Using PGRs to Enhance Branching and Growth Control of Perennials

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Benefits of PGRs

- Grower using PGRs:
  - Less space used per plant (cost of prod)
  - Have less shrinkage (production losses)
  - Have longer shelf life (gh and retail)
  - Can meet shipping height requirements
  - Can ship more plants per load

- Plant height impacts perceived quality
  - PGRs: higher quality and most saleable

Expanding PGR Toolbox

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancymidol</td>
<td>Abide, A-Rest</td>
</tr>
<tr>
<td>Chlormequat</td>
<td>Citadel, Chlormequat E-Pro, Cycocel</td>
</tr>
<tr>
<td>chloride</td>
<td></td>
</tr>
<tr>
<td>Daminozide</td>
<td>B-Nine, Compress, Dazide</td>
</tr>
<tr>
<td>Dikeylure sodium</td>
<td>Augeo</td>
</tr>
<tr>
<td>Fluprimidol</td>
<td>Topflor</td>
</tr>
<tr>
<td>Padlobutrazo</td>
<td>Borzi, Florazol, Paczol, Piccolo, Piccolo</td>
</tr>
<tr>
<td></td>
<td>10XG, Downsize (drenches only)</td>
</tr>
<tr>
<td>Uniconazole</td>
<td>Concise, Sumagic</td>
</tr>
<tr>
<td>BA</td>
<td>Configure</td>
</tr>
<tr>
<td>GA</td>
<td>GibGro, ProGibb T&amp;O</td>
</tr>
<tr>
<td>BA+GA</td>
<td>Fascination, Fresco</td>
</tr>
</tbody>
</table>

PGRs – NO Soil Activity

- Typically short-term responses
- Uptake by leaves; good coverage required
- Daminozide
  - B-Nine WSG (OHP)
  - Dazide (Fine Americas)
- Florel (ethephon, Monterey Chem.)

PGRs – LIMITED Soil Activity

- Some root uptake
- Primarily foliar applications; good coverage required
- Chlormequat Cl (not labeled for chemigation)
  - Cycocel (OHP)
  - Chlormequat E-Pro (Etigra LLC)
  - Citadel (Fine Americas)

PGRs – Soil ACTIVE

- Taken up by shoot and root tissues
- Typically more potent than foliar only
- Ancymidol (labeled for chemigation)
  - A-Rest (SePRO)
  - Abide (Fine Americas)
- Topflor (flurprimidol) (SePRO)
  - (labeled for chemigation)
PGRs – Soil ACTIVE

- Paclobutrazols
  - labeled for chemigation
  - much more potent than ancymidol
- Uniconazoles
  - not labeled for chemigation
  - 8-10 x more potent than paclobutrazols

PGRs – Soil ACTIVE

- Paclobutrazols
  - Bonzi (Syngenta Professional Products)
  - Piccolo (Fine Americas, Inc.)
  - Paczol (OHP)
  - Downsize (Greenleaf Chemical)
- Uniconazoles
  - Sumagic (Valent USA)
  - Concise (Fine Americas, Inc.)

Selecting the Dosage

- PGRs w/ No or Limited Soil Activity
  - Dosage = rate (ppm of solution)
- Soil Active PGRs
  - Dosage = ppm & volume

Soil Active = Volume is Critical!!

- Increased volume increases PGR effect

PGR Relative Activity

- Ancymidol
- Daminozide
- Chlormequat
- Daminoz + Chlomeq
- Paclo
- Uni
- Topflor

Less  More

Selecting the Dosage

- Rate selected depends on:
  - Method of application (volume)
  - Type of growing medium
  - Stage of root development
  - Stage of shoot development
  - Irrigation method and practices
Cultural Practices

- Spacing
  - Light is best PGR
- Shearing/pinching
- Growing temperatures
  - Less if cooler
- Light levels
  - Less if higher

PGRs for Perennial Plants

- Growth habit
  - Clumping vs. upright
- Production time
  - Time of year
  - Length of production time
  - Green or in flower?

