Plant Growth Regulators

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Hummert™ INTERNATIONAL

Excessive Plant Height

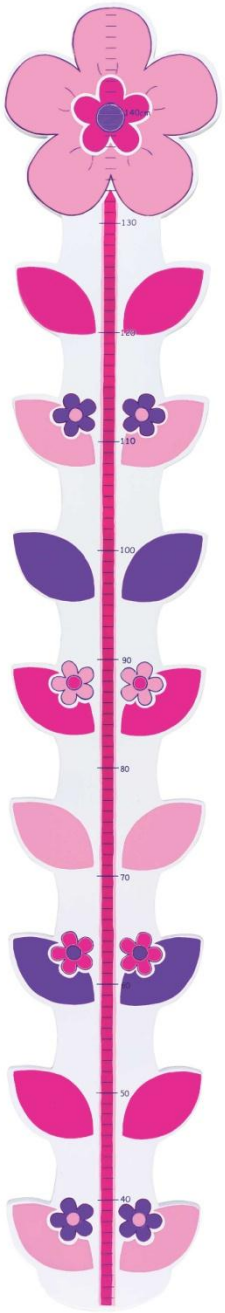
- Common problem
- Undesirable tall plants
- Damage during shipping
- Increased shipping costs
- Decreased sales

Early Spring Production

- Low light levels
- Warm temperatures
- High humidity
- High plant densities on bench
- This promotes stem elongation
- Plant growth regulators are often used

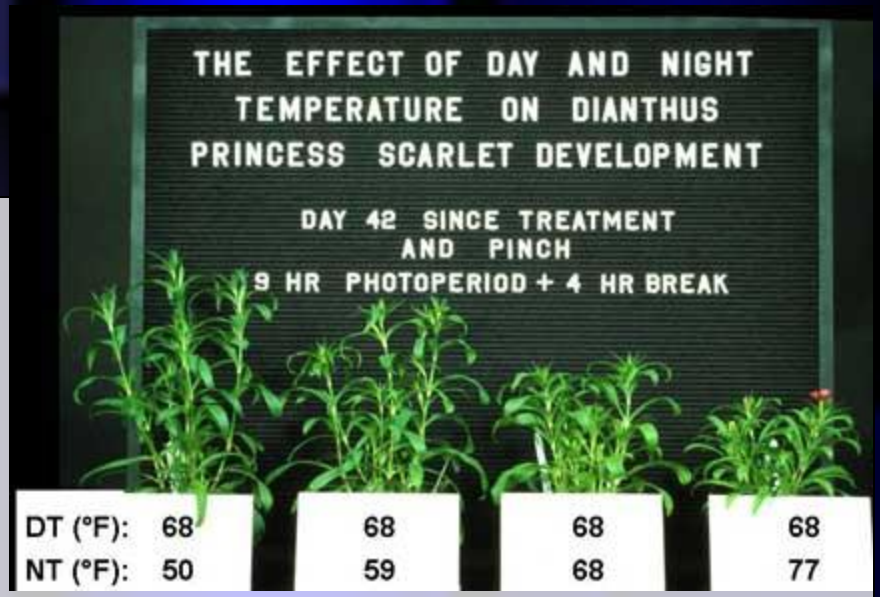
Plant Height Control

- How do you control plant height?
  - Physical
    - Pinching
    - Shaking/brushing
  - Biological
    - Cultivar selection
    - DIF
    - Fertilization
    - Light
    - Water Stress
  - Chemical
    - Plant Growth Regulators



Temperature

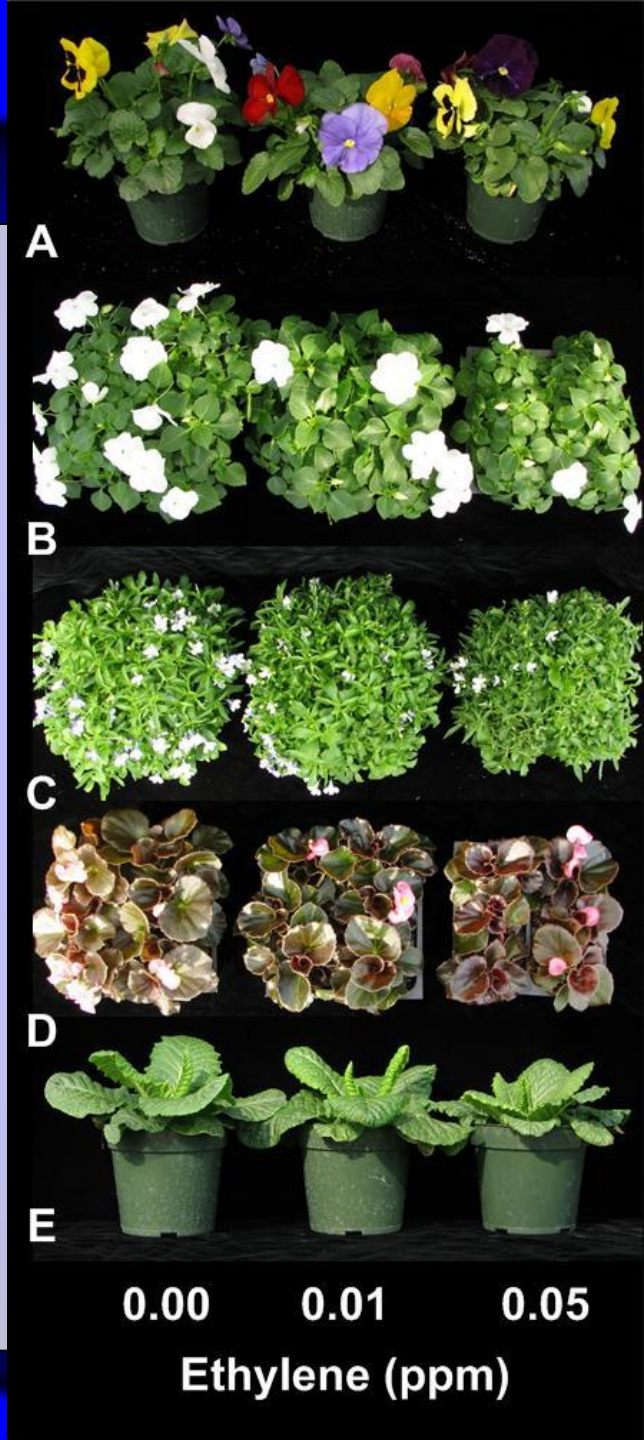
Figure 2. Poinsettia 'Velveteen Red' finished at 75°F/67°F day/night and 65°F/57°F day/night. Photographs were taken eight weeks after the start of short days.



