

Plant Growth Regulators – Growth Retardants

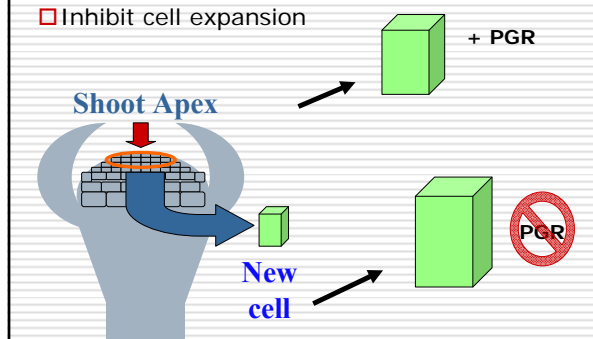
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Growth Retardants

- Cell elongation inhibitors
- Retard growth by inhibiting the production of the plant hormones Gibberellins
- Gibberellins cause cell expansion
- Therefore, plants are shorter

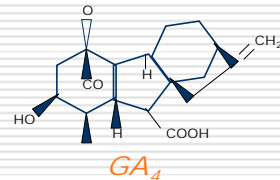
Growth Retardants

- Inhibit cell expansion



GA (Gibberellic Acid) Metabolic Pathway

Brian Whipker, NCSU

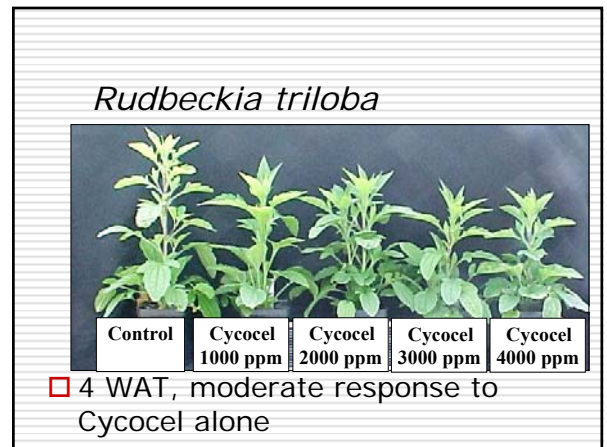
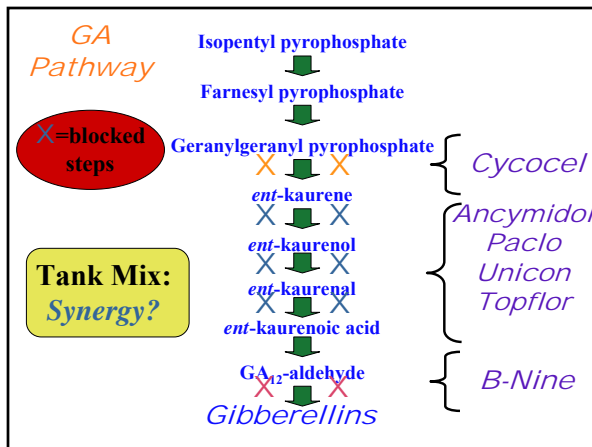
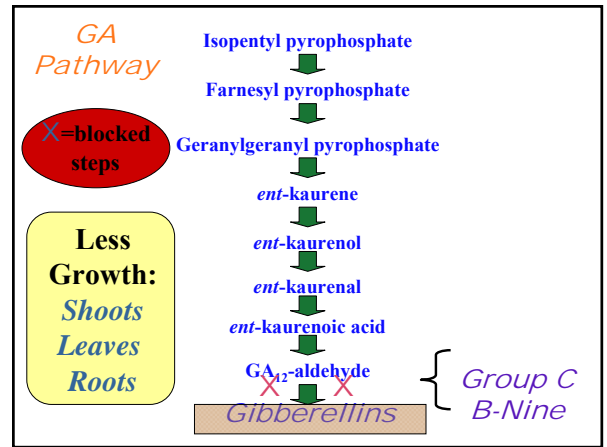
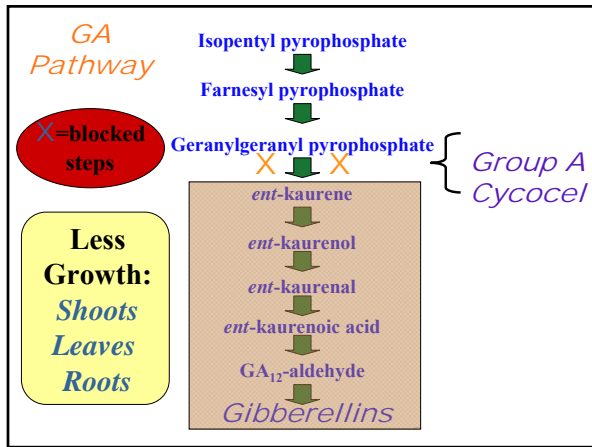
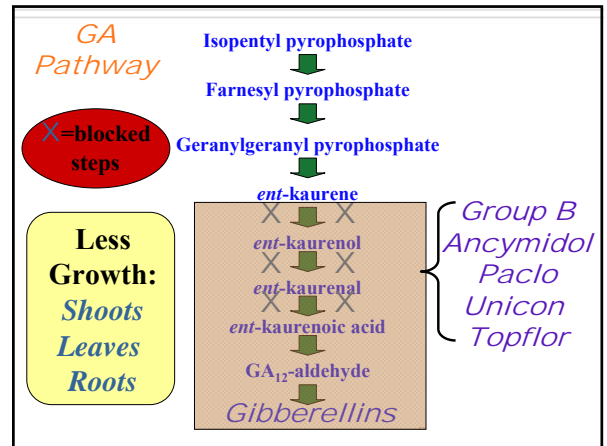
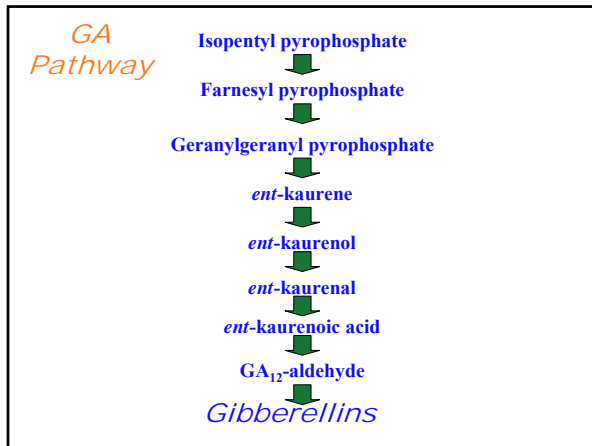