Increase Branching

- PGRs to substitute for pinching
- Pinching labor intensive
- Pinching delays growth and bloom
- PGRs improve quality and may control growth

Enhancement of Branching

- Apply or activate plant hormones
- Activate dormant buds
- Stimulate formation of adventitious buds
- Axillary buds grow out normally

Configure (Fine Americas, Inc.)

- 6-BA (promotes cell division)
- Label use on Christmas Cactus, hosta and Echinacea
- Supplemental label allows evaluation on additional crops
- Branching agent, short term response; good coverage required

Configure on Gaillardia

- G. arista ‘Dazzler’ at 4 WAT with 600 ppm
- Breaks: Untreated 23.4 vs. Configure 153
Configure on *Lobelia cardinalis*

- Number of basal branches increased at 2, 4 and 6 WAT
  - 2WAT Control 3.8 vs Configure 12.8 breaks
  - 4WAT Control 7.3 vs Configure 12.9 breaks
  - 6WAT Control 10.6 vs Configure 16 breaks

**Configure on Perennials (600 ppm; p<0.05)**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Untreated</th>
<th>BA</th>
<th>WAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaura 'Siskiyou Pink'</td>
<td>29.8</td>
<td>39.4</td>
<td>4</td>
</tr>
<tr>
<td>Euphorbia 'Chameleon'</td>
<td>13.5</td>
<td>20.0</td>
<td>6</td>
</tr>
<tr>
<td>Gaillardia 'Dazzler'</td>
<td>23</td>
<td>153</td>
<td>4</td>
</tr>
<tr>
<td>Heuchera 'Raspberry Ice'</td>
<td>11.8</td>
<td>18.1</td>
<td>4</td>
</tr>
<tr>
<td>Lobelia cardinalis</td>
<td>7.3</td>
<td>12.9</td>
<td>4</td>
</tr>
<tr>
<td>Penstemon 'Husker Red'</td>
<td>6.2</td>
<td>7.7</td>
<td>4</td>
</tr>
<tr>
<td>Lychnis 'Vesuvius'</td>
<td>3.1</td>
<td>5.3</td>
<td>4</td>
</tr>
<tr>
<td>Veronica 'Icicle'</td>
<td>2.5</td>
<td>3.6</td>
<td>2</td>
</tr>
<tr>
<td>Coreopsis 'Zagreb'</td>
<td>43.2</td>
<td>98.8</td>
<td>2</td>
</tr>
<tr>
<td>Leucanthemum x 'Alaska'</td>
<td>9.5</td>
<td>14.9</td>
<td>2</td>
</tr>
</tbody>
</table>

Augeo (OHP, Inc.)

- Dikegulac sodium
- Branching agent
- Broad label for spray applications
- Apply to well-rooted, actively growing plants
- Plants should be stress free

**Gaillardia ‘Gallo Yellow’**

- Augeo at low rate increased branching
- Control 24.5 vs. 400 ppm 45.3 branches
- Rates >800 ppm severely stunted plants

**Coreopsis grandiflora ‘Sunray’**

- Bonzi 80+ppm, multiple applications
- Sumagic/Concise 40 to 60 ppm, cultivar dependant
- B-Nine/Dazide 5000 ppm; Tank Mix also effective
Coreopsis
- Configure on Coreopsis ‘American Dreams’
- Rates – 300x2 or 600x1 ppm in late plug stage or soon after transplant

Delphinium elatum ‘Blue Bird’
- Topflor foliar spray, 4 WAT

Delphinium ‘Black Knight’
- No response to Piccolo spray at 100 ppm, 4 WAT; cultivar differences

Delphinium ‘Blue Bird’
- Abide drenches at 10 fl.oz. per trade gallon pot
- Control 31.3 cm vs. 8 ppm drench 17.3 cm

Delphinium ‘Blue Bird’
- Bonzi Spray vs. Drench; 4 WAT
- Drench at 10 fl.oz. per pot, persistent response to drenches
**Delphinium PGR Recs**