- Temperature can be used to control height
- DIF
  - DIFference between day temperatures (DT) and night temperatures (NT)
- (DT-NT) = DIF

Plant Growth Regulators

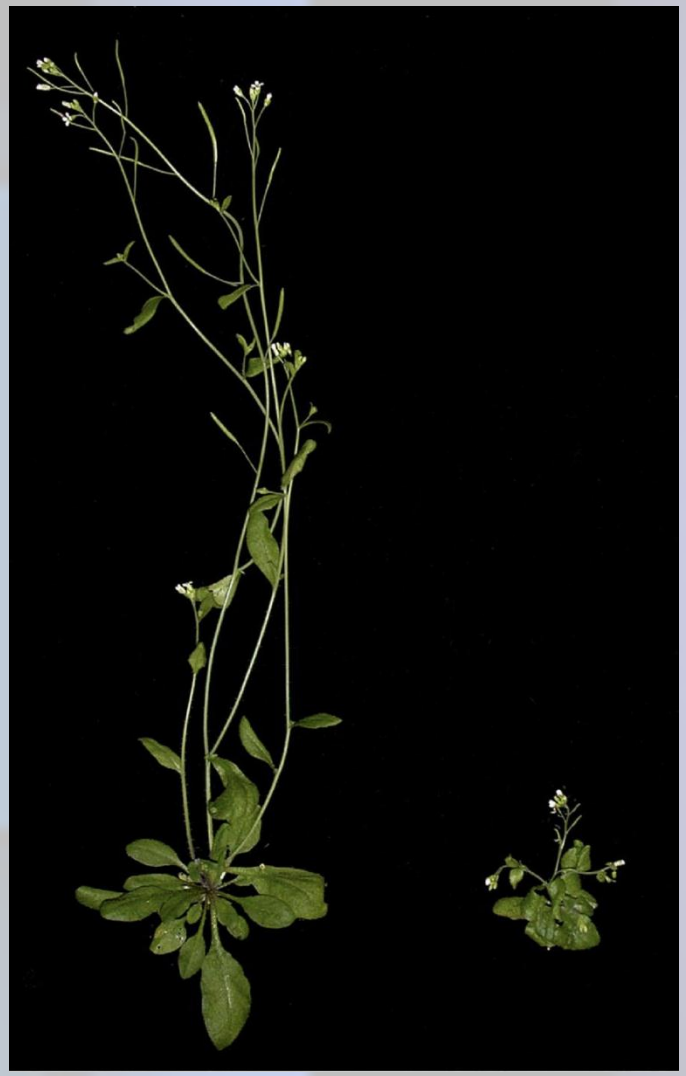
- Control Plant Height
  - Maintain high quality plants
  - Plant proportional to the pot size
  - Shipping
  - Customer specifications
  - Hold finished plants
- Control Flowering
  - Timing
  - Prevention
  - Abortion



Plant Growth Regulators (PGRs)

- Valuable tool in your grower's tool box
- Can make you lots of money
- Can make you loose money if you're lazy

Regulation of Growth



Lack of the growth hormone auxin causes abnormal growth

Plant Growth Regulator Class, Funcition & Uses

Class	Function	Practical Uses
Auxins	Shoot Elongation Cell Enlargement	Thin tree fruit, increase rooting & flower formation
Gibberellins	Stimulate Cell Division & Elongation	Increase stalk length, increase flower & fruit size
Cytokinins	Stimulate Cell Division	Prolong storage life of flowers & vegetables & stimulate bud initiation & root growth
Ethylene Generators	Ripening	Induce uniform ripening in fruit & veggies
Growth Inhibitors	Stops growth	Promote flower production by shortening internodes
Growth Retardants	Slows growth	Retard tobacco sucker growth

