been developed for the industry. These newer products work by inhibiting gibberellic acid production in the growing points of plants. Some work through leaf absorption (B-Nine, Altercel) and others work through stem and root absorption (Pac O). PGRs play a key role in crop production, primarily by reducing horticultural crop heights and overall growth. More compacted growth means more bench space for plants, better plants for shipping and better plants for the consumer.

Choosing the correct PGR and then determining when and how to use it is crucial if a successful outcome is to be achieved for the intended crop.

Rooting Hormones

Rooting hormones are not generally thought of as PGRs, but since they do affect plant growth, especially root growth, they should be part of an overall PGR program. Hormodin® offers three different levels of rooting hormone for the three main classes of ornamental materials growers propagate.

Hormodin contains IBA (indole-3-butyric acid), a rooting hormone. It is used to improve root formation on cuttings during plant propagation. Three formulations of Hormodin are available. The formulation selected will depend on the type of plant being propagated.

- Hormodin® 1 is a general purpose powder designed for the home gardener or commercial grower who propagates plants such as roses, carnations, poinsettias, some shrubs and most home garden and greenhouse plants.
- Hormodin® 2 is prepared specially for propagating many woody and semi-woody plants, including some of the evergreens.
- Hormodin® 3 is prepared specially for propagating the more difficult to root varieties, including many of the evergreens and dormant leafless cuttings.

Lateral Branching Agents

Recent developments in PGR research have brought several new products to the market, e.g. 6-Ba Cytokinins. These materials focus on enhanced branching making for a thicker and fuller plant. The mode of action can differ between the products, either by increasing cell growth and division or by reducing apical dominance. The latter works like a chemical pinch. Applications of these materials should be made early in the cropping cycle. Late applications are not advised as often times chlorosis or necrosis can develop. Early applications will also allow ample time for the plants to grow out of the treatment.

Which PGR?

Crops that have excessive growth - in particular, leafy growth - are candidates for products like B-Nine or Altercel, which are taken into the plants through leaves. They are sprayed onto the leaf canopy just before run-off. This approach works well for crops such as zinnia, hydrangea, poinsettia etc.

Crops that have more exposed stem tissue or plants that can be soil drenched may be better treated with Pac O, which is easily absorbed into stems and root tissue. Pac O (triazole type PGR) also has significantly more activity than other PGRs. Drench ap-

plications tend to have very uniform results and are used at 1/10 the typical spray rate. Attention to detail is a must when using these more active PGRs.

When to apply?

The usual timing for PGR applications is around one week after transplanting into the finished pot. This allows the plant to set roots and overcome transplant shock. Other variables such as applying at first true leaf stage, or applying low-dose or late drenches allow you to tailor PGR use to your needs. The younger or earlier in the crop cycle a PGR is applied, the more receptive the plant will be (i.e. applying at plug stage rather than finish stage).

How to apply?

Foliar sprays can be done with any sprayer from a small hand-held device to a large spray rig. Application volume is 2 quarts per 100 sq. ft. or about 218 gallons per acre. This is a nice wet spray, just before run-off. Using more spray volume than this will waste material (B-Nine or Altercel) or it may produce unwanted and significantly shorter plants (Pac O). Avoid "run-off" when using Pac O.

Pac O drench applications require a specific amount of drench volume into the container. Typically, this is 4 fl. oz. per 6-inch container. Plants should be watered the day before application. For larger areas use the "watering in" method where the lower rates (1/2 to 1 PPM Pac O) are injected into the watering line and applied in the same manner as a fertilizer application. This method allows for some application error and will be less likely to create an overdose response in the plants. To best decide which product to use, when to use it and how to apply it, consult the labels for more information. Also, the OHP website, ohp.com, contains data showing the results of many years of PGR research and crop use recommendations. Contact your OHP technical sales manager for further PGR support and information.

SUGGESTED PGR RATES FOR SELECTED ORNAMENTALS

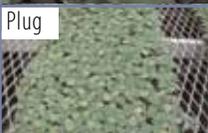
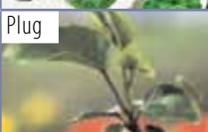
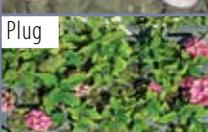
Application to either the plug stage or the finish stage.