- NR B-Nine/Dazide at 5000 ppm
- B-Nine/Dazide – Cycocel/Citadel Tank Mix, good control with multiple applications
- Bonzi/Piccolo/Paczol at 30 to 40 ppm, multiple appl, sensitive to drenches
- Sumagic/Concise at 10 to 15 ppm, sensitive to drenches
- Topflor 15 to 20 ppm
- Abide drenches 6 to 8 ppm

**Echinacea ‘Ruby Star’**

- Topflor <45 ppm foliar spray
- Multiple appl of 20 to 25 ppm

**Echinacea ‘White Swan’**

- 6-BA; now formulated as Configure
- 6 WAT, fall application, increased branching (3.4 vs. 13.6)

**Echinacea ‘Sombrero Hot Pink’**

- Augeo at 800 and 1600 ppm increased branching; 8 WAT
- Control 6.0 vs. 1600 ppm 9.5 branches (fewer flowers)

**Echinacea ‘Doubledecker’**

- 600 ppm Configure (BA)
- Control 1.2 vs. Configure 4.6 breaks at 4 WAT

**Branching of Echinacea (At 4 WAT)**

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Control</th>
<th>Configure 600 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnus</td>
<td>3.8</td>
<td>6.6</td>
</tr>
<tr>
<td>White Swan</td>
<td>2.4</td>
<td>11.4</td>
</tr>
<tr>
<td>Doubledecker</td>
<td>1.2</td>
<td>4.6</td>
</tr>
<tr>
<td>Ruby Star</td>
<td>4.4</td>
<td>11.2</td>
</tr>
<tr>
<td>Tiki Torch</td>
<td>1.7</td>
<td>4.1</td>
</tr>
<tr>
<td>Merlot</td>
<td>1.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Fragrant Angel</td>
<td>2.6</td>
<td>4.4</td>
</tr>
</tbody>
</table>
**Echinacea PGR Recs**
- Sumagic/Concise: 15 to 30 ppm
- Bonzi/Piccolo/Paczol: 30 to 40 ppm
- B-Nine/Dazide: 5000 ppm, multiple appl
- B-Nine/Dazide – Cycocel/Citadel: 5000/1500 ppm
- Topflor: less than 45 ppm
- Configure: 300 to 600 ppm (multiple) at late plug stage or shortly after transplanting

**Gaura lindheimeri ‘Whirling Butterflies’**

**Gaura lindheimeri ‘Siskiyou Pink’**
- For many perennials, growers are interested in width as well as height

**Gaura ‘Siskiyou Pink’**
- Configure increased number of shoots per pot at 4 WAT: Control 5 vs. Configure 7.3 shoots/pot
- Also increased lateral branching of shoots at 4 WAT: Control 29.8 vs. Configure 39.4 branches per pot

**Gaura PGR Recs**
- Sumagic/Concise: 15 to 30 ppm, multiple applications?
- Piccolo/Bonzi/Paczol: 80 ppm, multiple applications?
- B-Nine/Dazide: 5000 ppm, 7-10 day intervals
- B-Nine/Dazide – Cycocel/Citadel: 5000/1500 ppm multiple appl may be required
- Configure: 300 (multiple) to 600 ppm to plugs and/or finished plants
Hemerocallis ‘Hyperion’

- Bonzi sprays, 4 WAT, little control

Hemerocallis ‘Hyperion’

- Bonzi drenches, 4 WAT, moderate control

‘Hyperion’ Daylily – Drench vs. Spray

- Drenches more effective than sprays (with significant flower height reduction)
  - Bonzi/Piccolo/Paczol at 2 to 4 ppm*
  - Sumagic/Concise at 0.5 ppm
  - Abide/A-Rest at 2 to 6 ppm

* drenches at 10 fl. oz. per trade gallon pot

Hibiscus moscheutos ‘Grenache’

- 6 WAT, Sumagic saturated response between 0.5 and 1.0 ppm drench (10 fl. oz. per pot)