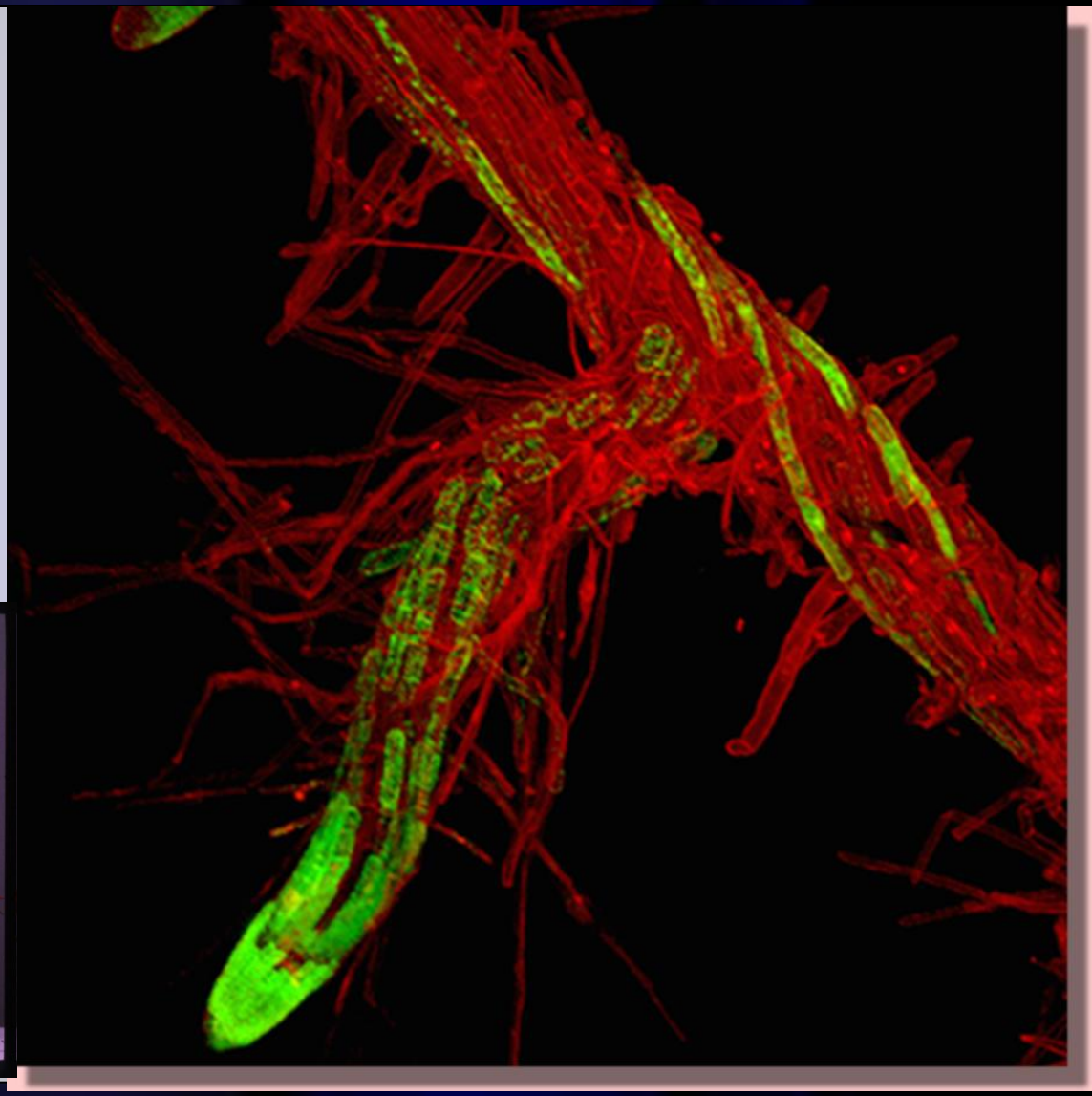
Cell Division Inhibitors

Cell Division Inhibitors

- Cell Division Inhibitors
  - Florel
  - Configure

Cell Division Inhibitors

- Stops terminal growth
- Promotes lateral shoots



Cell Division Inhibitor - Ethylene Generator

- Florel - Ethephon
  - Keep plants vegetative
    - Stock plants
  - Flower delay 6-8 weeks
    - Timing of flowering
  - Enhance branching
    - Ivy Geraniums
    - Florel “Sandwich”
      - 3-4 days before pinch
      - 1 week after pinch
      - Use caution with low vigor cultivars and cold finish

Florel – Ethephon

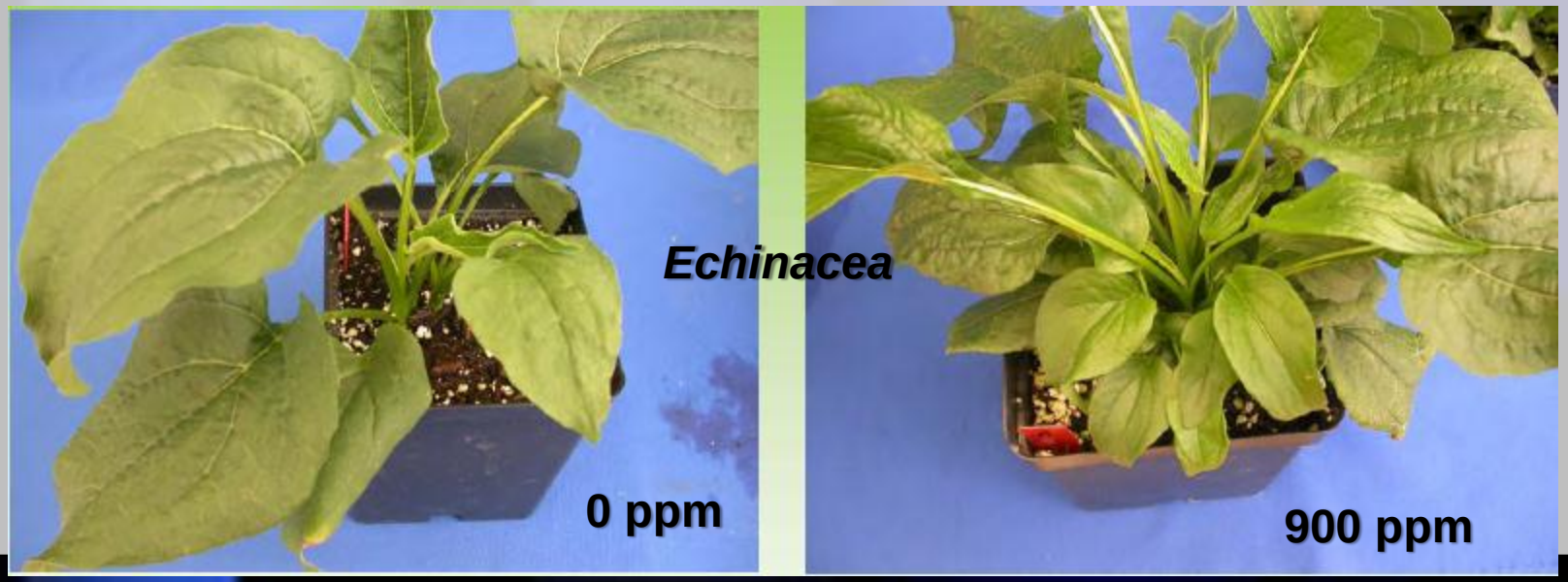
- Foliar Spray
- Promotes lateral branching, reduces elongation, aborts flowers, improves stock plant branching & cutting yield
- Use early in crop cycle to increase branching & remove early flowers (6-8 weeks before flowering).
- Induces flowering of bromeliads
- Reduces height & stem topple of potted daffodils & hyacinths
- pH of spray solution = 5.0
- No drench activity
- Use within 4 hours of mixing