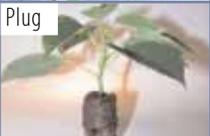
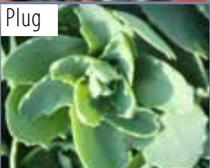
Rates will need to be fine tuned to grower situation. Growers should test PGR rates prior to any large scale application to crops. Plug production refers to small plants in plug trays. Finish is any stage from plug transplant to sale.

*** Note: Paczol product name has changed to Pac O.**

Plants	Plant Stage	Application Method	PGR Product	PGR Rate PPM (Respectively)	Comments
Ageratum	Plug	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O	2500 ppm 800 to 1000 ppm Not tested Not tested	Spray to wet. Suggested 5 ppm to test.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 800 to 1500 ppm 2500 + 1500 ppm 5 to 45 ppm Not tested	Spray to wet few days after transplant.
Alyssum	Plug	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O		Plug testing not done.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	> 7500 ppm Not tested > 2500 + 1500 ppm 30 ppm Not tested	Poor response.
Argyranthemum	Plug	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	Not tested Not tested Not tested 4 ppm: 15 sec	Soil should be 50% moist to start.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 1500 ppm 2500 + 1000 ppm 30 ppm 2 to 5 ppm	Spray to wet. Apply second application 2 weeks later if needed. Use correct drench volume per pot.
Begonia	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O		Plug testing not done.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	5000 ppm 1000 ppm 2500 + 1500 ppm 2 to 5 ppm *	Mild response. Very sensitive to Pac O. *Not advised.
Calibrachoa	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	2500 ppm Not tested Not tested 4 ppm: 15 sec	Spray to wet. Adjust as needed. Soil should be 50% moist to start.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 ppm 1000 ppm 2500 + 1500 ppm 20 to 50 ppm 2 to 5 ppm	Spray to wet. Apply 2nd application 2 weeks later if needed. Use correct drench volume per pot.

Plants	Plant Stage	Application Method	PGR Product	PGR Rate PPM (Respectively)	Comments
Calla Lily	Plug 	Spray Spray Spray Tuber Soak	B-Nine Altercel B-Nine + Altercel Pac O	Not tested Not tested Not tested 20 ppm: 15 sec	Soak cleaned tubers.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	No response Not tested Not tested Not recommended 8 to 12 ppm	Apply when 1 to 2" of growth appears.
Celosia	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O		Plug testing not done.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	5000 ppm 800 to 1500 ppm 2500 + 1500 ppm 20 ppm *2 ppm	Spray to wet. *Suggested testing rate.
Chrysanthemum <i>General Rates</i>	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	1000 ppm 800 to 1000 ppm 1500 to 2500 ppm ¼ to ½ ppm: 15 sec	Pre-plug dip. Apply as needed.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 3000 ppm 1000 to 1500 ppm Not tested 30 to 50 ppm 1 to 2 ppm	Apply post pinch on 1" growth up to 1 week before disbud. Use correct drench volume per pot.
Coleus	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O	2500 ppm 800 to 1000 ppm Variable response 4 to 8 ppm	Spray to wet. Poor foliar uptake.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 1000 to 1500 ppm 2500 + 1000 ppm *20 to 30 ppm 2 to 4 ppm	Spray to wet. 2nd application may be needed. *Variable results.
Cosmos	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O		Plug testing not done.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 ppm 1250 ppm 2500 + 1250 ppm 5 ppm 1 ppm	Spray to wet. 2nd application may be needed.
Delphinium Elatum	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	No response Not tested Not tested Not tested	Suggested rate of 1 to 2 ppm for plug.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	No response Not tested Not tested 20 ppm 2 to 4 ppm	Apply at 12" tall. Apply 2nd application 2 weeks later if needed. Drench 1 week after transplant.

