



**Great Lakes Fruit, Vegetable & Farm Market EXPO
Michigan Greenhouse Growers EXPO**

December 10-12, 2019

DeVos Place Convention Center, Grand Rapids, MI



**The PGR Toolbox 1 - Selection and Effective Use of Plant
Growth Retardants (OH 6D, 0.5 hrs)**

Moderator: Scott Klooster

Sponsored by: Fine Americas, Inc


9:00 am

- Joyce Latimer, Virginia Tech University




The PGR Toolbox Part 1 Selection and Effective Use of Plant Growth Retardants

Joyce Latimer
Extension and Research, Greenhouse Crops
Virginia Tech, Blacksburg VA




Production of Quality Plants

- Build a quality plant from the start
- Right plants
- Proper cultural conditions
- Proper chemical intervention
- Focus on quality
- Use tools available:
 - Develop plant architecture
 - Manage plant growth



Plant Growth Regulators (PGRs)

PGRs are used in commercial greenhouse operations to **manage** plant growth and development to optimize production space, enhance plant quality and extend shelf-life, thereby improving greenhouse profitability.



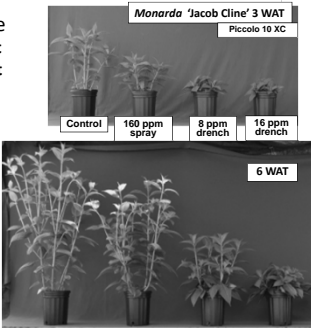
Expanding PGR Toolbox

Type	Chemical	Products
Anti-GA	Ancymidol	Abide, A-Rest
	Chlormequat Cl	Citadel, Cycocel
	Daminozide	B-Nine, Dazide
	Fluprimidol	Topflor
	Paclobutrazol	Bonzi, Pac O, Piccolo, Piccolo 10 XC, Downsize (<i>drenches only</i>)
	Uniconazole	Concise, Sumagic
Structural	BA	Configure
	GA	Florgib, ProGibb T&O
	BA+GA	Fascination, Fresco
	Dikegulac sodium	Atrimmec
	Ethephon	Collate, Florel

B. Whipker


Benefits of Growth Retardants

- Control plant height/size
- Less space used per plant
- Can meet shipping height requirement
- Can ship more plants per load
- Buffer period of growth control



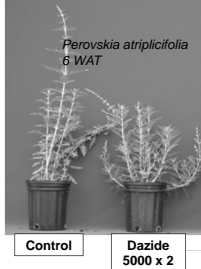
Additional Benefits of Growth Retardants (anti-GAs)

- Improve plant quality
 - Deeper color
 - Strengthen stems
- Increases disease resistance
 - Some cases
- Increase stress resistance
 - Have less shrinkage (production losses)
 - Have longer shelf life (production and retail)




PGRs – NO soil activity

- Typically short-term responses
- Uptake by leaves; good coverage required
- Labeled for use as spray applications
- Daminozide
 - B-Nine WSG (OHP) – 24 hr REI**
 - Application in greenhouse or nursery; restricted to containers if not under cover
 - Dazide (Fine Americas) – 12 hr REI**
 - Application inside enclosed structures (greenhouse, shadehouse) to containers only




PGRs – LIMITED soil activity

- Chlormequat Cl (not labeled for chemigation)
- Some root uptake
- Primarily foliar applications; good coverage required
 - Labeled for spray or drench applications**
 - Cycocel (OHP)**
 - Applications in greenhouse or nursery; restricted to containers if not under cover
 - Citadel (Fine Americas)**
 - Application to containerized ornamentals in greenhouses
- Labeled for tank mix with daminozide



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)**
- Labeled for use on containerized plants in nurseries, greenhouses, shadehouses or interiorscapes
- Topflor (flurprimidol; SePRO)**
 - Labeled for chemigation
 - Labeled for use on containerized plants grown in nurseries, greenhouses, shadehouses
- Topflor Granular (flurprimidol; SePRO)**
 - Topical application to containerized ornamentals



PGRs – Soil ACTIVE

- Paclobutrazols (labeled for chemigation)
 - Bonzi (Syngenta Professional Products)**
 - Sprays or drenches on containerized ornamentals in nurseries, greenhouses, shadehouses or interiorscapes
 - Downsize (Greenleaf Chemical)**
 - Drenches only on containerized ornamentals in nurseries, greenhouses, shadehouses or interiorscapes
 - Pac O (OHP)**
 - Sprays, drenches, or liner soaks on containerized ornamentals in nurseries, greenhouses, shadehouses or interiorscapes
 - Piccolo & Piccolo 10 XC (Fine Americas, Inc.)**
 - Sprays permitted only in enclosed greenhouses
 - Drenches or liner soaks on containerized ornamentals in nurseries, greenhouses, shadehouses or interiorscapes

PGRs – Soil ACTIVE

- Uniconazoles
 - Concise (Fine Americas, Inc.)**
 - Also labeled for liner soaks
 - Sumagic (Valent USA/NuFarm)**
 - Supplemental label for use on vegetable transplants
- Not labeled for chemigation**
- Sprays or drenches on containerized ornamentals in greenhouses, shadehouses or lath structures**
- 8 to 10 times more potent than paclobutrazol**