Cell Division Inhibitors

- Florel (cont'd)
  - Apply as a foliar spray
  - Need to pH balance
    - Lower your water pH to 4.0 to 5.0
    - Activity decreases at higher pH
  - Add a wetting agent
    - Capsil 1 oz/gallon
  - 48 hour REI

Cell Division Inhibitors

- Configure
  - Application time is critical
  - Produces more vegetative breaks
    - When applied during vegetative growth
  - Produces more flower buds
    - When applied during floral initiation

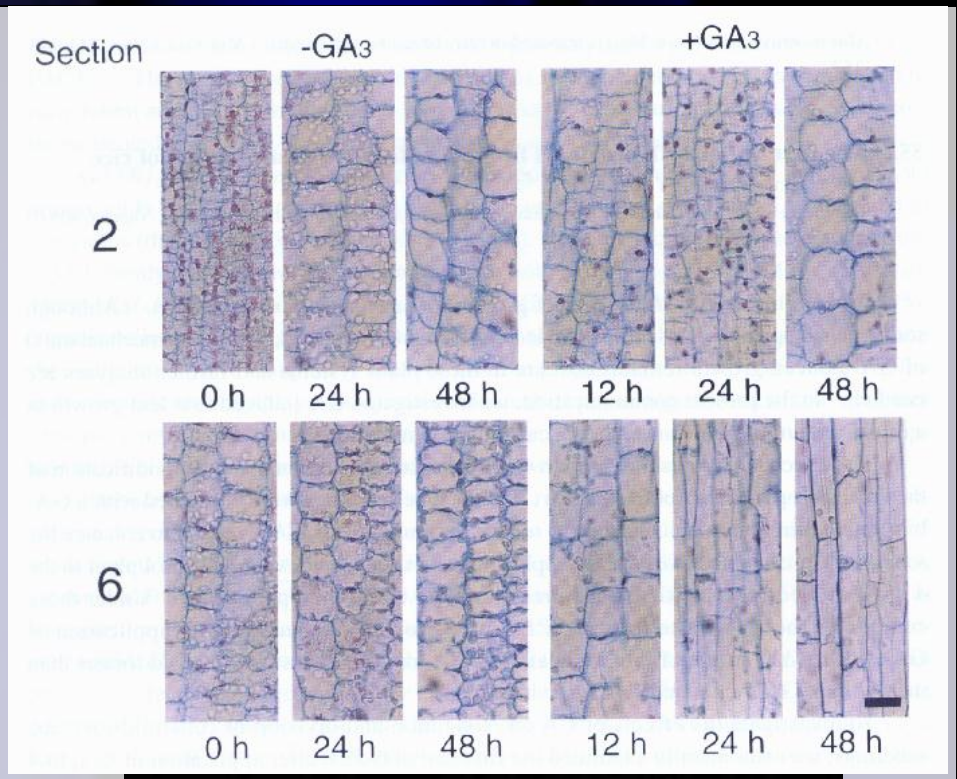


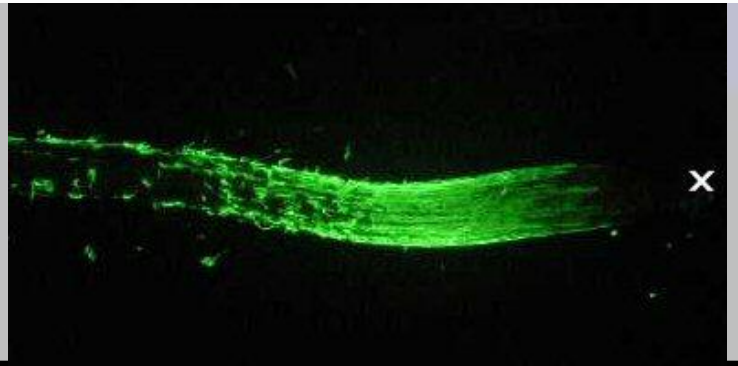
Cell Division Inhibitors

- Configure (2% 6-BA)
  - Christmas cactus
  - Hostas
  - Echinaceae
  - Tropicals
  - Annual & perennial flowering & foliage plants
  - 0.3 to 18 fl oz per gallon
  - 12 hour REI