Plants	Plant Stage	Application Method	PGR Product	PGR Rate PPM (Respectively)	Comments
Dianthus	Plug 	Spray Spray Spray Spray	B-Nine Altercel B-Nine + Altercel Pac O	2500 ppm Not tested Not tested 5 ppm	Spray to wet. Spray to wet.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 800 to 1500 ppm 2500 + 1250 ppm 20 ppm ¼ to ½ ppm	Apply 2nd application 2 weeks later if needed. Use correct drench volume per pot.
Foliage	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	2500 ppm 800 to 1000 ppm Not tested Test at ½ to 1 ppm	Very little data on foliage plants, grower should test rates before large scale use.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 1000 to 3000 ppm 2500 + 1000 ppm 5 to 30 ppm ½ to 3 ppm	These are suggested test rates. Altercel rates above 1500 ppm may cause short term yellowing. Test rates before large scale use.
Geranium	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	Not tested 1500 ppm (seed type)* Not tested Not tested	*Apply 1500 ppm 35 & 42 days after seeding. Geranium is very sensitive to Pac O.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	Limited response 800 to 1500 ppm 2500 + 1250 ppm 8 to 15 ppm ¼ to ½ ppm	Limited activity. Apply 1 to 2 weeks after transplant. Apply 2nd application 2 weeks later as needed. Use correct drench volume per pot.
Hibiscus	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	Not tested Not tested Not tested Not tested	Grower could test PGRs using ½ rates listed for finish.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 200 to 600 ppm 2500 + 1250 ppm 50 ppm 5 ppm	Spray to wet. Apply 2nd application 2 weeks later if needed. Use correct drench volume per pot.
Hydrangea	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	Not tested Not tested Not tested Not tested	Grower could test PGRs using ½ rates listed for finish.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 7500 ppm test at 1500 ppm 2500 + 1000 ppm 50 ppm Not tested	Spring-low rate. Summer-high rate. Apply 2nd application 2 weeks later if needed.
Impatiens <i>Seed Type</i>	Plug 	Spray Spray Spray Plug Soak Spray	B-Nine Altercel B-Nine + Altercel Pac O Pac O	Limited response Limited response Limited response ¼ to ½ ppm: 15 sec ½ to ¾ ppm	Limited activity. Soil should be 50% moist to start. Stage 3 germination.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	No response Not tested 2500 + 1250 ppm 15 to 30 ppm ¼ to ½ ppm	Apply 2nd application 2 weeks later if needed. Use correct drench volume per pot.

Plants	Plant Stage	Application Method	PGR Product	PGR Rate PPM (Respectively)	Comments
Marigold	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O	Poor response 5 to 10 ppm ½ to 1 ppm	
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	5000 ppm 800 to 1000 ppm 2500 + 1500 ppm 30 to 60 ppm Not tested	Variable response. French type use low rate.
Pansy	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O	Poor response *1 to 5 ppm *Not tested	*Very sensitive to Pac O. *Very sensitive to Pac O.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	>5000 ppm 1500 ppm 5000 + 1500 ppm 5 to 10 ppm Not recommended	Multiple apps needed. Lower rate in cooler temps.
Petunia	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	1000 to 2500 ppm 800 to 1250 ppm 2500 + 1250 ppm 1 to 2 ppm: 15 sec	Spray to wet. Adjust as needed. Soil should be 50% moist to start.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 ppm 800 to 1250 ppm 2500 + 1500 ppm 4 to 45 ppm 2 to 4 ppm	Spray to wet. Apply 2nd application 2 weeks later if needed. Use correct drench volume per pot.
Poinsettia <i>General rates</i>	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	1250 to 2000 ppm 1500 ppm Not tested Not tested	Apply to rooted cuttings to reduce stretch and maintain color.
	Finish 	Spray Spray Spray Spray Drench low dose	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2000 to 3000 ppm 1000 to 1500 ppm 2000 + 1000 ppm 15 to 30 ppm* ¼ ppm	Apply post pinch on 1" to 2" growth. [*½ to 1 ppm late drench 1" before finished height]. Low dose rate as needed per crop curve.
Salvia	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	2500 to 5000 ppm 800 to 1250 ppm 1250 + 1000 ppm ½ to 2 ppm: 15 sec	Spray to wet. Adjust as needed. Soil should be 50% moist to start.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 1500 ppm or higher 2500 + 1250 ppm 20 to 50 ppm 2 to 5 ppm	Spray to wet. Apply 2nd application 2 weeks later if needed. Use correct drench volume per pot.
Sedum	Plug 	Spray Spray Spray	B-Nine B-Nine + Altercel Pac O	5000 ppm 5000 + 1000 ppm 30 ppm	2nd application may be needed. 1 to 2 applications.
	Finish 	Spray Spray Spray Drench	B-Nine B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 5000 + 1200 ppm 50 ppm 5 to 10 ppm	2nd application may be needed. Multiple applications. 2 or more applications Use correct drench volume per pot.