Hosta Production

- Configure at 1500 to 3000 ppm, foliar spray, multiple applications
- Increased lateral bud break on the rhizome
- Increase divisions
- Increase sales
**Hosta ‘Ginkgo Craig’**

- Configure increased branching; 8 WAT
- Control 4.5 vs. 8.8 with 1000ppm Configure

**Branching of Hosta Cultivars**

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Control</th>
<th>BA 1000 ppm x 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abba Dabba Do</td>
<td>2.2</td>
<td>5.8</td>
</tr>
<tr>
<td>Blue Angel</td>
<td>1.0</td>
<td>5.7</td>
</tr>
<tr>
<td>Fragrant Bouquet</td>
<td>1.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Guacamole</td>
<td>1.8</td>
<td>7.0</td>
</tr>
<tr>
<td>Minute Man</td>
<td>1.1</td>
<td>3.9</td>
</tr>
<tr>
<td>Whirlwind</td>
<td>1.9</td>
<td>3.9</td>
</tr>
<tr>
<td>June</td>
<td>1.0</td>
<td>3.3</td>
</tr>
<tr>
<td>Iron Gate Delight</td>
<td>1.3</td>
<td>6.1</td>
</tr>
</tbody>
</table>

*Perennial Solutions Consulting; GrowerTalks May 2008

**Lavandula angustifolia ‘Silver Edge’**

- B-Nine or B-Nine/Cycocel (5000/1500 ppm) tank mix sprays, 8WAT

**Lavandula angustifolia ‘Silver Edge’**

- Concise sprays, 6 WAT
- NR 160 Paczol

**Lavandula ‘Provence’**

- Configure applied to plugs increased number of shoots, lateral branches & shoot dry weight, 4WAT

**Monarda didyma Jacob Cline’**

- Sumagic, multiple applications, 4 WAT
**Monarda ‘Jacob Cline’**

- Topflor foliar spray, 4 WAT

**Monarda PGR Recs**

- Cultivar differences
- B-Nine/Dazide multiple appl 5000 ppm
- Sumagic/Concise 15 to 30 ppm
- Little response to paclobutrazol
- Topflor <30 ppm

**Perovskia atriplicifolia**

- B-Nine: 5000 x3, good control
- B-Nine/ Cycocel Tank mix, multiple applications

**Perovskia atriplicifolia**

- Sumagic/Concise at 15 to 30 ppm, multiple appl?
- Bonzi/Piccolo/Paczol at 60 to 80 ppm
- Topflor at less than 45 ppm

**Perovskia atriplicifolia**

- Bonzi Liner Dip; baseline control of vigorous crops; 5 WAT

**Perovskia atriplicifolia**

- Bonzi Liner Dip; 8 WAT
**Phlox paniculata ‘Blue Boy’**

- Generally little response to triazoles or B-Nine; some response to Tank Mix

**Phlox paniculata ‘David’**

- Concise liner dips on hard to control crops
- “Dry” plugs, 2 min.
- 6 WAT

**Phlox paniculata ‘Laura’**

- 1600 ppm Augeo increased branching at 4 WAT
- Control 13.3 vs. 1600 ppm 26.8 branches
- No phyto but 3200 ppm stunted plants

**Phlox paniculata ‘Laura’**

- Configure increased branching, 6 WAT
- Control 15.7 vs. 600 ppm 21.0 breaks

**Phlox subulata ‘Apple Blossom’**

- Piccolo, 6 WAT, moderate control of plant width
- NR B-Nine/Dazide but good control with Tank Mix
- Good control with Sumagic/Concise at 15 ppm

**Rudbeckia ‘Goldsturm’**

- Concise/Sumagic: 15 to 30 ppm
- Paclo: 160 ppm or 30 to 40 ppm (multi)
- NR B-Nine/Dazide; good with Tank Mix
**Rudbeckia ‘Goldsturm’**