Cell Elongation Inhibitors

- Same number of cells
- Smaller cells
- Effects Gibberellic Acid Pathway

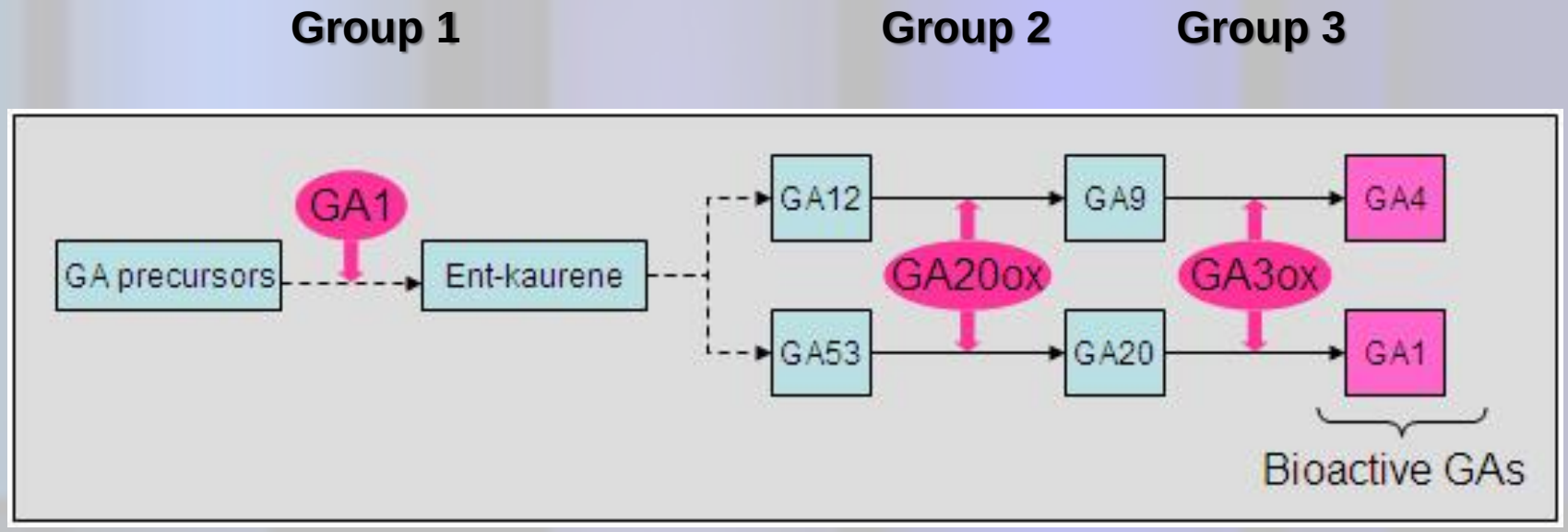




Cell Elongation Inhibitors

Chloromequat (Citadel, Cycocel)	Group 1
Ancymidol (Abide, A-Rest)	Group 2
Flurpimidol (Topflor)	Group 2
Paclobutrazol (Bonzi, Piccolo)	Group 2
Uniconazole (Sumagic, Concise)	Group 2
Daminozide (B-nine, Dazide)	Group 3