Plants	Plant Stage	Application Method	PGR Product	PGR Rate PPM (Respectively)	Comments
Snapdragon	Plug	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O	2500 ppm 800 to 1000 ppm 15 to 20 ppm Not tested	Apply at true leaf stage. *Suggest 2 to 4 ppm soak.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	5000 ppm 1500 ppm 3000 + 1000 ppm 45 to 75 ppm Not tested	Multiple apps required. Multiple apps required. Get good stem coverage.
Verbena	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O	2500 ppm 800 to 1000 ppm 5 to 10 ppm 8 ppm	Spray to wet.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 1000 to 1500 ppm 2500 + 1000 ppm 30 ppm 5 ppm	Spray to wet. Use correct drench volume per pot.
Veronica	Plug	Spray Spray Spray Plug Soak	B-Nine B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 2500 + 1000 ppm 30 ppm 2 to 3 ppm	2nd application may be needed 1 to 2 applications.
	Finish 	Spray Spray Spray Drench	B-Nine B-Nine + Altercel Pac O Pac O	5000 ppm 5000 + 1000 ppm 40 ppm 3 to 4 ppm	2nd application may be needed. 1 to 2 applications. 1 application Use correct drench volume per pot.
Vinca	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O	1250 to 2500 ppm 800 to 1000 ppm Not recommended Pac O	
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 1000 to 1500 ppm 2500 + 1500 ppm Not recommended Pac O	Spray to wet. Causes leaf spots.
Woody Landscape Plants <i>General Rates</i>	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel B-Nine + Altercel Pac O	Not tested Not tested Not tested Not tested	Grower could test PGRs using 1/2 rates listed for finish.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	500 to 7500 ppm 1500 to 3000 ppm 5000 + 1500 ppm 100 to 150 ppm 5 to 15 ppm	Spray to wet. Apply 2nd application 2 weeks later if needed. See label recommendation. Use correct drench volume per pot.
Zinnia	Plug 	Spray Spray Spray Plug Soak	B-Nine Altercel Pac O Pac O	1250 to 2500 ppm 800 to 1000 ppm Variable results Not tested	Spray to wet.
	Finish 	Spray Spray Spray Spray Drench	B-Nine Altercel B-Nine + Altercel Pac O Pac O	2500 to 5000 ppm 1000 to 1500 ppm 3000 + 1000 ppm 25 to 50 ppm Pac O	Works very well, 2nd application may be needed. Variable results.

GENERAL RATE RECOMMENDATIONS and BEST USE GUIDE for B-NINE®, Altercel® and PAC O™

(Read product label and visit ohp.com for an expanded list of plant material tested.)

Crop	Plug / Liner	Plug / Liner Comment	Finish	Finish Comment
Bedding Plants	1500 to 2500 ppm	B-NINE: Apply at first true leaf stage and as needed for compact growth.	1500 - 2500 ppm	B-NINE : Apply 3 - 7 days after transplant then as needed every 2 weeks to control growth.*
	500 to 1000 ppm	Altercel: Apply at first true leaf stage and as needed for compact growth.	800 - 1500 ppm	Altercel: Apply 3 - 7 days after transplant and as needed for compact growth. May increase to 3000 ppm.
	¼ to ½ ppm	PAC O: Apply at first true leaf stage media spray, plug dip.***	1 to 30 ppm spray ½ to 3 ppm drench	PAC O: Apply 3 - 7 days after transplant and as needed for compact growth; drench rate is ¼ spray rate.
Perennials	1250 to 2500 ppm	B-NINE: Apply to early leaf stage and as needed for growth control.	2500 to 5000 ppm	B-NINE: Apply 7 days after transplant then as needed to control growth.*
	800 to 1000 ppm	Altercel: Apply to early leaf stage and as needed for growth control.	1250 to 3000 ppm	Altercel: Apply 7 days after transplant then as needed to control growth.*
	½ to 1 ppm	PAC O: Apply at first true leaf stage media spray, plug dip.***	10 to 30 ppm spray 1 to 10 ppm drench	PAC O: Apply 3 - 7 days after transplant and as needed for compact growth.
Foliage Plants	2500 ppm	B-NINE: Apply to early leaf stage and as needed for growth control.	2500 to 5000 ppm	B-NINE: Apply 7 days after transplant then as needed to control growth.*
	800 to 1000 ppm	Altercel: Apply to early leaf stage and as needed for growth control.	1000 to 3000 ppm	Altercel: Apply 7 days after transplant then as needed to control growth. Rates higher than 1500 may cause short term leaf yellowing.
	½ ppm to 1 ppm (estimate)	PAC O: Little data on foliage plug use, user should test first.	5 to 10 to 30 ppm Estimate, see comment	PAC O: use not evaluated at this time.
Mums	1000 ppm	B-NINE: Use a pre-plant dip to rooted cuttings. Allow to dry before potting up.	2500 to 5000 ppm	B-NINE: Apply after pinch when shoots are 1" long, then as needed up to 1 week before disbud.
	800 to 1000 ppm	Altercel: Apply to early leaf stage and as needed for growth control.	1000 to 1500 ppm	Altercel: Apply after pinch when shoots are 1" long, then as needed up to 1 week before disbud.
	¼ to ½ ppm	PAC O: Apply at first true leaf stage media spray, plug dip.***	30 to 50 ppm spray 1 to 2 ppm drench	PAC O: Apply after pinch when shoots are 1" long.
Poinsettias	1250 to 2000 ppm	B-NINE: Apply to rooting cuttings to reduce stretch and maintain color. Overhead mist will reduce response.	2000 to 3000 ppm	B-NINE: Apply after pinch when shoots are 1½ - 2" long, then 2 week intervals.**
	1500 ppm	Altercel: Apply to rooting cuttings to reduce stretch and maintain color. Overhead mist will reduce response.	1000 to 1500 ppm	Higher rates may cause leaf yellowing. Altercel: Apply after pinch when shoots are 1½ - 2" long, then 2 week intervals.**
	N/A	PAC O: Use not evaluated at this time.	15 to 30 ppm spray ½ ppm as late season drench	PAC O: Apply after pinch when shoots are 1½ - 2" long, then 2 week intervals** late season drench applied 1" before finish.