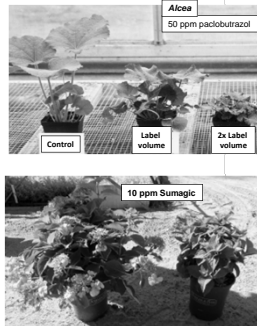
Relative activity of anti-GA PGRs

Ancymidol Daminozide Chlormequat	Daminozide + Chlormequat	Paclobutrazol <i>Flurprimidol</i> Leaf	Uniconazole <i>Substrate</i> Stem Bulb soak
Less →			More

BWhipker

Soil Active PGRs – Spray Applications

- Overspray (excess volume is active in substrate)
- Application volume critical!!!
- Application uniformity CRITICAL!!
- Crop uniformity depends on uniform applications that are consistent over time



Choosing a PGR to Match the Applicator

- Little to no experience?
 - Use PGRs with little or no soil activity
 - Typically short-term responses, multiple applications required
 - Daminozide [B-Nine, OHP; Dazide, Fine Americas]
 - Chlormequat Cl [Citadel, Fine; Cycocel, OHP]
 - Tank mix of daminozide and chlormequat – can be very potent
 - Uptake by leaves; good coverage required but volume of application less critical

Foliar Sprays

- Foliar sprays are most often used, economics, ease of use
- Volume critical for soil active PGRs
 - Apply evenly to area not to plants
 - Impacts DOSAGE
 - Want a constant volume
 - Use pressure gauge and pressure regulator
- Uniformity of crop depends on uniformity of application



Other Spray Application Notes

- Addition of surfactant may be necessary for plants with waxy leaves
 - **Check PGR label!!!**
- Spray applications have the most potential to delay flowering when applied late in crop
- Multiple applications may be required
- Pay attention to environmental conditions
 - Status of plant at time of application
 - To reduce phyto, treat unstressed plants under moderate temperature and relative humidity

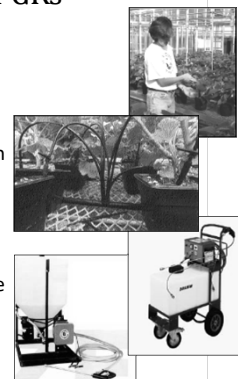
Relative Absorption Time of Foliar Applications

PGR	Trade Names	Chemical Absorption (hours)
Ancymidol	Abide / A-Rest	0.5 to 1
Chlormequat	Citadel / Cycocel	4
Daminozide	B-Nine / Dazide	18 to 24
Ethephon	Collate / Florel	12 to 16
Flurprimidol	Topflor	0.5 to 1
Paclobutrazol	Bonzi / Paczol / Piccolo	0.5 to 1
Uniconazole	Concise / Sumagic	0.5 to 1

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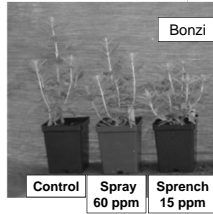
Drenches – Soil Active PGRs

- Provides uniform growth control
- Correct dosage:
 - Correct volume & concentration
 - Volume increases with pot size
- Good soil moisture at application
- Typically one application
- Labor intensive application – unless using chemigation; automated equipment available
- Subirrigation: use ~½ drench rate



Volume as a Tool – Sprenches

- High volume sprays or a hybrid of spray and drench
- Soil ACTIVE PGRs
- Apply 2 to 4 times the recommended spray volume
- Use rates between spray and drench (one-half to one-quarter the spray rate)
- Can be more effective than regular spray
- Can be applied through boom irrigation systems (for PGRs labeled for chemigation)



Tips for Using Liner Drenches

- Liner soaks and drenches are very effective PGR application methods
- In general, drenches, including liners, are already labeled; Be aware of chemigation labeling and requirements; follow label directions
- Volume (soak uptake or drench retention) is affected by plant water status and affects growth response to PGRs
- Develop a consistent application method/volume for liner drenches
- Species and cultivars vary in response – conduct your own rate trials!
- Determine the desirable rate at that volume

Timing of PGR Applications

- Plants should be actively growing and healthy
- Time the PGR application to affect the plant's growth and/or development
- Learn how your plants grow and develop so that you can anticipate interventions!
- Read the PGR label, PGR Guides and other resources for guidance



The “Right” Plant Growth Regulator

- Right chemical for the **job**
- Right chemical for the **applicator's** experience level
- Right chemical, rate and timing for the **plant**
 - **Plants are People, too!**
 - **Some plants respond better to some products than to others**
 - **Use all of our resources to help you narrow the field**
- **Learn the ART of growth regulation!**



Benefits of Using PGRs

- Grower using PGRs:
 - Less space used per plant (↓ cost of prod)
 - Have less shrinkage (↓ production losses)
 - Have longer shelf life (production and retail)
 - Can meet shipping height requirements
 - Can ship more plants per load
- PGRs improve plant quality
 - Plant height impacts perceived quality
 - Improved branching and pot fill
- Results in higher quality and more saleable plants



****Higher profits!****

VIRGINIA TECH
For More Information:

For a pdf of the full presentation, contact me:

<http://e-gro.org>

Joyce Latimer

jlatime@vt.edu

540-231-7906

Floriculture