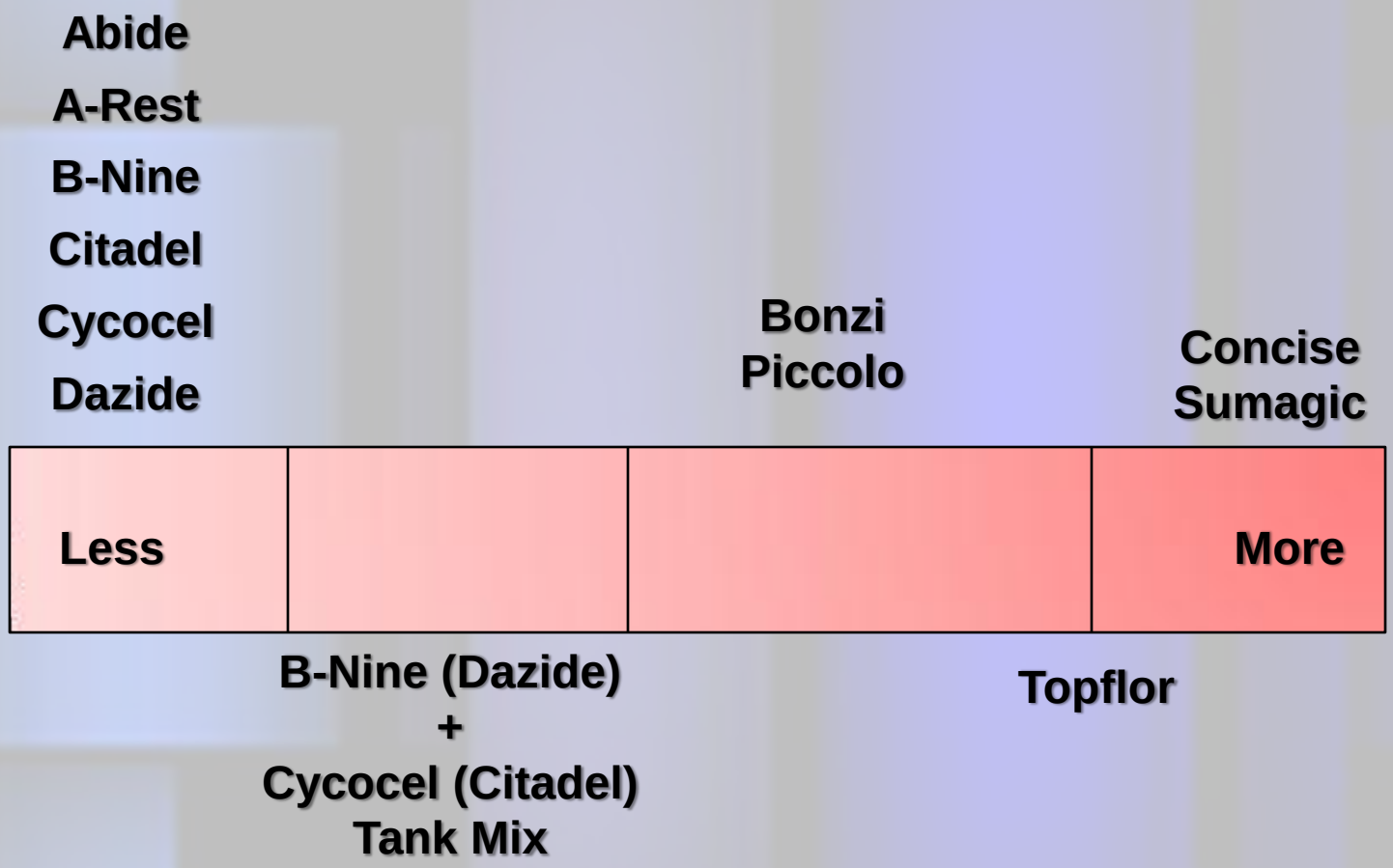
Gibberellic Pathway



Group 3 PGRs

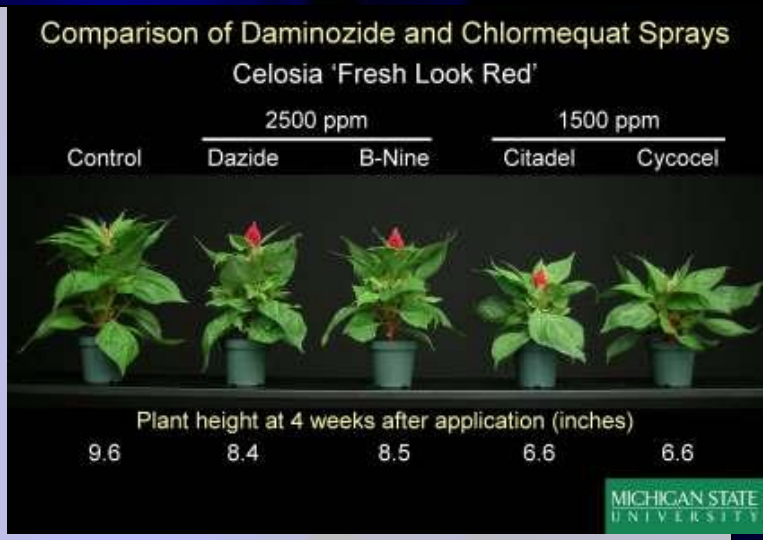
- Triazoles may cause darker green foliage

Plant Growth Regulator Activity



Group 1 – Chlormaquat Chloride

- Citadel & Cycocel
- Short-term inhibition (1-3 weeks)
- Compact, darker green, thicker leaves, stronger stems
- Poinsettias, geraniums, bedding plants, hibiscus, azaleas, woodies, mums etc.
- Spray or drench
- Apply when plants are elongating
- 0.22 to 4.34 fl. oz. per gallon
- 12 hour REI

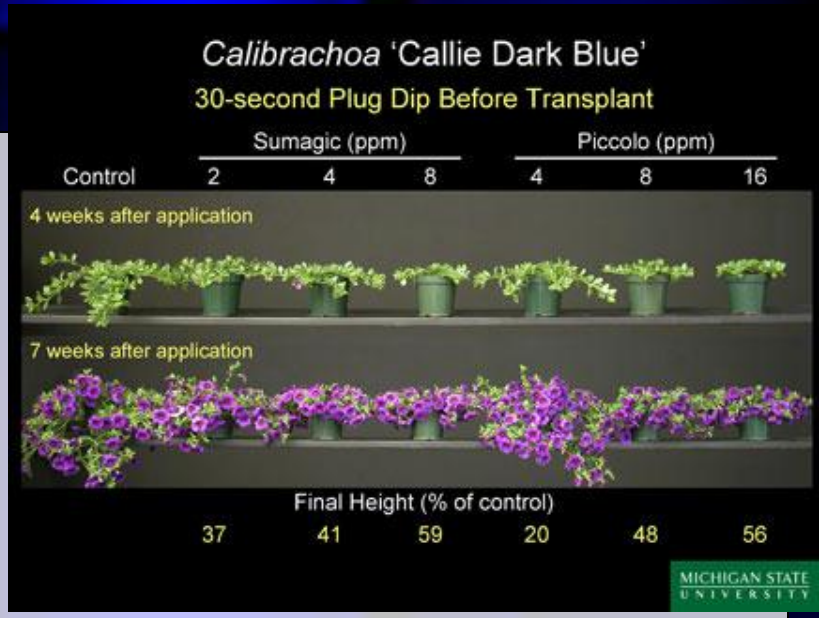


Group 2 - Ancymidol

- Abide & A-Rest
- Absorbed by roots, leaves, stems
- Mums, poinsettias, woodies, bedding plants
- Spray or drench
- Chemigation
- 3 to 50 ppm
- 12 hour REI