* Applications made near flower bud formation may delay bloom response.

** Do not apply after the beginning of short days or about 11 hours maximum of light.

*** Plug dip is using very low rates, plug tray dipping time of 15-30 sec. Plug soil should be near 50% of field moisture capacity at time of dip.



Typical Questions and Answers

1. How can I mix-up a low dosage Pac O rate accurately for testing some plants?

The best method would be to use measuring equipment such as pipettes, graduated cylinders or other such tools that can measure small amounts of product.

Another method is to mix-up a larger spray solution and then dilute down the solution to the desired ppm level. As an example, let's say you need a 1 gallon, 1 ppm spray solution. Looking at the Pac O label 1 mL per gallon is 1 ppm. (There are about 30 mL per 1 fl oz.) Start by measuring out 1 fl oz of Pac O and dilute it by 30 times by adding 30 fl oz of water to this 'concentrate.' Next measure out 1 fl oz of this 'concentrated' dilution and mix into your 1 gal spray solution. You now have a 1 ppm Pac O solution.

2. My basket crops can become quite large for shipping. What can I do to hold their growth?

Many crops can become large or even overgrown as they come to the end of finish. Using a low dose of Pac O can "hold" them for a longer period of time. A good example of this is to apply a drench at 4 ppm to a petunia crop once it is up to size. This late drench will not disrupt bloom development and will dramatically slow down growth. Another crop this can work on is poinsettia. Application of ½ to 1 ppm drenched in November can hold down excessive stretch.

3. I like to spray PGRs rather than drench. Which products are best for this?

OHP products B-Nine and Altercel are very effective growth control agents when applied to leaves. These materials are readily absorbed into the leaves. Therefore, both B-Nine and Altercel can be used at much higher rates (ppm) than Pac O. This lessens the risk of over stunting the crop.

4. How can I make my foliar sprays more active?

The tank mix of B-Nine and Altercel is synergistic and will increase the activity that results when either product is applied separately. Research has shown a ratio of about three parts B-Nine to one part Altercel to be the most active. Based on this work, using B-Nine at 2500 ppm plus Altercel at 1000 ppm will increase your PGR activity more so than the two products separately.

5. Should I use a spreader sticker with my PGR applications?

This is a common question when using PGRs as well as other foliarly-applied products. The answer for PGRs is NO. Products like B-Nine and Altercel have very good wetting agents already incorporated into the product formulation. The addition of more spreader sticker would be of little benefit. Products like Pac O also contain a wetting agent and more importantly, Pac O is absorbed into the plant in about 30 minutes.

6. When is the best time to apply PGRs?

Growth inhibiting PGRs like B-Nine, Altercel or Pac O are usually applied 1 week after transplant into the finish pot. These same PGRs have also performed well when used in a plug or liner dip or late in finish to hold a crop.