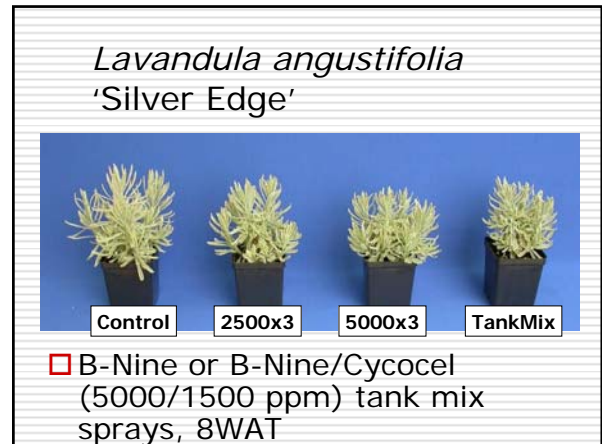
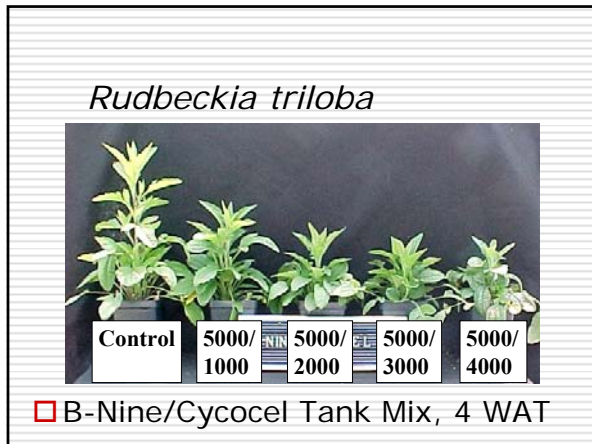
GA Metabolic Pathway

- Chemical chain of events, which leads to the production of GA
- Knowing the pathway provides a better understanding of how PGRs work.

Cell Elongation Inhibitors

- Group A
 - **Cycocel** (chloromequat)
- Group B (N - containing heterocyclic compounds)
 - **A-Rest/Abide** (ancymidol) [pyrimidine]
 - **Topflor** (flurprimidol) [pyrimidine]
 - **“Paclo”** (paclobutrazol) [triazole]
 - **“Unicon”** (uniconazole) [triazole]
- Group C
 - **B-Nine** (daminozide)