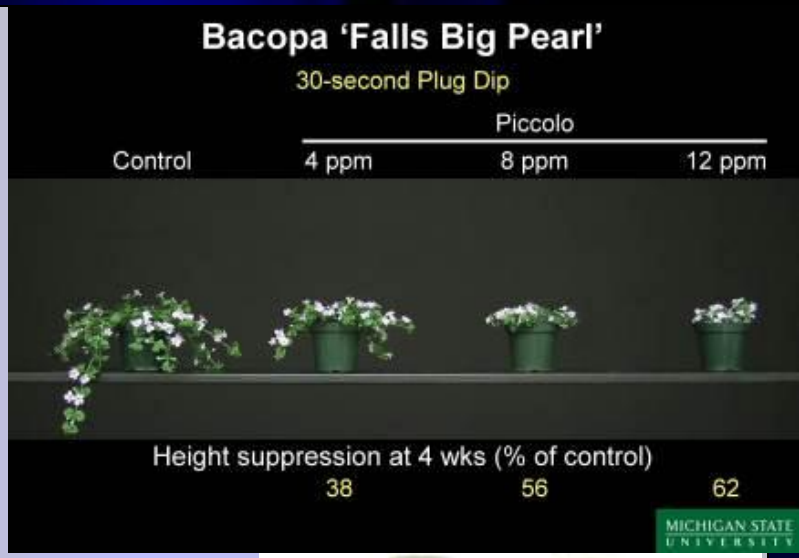
Group 2 - Uniconazole

- Concise & Sumagic
- Bedding plants, bulbs, geraniums, Easter lilies, poinsettia, mums, azaleas, woodies, hibiscus, ixora
- Spray, drench, dip or media spray
- Longer lasting results, dark green, thicker leaves, stronger stems, stress tolerant, increase flower number & size
- 0.26 to 19.2 fl. oz. per gallon
- 12 hour REI



Group 2 - Paclobutrazol

- Piccolo & Bonzi
- Xylem PGR
- Spray, drench, bulb soak, liner dip
- Azaleas, bedding plants, plugs, mums, geraniums, annuals/perennials, poinsettia, herbaceous, woodies etc.
- Compact & darker
- Chemigation
- 0.032 to 6.4 fl. oz. per gallon
- 12 hour REI



Group 2 - Flurprimidol

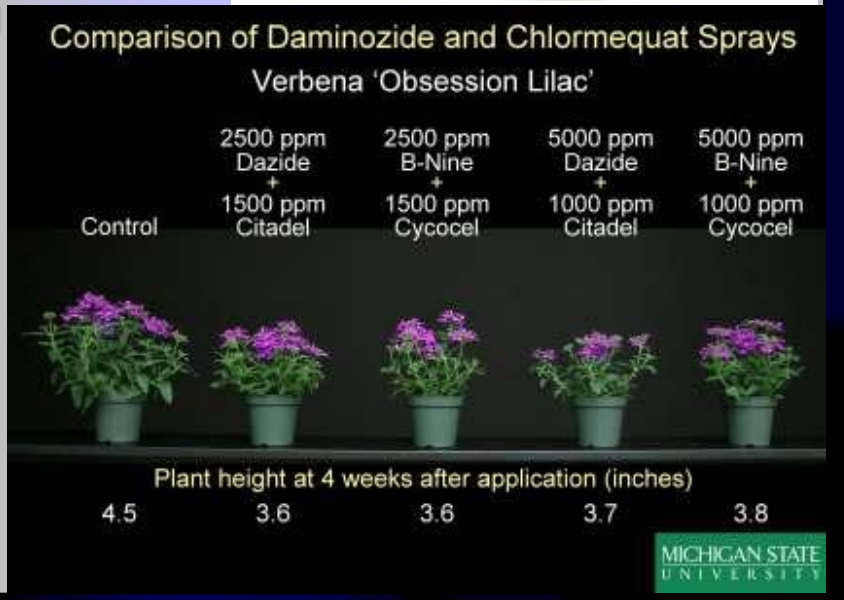
- Topflor
- Reduces internode elongation
- Increases color, thicker leaves, decreases water loss

Foliar sprays of Topflor controlled growth of New Guinea impatiens. The rate response curve is above and the left photograph compares the untreated control, Topflor at 5 ppm and Topflor at 80 ppm. Southeastern U.S. growers should begin with 2.5 to 5 ppm sprays. Rates may vary by location and cultivar.

- Sprays, drenches, chemigation
- Absorbed through foliage, stems and roots
- Poinsettia, bedding plants, plugs, bulbs, foliage, perennials, woodies
- 0.02 -6.46 fl. oz. per gallon
- 12 hour REI

Group 3 – Daminozide

- Dazide & B-Nine
- Shorter-term inhibition
- Azaleas, bedding plants, plugs, mums, foliage, hydrangeas, poinsettias
- Compact, stronger plants with additional buds
- Tank mix synergy
- 4/5 to 6 TBS per gallon
- 24 hour REI



Plant Growth Regulators

- Applied as:
  - Foliar sprays
  - Substrate drenches
  - Pre-plant bulb soaks
  - Liner dips

Foliar Spray

- Ancymidol
  - (Abide, A-Rest)
- Daminozide
  - (B-Nine, Dazide)
- Chlormequat
  - (Cycocel, Citadel)
- Flurprimidol
  - (TopFlor)
- Paclobutrazol
  - (Bonzi, Paczol, Piccolo)
- Uniconazole
  - (Concise, Sumagic)

Wear proper PPE
Check label

Key to Foliar Sprays

- ½ gallon per 100 ft2
- Even coverage
- Pay attention to the weather
  - Spray in the evening
  - Spray on a cloudy day
- Longer drying times = better results

Keys to Foliar Sprays

- Know your PGR
  - Mobile in plant
    - Ancymidol
    - Chloromequat
    - Daminozide
  - Not mobile (must contact the stems)
    - Flurprimidol
    - Paclobutrazol
    - Uniconazole

Keys to Foliar sprays

- Apply
  - To well watered plants
  - On cloudy days or in evening
- Allow as much drying time as possible

Use the Correct Sprayer

Substrate Drench

- Ancymidol
  - Abide, A-Rest
- Chlormequat
  - Cycocel, Citadel
- Flurprimidol
  - TopFlor
- Paclobutrazol
  - Bonzi, Piccolo
- Uniconazole
  - Concise, Sumagic