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B-Nine is a trademark of UPL Corporation Limited Group Company.

Altercel is a trademark of OHP, Inc.

OHP PGR Solutions is a trademark of OHP, Inc.

PAC O™ Dilution Table

Below is a helpful table to calculate how much **PAC O** should be added to a gallon of water for use with chemical injectors. A common injection ratio is 1:100 meaning one gallon of concentrate (stock solution) is evenly dispersed via injection into 100 gallons of irrigation water.

Injector Ratio

Desired Concentration	1:16	1:50	1:100	1:200
0.25 PPM	4	12	24	48
0.50 PPM	8	24	47	94
0.75 PPM	12	36	71	142
1 PPM	15	48	95	190
2 PPM	30	90	190	380
3 PPM	45	140	280	560
4 PPM	60	190	380	760
5 PPM	75	235	470	940
10 PPM	150	470	940	1880

All quantities are expressed in milliliters per gallon stock solution.

1 fl. oz. equals 29.57 mL

Example: for 1 PPM with a 1:100 injector, you would use 95 mL **PAC O** (3.2 fl oz) mixed into 1 gallon of water (stock solution) and run the injector until the gallon is gone. Be sure to check that the 100 gallons used is correct for the square footage of bench space sprayed or for the number and size of pots being drenched i.e. spray at 2 qt./100 sq. ft. or 100 gal./20,000 sq. ft. Drench at 2 fl. oz. per 4 inch pot, 4 fl. oz. per 6 inch pot, etc. See label for directions.

It is advised to leave a small portion of the crop untreated so an accurate evaluation of the growth suppression may be observed.

POINSETTIA PGR RECIPE FOR SUCCESS

Regulating Plant Height of Poinsettias PGRs

Along with managing light and spacing a grower often will use a good plant growth regulator (PGR). When a PGR is employed you need to error on the side of caution. Using a product that is generally forgiving and cost effective is the key.

OHP markets three PGRs that can be used on poinsettias: Altercel, B-Nine, and Pac O.

PGRs regulate plant growth by reducing stem elongation. The result is a compact appearance, darker green leaves and better shipping quality.

B-Nine or Altercel are best used as a foliar spray and provide excellent growth control with reduced risk of excessive stunting. They can be used separately or more commonly, as a tank mix. Applications are made post pinch when new growth is from 1½ to 3 inches long (see photo below). Repeat spray applications are used as needed to control growth.

Pac O applied as an early spray to new lateral breaks also works to effectively control growth. Overspray of Pac O to soil surface will increase Pac O uptake and could result in shorter plants. Poinsettias are extremely sensitive to an early drench application of Pac O; therefore a single early drench is not recommended; however, recent research using very low-dose drench applications allows growers a method to drench apply or chemigate, making for a very efficient delivery method of Pac O.



Lateral breaks ready for PGR application

Altercel®

For natural-season crops in the north, Altercel should typically not be used after October 15. Altercel may be used at reduced rates until October 21 if conditions are warm and sunny. In the south, Altercel should not be used after November 1. Late application times or excessive rates can cause reduced bract size and/or delayed flowering. If the crop is being produced for other than the natural season, the last application should be no later than 6 weeks prior to flower maturity.

Spray applications can be made at rates between 800 and 1,500 PPM. Multiple applications may be made as needed at intervals between 3 and 14 days. Frequent reapplications may be needed if lowest application rates are used. At rates of 1,000 to 1,500 PPM, less frequent reapplication is needed.

B-Nine®

Applications should begin when new growth is 1½ to 2 inches long. The recommended rate range is 2,000 to 3,000 ppm. The lower rate should be used in areas north of the sunbelt and the higher rate used in the sunbelt. Two applications will give better growth control than a single application.

Late season applications will reduce plant height but may also reduce bract size and delay flowering. For crops scheduled for early December flowering, applications should not be made after the start of short days. As a general guide, do not apply B-Nine after October 1 in areas outside Florida, or after October 25 in Florida.

Tank Mixes of Altercel® and B-Nine®

Combinations of Altercel and B-Nine have shown a synergistic effect, meaning the combination is stronger than either by themselves. This combination provides height control and can minimize concerns with phytotoxicity.

The application rate for Altercel and B-Nine can be altered to adjust the degree of height reduction resulting from a spray treatment. In general, the highest Altercel rate that does not cause excessive leaf yellowing can be used, and then the B-Nine rate can be raised or lowered to adjust the activity of the tank mix application.