- Concise drenches, 2 oz per pot, 4 WAT

**Salvia leucantha**

- Linear height response to increasing rates

**Salvia PGR Recommendations**

- B-Nine/Dazide at 5000 ppm, multiple applications
- B-Nine/Dazide – Cycocel/Citadel Tank Mix, good response
  - ‘Blue Queen’ sensitive, test 2500/1000 ppm
- Bonzi/Piccolo/Paczol: 60 to 80 ppm, multiple applications
- Sumagic/Concise: 15 to 30 ppm
- Topflor: 45 ppm

**Salvia ‘Indigo Spires’**

- Sumagic moderate control at 45 to 60 ppm, 2 WAT; persisted through 4 WAT

**Sedum ‘Matrona’**

- 6 WAT
- Width control
- NR to B-Nine or tank mix

- Bonzi
- Sumagic
- Topflor
**Sedum ‘Autumn Joy’**
- Augeo (400 ppm) – Multiple applications on responsive plants may enhance branching; take care with chlorosis (phyto).

**Verbena ‘Homestead Purple’**
- Sumagic sprays, 2WAT, moderate control, multiple applications required.

**Veronica x ‘Sunny Border Blue’**
- B-Nine (x2) good control, 7-14 day intervals, 4 WAT.
- B-Nine/Cycocel Tank Mix, good control, single application.

**Sedum ‘Autumn Joy’**
- Configure treatment caused distorted leaves at 3 WAT; no symptoms at grow out.

**Verbena bonariensis 'Lollipop'**
- Augeo increased branching: C 1.3 vs. Trt 9-12.
- Florel also increased branching (5); 3 WAT.

**Veronica x ‘Sunny Border Blue’**
- Bonzi overdose.
- Tank Mix excellent control, 1x.
**Veronica ‘Icicle’ – 4 WAT**

- Abide drenches at 2 fl.oz. per quart pot
- Rates >2 ppm caused bronzing

**Veronica spicata ‘Goodness Grows’**

- After 4 wk grow out, all Augeo treatments increased branching but the 800 and 1600 ppm treatments caused excessive stunting – plants did not grow out.
- Florel (spray or drench) increased branching without reducing plant growth.

**Veronica repens ‘Sunshine’**

- Piccolo, 6 WAT, excessive control

**Veronica spicata ‘Goodness Grows’**

- At 4 WAT, 400 ppm Augeo increased branching (Untreated 1.0 vs. treated 8.0)
- Florel increased branching (C 1.0 vs. 4.1 to 4.8)
- Root dry wt not affected

**Veronica spicata ‘Goodness Grows’**

- All Configure treatments increased basal branching at 2 and 4 WAT:C 2.3 vs. Trt 5.0 to 9.3
- Root dry weight not affected
Successful PGR Use

- **Learn about PGRs**
- **Plan to use PGRs**
  - Do your own research and testing; leave untreated plants
  - PGRs are tools just like fertilizer and water
    - Know your plant materials
    - Adjust rates and timing to environmental conditions and cultural practices
- **Practice using PGRs**
  - Use proper rate and volume; check your math
  - **Read the label**
  - Pay close attention to equipment to apply proper volume
  - **Keep records** to refine your skill/art

For More PGR Information

- Product labels & Product use guides, such as Fine Americas: www.fine-americas.com/Content/prodL.asp?id=85
- “Floriculture: Principles and Species” book by John Dole and Harold Wilkins
- Michigan State University: www.flor.hrt.msu.edu/pgrs
- Virginia Tech: http://pubs.ext.vt.edu/430/430-103/430-103.html
- Virginia Tech PGR rates for perennials (searchable database): http://www.gpnmag.com
- North Carolina State University: www.ces.ncsu.edu/depts/hort/floriculture/crop/crop_PGR.htm
- Product representatives
- Experienced growers in your area

http://www.gpnmag.com

Special Thanks to:

- Fine Americas, Inc.
- OHP, Inc.
- Valent USA
- SePRO
- Syngenta Professional Products
- Riverbend Nursery, Riner VA
- Aris (Yoder/Green Leaf Perennials)

For more information

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