Keys to Substrate Drench

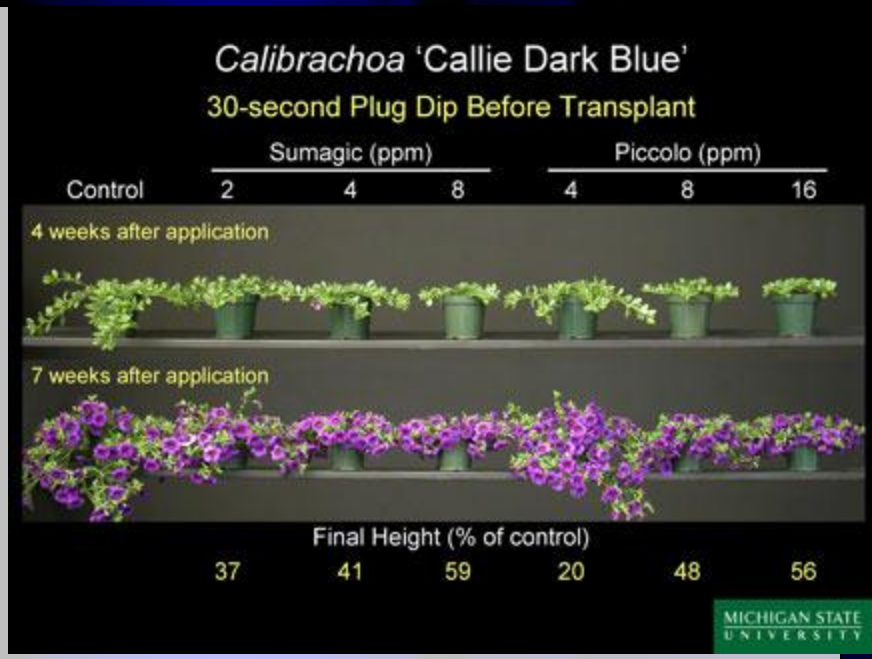
- Pot size and drench volume
  - 2 oz per 4” pot
  - 4 oz per 6” pot
- Consistency
  - Careful dosing
  - ChemDoser Dramm

Keys to Substrate Drenches

- Moisture level
  - Moderate moisture
  - Don’t water right away
- Timing

Application Liner Dip

- Great for combo planters
  - Allows for individual control
  - Treat vigorous species
- Ancymidol – Abide, A-Rest
- Chlormquat – Cycocel, Citadel
- Flurprimidol – Topflor
- Paclobutrazol – Bonzi, Piccolo
- Uniconazole – Concise, Sumagic
- Moderately dry – 10 seconds to 2 minutes

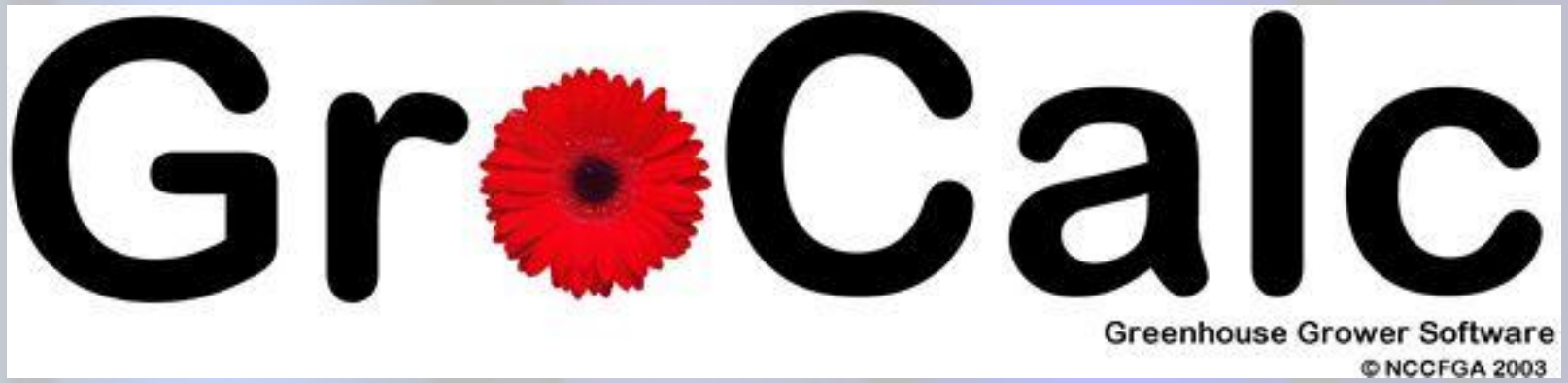


Bulb Soaks

- Ancymidol (Abide, A-Rest)
- Chlormequat (Cycocel, Citadel)
- Flurprimidol (Topflor)
- Paclobutrazol (Bonzi, Piccolo)
- Uniconazole (Concise, Sumagic)
- 2 to 40 minutes
- Up to 7 days before planting
- Solution @ 46F
- Dispose by drenching another crop

PGRCALC

- http://www.ces.ncsu.edu/depts/hort/floriculture/software/PGRCALC.htm



Other PGRs

- Indole-3-butyric acid (IBA) – Rooting hormone
- Naphthalene-acetic acid (NAA) – Rooting hormone
- Gibberellic acid – Increases cell division & elongation

Canned Labs & Lessons

- Carolina Biological Plant Tissue Culture kit
- $686
- 30 Tubes Auxin (2-4-D) Medium
- 30 Tubes Cytokinin Medium
- 30 Tubes Auxin (IAA) Medium
- 30 Tubes High Auxin/Low Cytokinin Medium
- 30 Tubes High Cytokinin/Low Auxin Medium
- Tools & supplies

Possible Lab Demonstrations

- Florel (pt. $14.40) – ethylene generator, cell division inhibitor
- FlorGib (gal $84.50) – increases cell division & elongation
- Contrast the two products affects on growth as compared to a control plant

Thank you. Questions?

Julius von Sachs
German Botanist
October 2, 1832 - May 29, 1897

- **First suggested chemical substances create organs, control growth**