The following table gives a range of application rates for Altercel and B-Nine to use.

Activity	Altercel (ppm)	B-Nine (ppm)
Very High	1,500	5,000
High	1,250	2,500
Medium	1,250	1,250
Low	1,000	800

Pac O™

Recommended spray application rates are 10 to 30 ppm in most areas of the U.S. In southern Florida, higher rates of 15 to 45 ppm are recommended. Single applications can be made using the higher rates, but sequential applications using lower rates will provide a better safety margin against too much growth regulation.

Applications to slower growing varieties in cooler areas should begin when new shoot growth is 2 to 3 inches long. For fast growing varieties in warmer areas, begin applications when new shoot growth is 1½ to 3 inches long.

Pac O applications should not be applied after initiation of short days. As a guide, do not apply Pac O sprays after October 1 in areas outside of Florida, or after October 25 in Florida. Drench applications for late season growth control to plants that have initiated bract formation or are about 1 inch from their final height. Recommended rates are ½ to 1 ppm for northern growers and 1 to 3 ppm for southern growers. These late season applications can be made with little to no effect on bract size.

OHP PGR Program for Poinsettia from Pinch to Finish

Suggested rates below will vary depending on grower location, growing conditions and poinsettia varieties.

Application Timing	PGR	Rate Range
Early September — Post pinch, new growth 1 1/2" long	B-Nine spray, or Altercel spray, or B-Nine+Altercel spray, or Pac O spray Pac O low-dose drench	1250 to 2500 ppm 1000 to 1500 ppm 1250 +1250 ppm* 15 to 30 ppm 1/10 PPM apply as needed**
Mid-September — About 2 to 3 weeks after first application.	B-Nine spray, or Altercel spray, or B-Nine+Altercel spray	1250 to 2500 ppm 1000 to 1500 ppm 1250 +1250 ppm*
Late September (short days) — B-Nine spray applications past short days will disrupt bract development. Follow label guidelines.	B-Nine spray, or Altercel spray, or B-Nine+Altercel spray	1250 to 2500 ppm 1000 to 1500 ppm 1250 +1250 ppm*
Early October to Mid October (15th) —	Altercel sprays	500 to 700 ppm
Mid to late November — Apply 1 inch before finish height.	Pac O late drench	1/2 to 1 ppm Southern states may need higher rates

* Adjust B-Nine rate up or down while using Altercel at a constant rate will provide maximum height control from the combination spray program. i.e. 2500 ppm B-Nine+1000 ppm Altercel.

**Early "Low-Dose" Pac O drench is effective, best used through chemigation systems. Contact your OHP technical sales manager for more information on how to design such a program. Rates higher than 1/10 ppm will dramatically affect crop finish, care must be taken to follow directions.

Plant Growth Regulators	Parts per Million (ppm)	Rate per 1 gallon
B-Nine® WSG - Spray	1000 to 2500 to 7500 ppm	4/5 TBS to 2 TBS to 6 TBS
Altercel® - Spray	200 to 1250 to 4000 ppm	.22 to 1.36 to 4.34 fl oz
Hormodin® 1, 2 or 3	— See label for which Hormodin to use on various cuttings. —	
Pac O™ - Spray or Drench	1 to 30 ppm Drench, 5 to 100 ppm Spray	1 ppm = 1 mL/gl; 5 ppm = 4.7 mL/gl; 30 PPM = 1 fl oz/gl

Users should read entire label for full information and application instructions.

TBS = tablespoon tsp = teaspoon mL = milliliter 1 fl oz = 29.6 mL 1 tsp = 5 mL 1 TBS = 15 mL

PGR Recommendations To Slow Growth on Crops



Growers have asked, “**What can be done to slow growth on crops during times of low demand?**” —A great question. Let’s look at the available options.

Environmental

If you find your crops growing under lower light levels, warm temperatures and heavy fertilization, excessive growth or stretching may occur. Excess growth can be slowed by growing crops cooler with increased spacing and using less water, a term called growing “harder.” If space allows, increase plant spacing and if crops can take colder temperatures in the 60° F range, you may want to consider this approach. The use of negative DIF (*difference between daytime and night time temp.*) is also a growing technique useful during finishing and can help reduce plant height.

OHP Plant Growth Regulators (PGRs)

Chemical plant growth control is a standard tool for growing many crops and is used during early plug, liner, and early to mid-finish production. Late application of PGRs to plants can offer growth control for a short period of time or stop growth in order to hold a crop for a long time. Such applications are done with a drench of triazole-based PGRs such as OHP’s **Pac O**. Below are suggested OHP products and rates that can offer late growth control.

B-Nine® WDG

A spray application at 2500 to 3750 PPM (mums) or 5000 PPM can offer growth control on a number of plants. Zinnia, coleus, mums and other large-leafed plants respond well from **B-Nine** foliar applications. Apply early in the morning and do not overhead water for 24 hrs. The lower rate of 2500 PPM is less risky but users may need to make a couple of applications. A tank-mix of **B-Nine** at 1250 or 2500 PPM plus Altercel at 1000 PPM will increase effectiveness. **DO NOT use Altercel rates over 1200 PPM.**

Altercel®

We do not recommend the use of **Altercel** in late finish as the rates needed for growth control may produce a yellowing. **Altercel** is best used early to mid-cycle in crop production.

Pac O™ (Spray applications)

Foliar applications can vary wildly depending on the crops involved. Remember that viola, geranium, and begonia are VERY sensitive to Pac O. Sprays could range from 2 to 5 PPM. For other herbaceous crops use the mid to higher rate recommendations making sure to cover stems as best as possible; consider rates of 15 to 30 PPM. If crops have more leaves than stems showing you should consider B-Nine sprays.

Pac O™ (Drench applications)

Drench applications are very effective in holding crops over. Consider using from 1 to 4 PPM using the correct drench volume for the pot size. A 1 PPM drench is like a 10 PPM spray. This 10:1 ratio can help you to determine what drench rate to use. Petunia baskets that are up to size will hold well using a 4 PPM drench.

Woody ornamentals are probably best held in check by using high spray rates or moderate drench rates of Pac O. Plants like azalea and other woody plants would use 100 to 150 PPM as a spray or 10 to 15 PPM as a drench. Lantana or other smaller plants respond well to a 2 PPM drench.

Generally speaking, one drench application should hold for 4 weeks or possibly longer. Drench volume is very important and users should follow the container drench volume rates in the label.

For specific rates, contact your OHP technical sales manager or use our "Ask The Experts" link at https://www.ohp.com/Solutions/ask_experts.php

You can also download the free **OHP PGR Calculator** via the App Store® for your iPhone. It has rates, specimen labels, PGR Solutions Guide and SDS information all via the app.



B-Nine is a trademark of UPL Corporation Limited Group Company. Altercel and Pac O are trademarks of OHP, Inc.

5151 McCrimmon Pkwy., Suite 275, Morrisville NC 27560

(800) 356-4647
www.ohp.com

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OHP PGR DILUTION TABLES

Altercel®		
PPM Altercel Desired	Fluid Ounces per Gallon	mL per Gallon
200	0.22	6.4
460	0.50	14.7
800	0.87	25.7
1000	1.08	32.1
1250	1.36	40.1
1500	1.63	48.1
2000	2.17	64.2
3000	3.25	94.2
4000	4.34	128.0

Pac O™		
PPM Pac O Desired	Fluid Ounces per Gallon	mL per Gallon
1	0.032	1.0
2	0.064	1.9
3	0.096	2.8
4	0.13	3.8
5	0.16	4.7
10	0.32	9.5
20	0.64	19.0
25	0.8	24.0
30	1.0	28.0
40	1.3	38.0
50	1.6	47.0
100	3.2	95.0
200	6.4	190.0

B-Nine®		
PPM B-Nine Desired	Ounces Weight per Gallon	Grams per Gallon
1250	0.2	5.6
2500	0.4	11.1
3750	0.6	16.7
5000	0.8	22.3

For help on PGR calculations and determining dose rate amounts, visit ohp.com to download the PGR calculator for your iPhone®, iPad® or iPod Touch®.

The PGR calculator allows users to look up current PGR rates in PPM for spray or drench applications. The user then enters the desired dose and the size of the application area (L x W) or the number of pots for a drench and the App calculates the amounts of solution and product needed.

iPhone, iPad, iPod Touch, and iTunes are registered trademarks of Apple Inc.



OHP's PGR App is available through the iTunes® Application Store.

OHP, Inc.
 5151 McCrimmon Pkwy.
 Suite 275
 Morrisville NC 27560
 Technical Service: (800) 356-4647
ohp.com

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