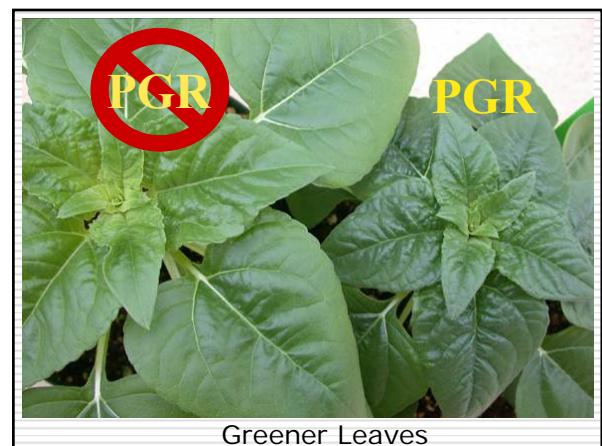
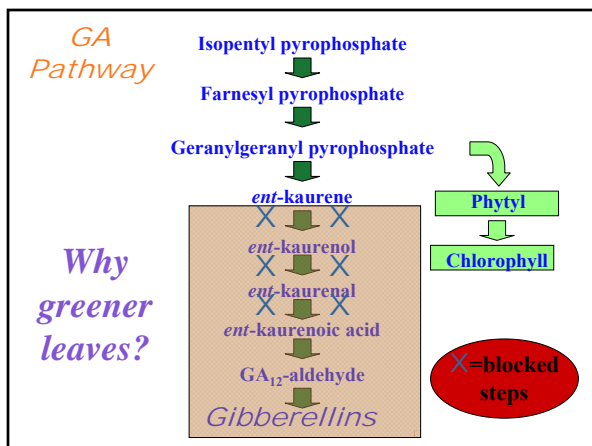
Other Effects of PGRs

Brian Whipker, NCSU

GA₄

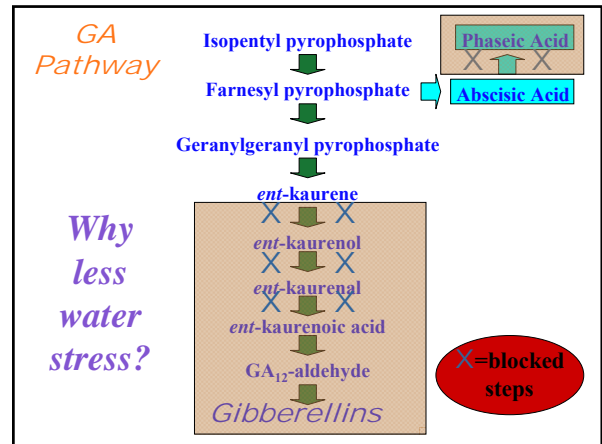
Greener Leaves

- ☐ PGR treated leaves are darker green
- ☐ Suggests a higher chlorophyll content
 - Cells smaller, so chlorophyll more concentrated
 - Increased chlorophyll production because of blocked pathway

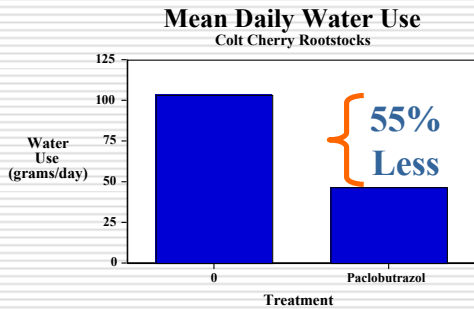


Reduced Water Stress

- Blocked GA pathway increases abscisic acid production ... and
- Interferes with the breakdown of abscisic acid

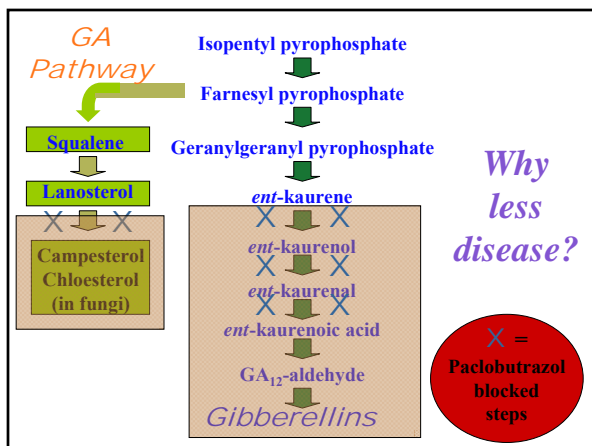


Reduced Water Stress

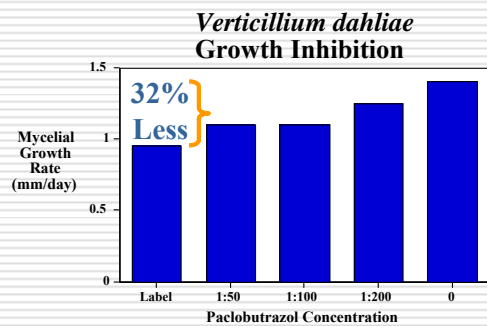


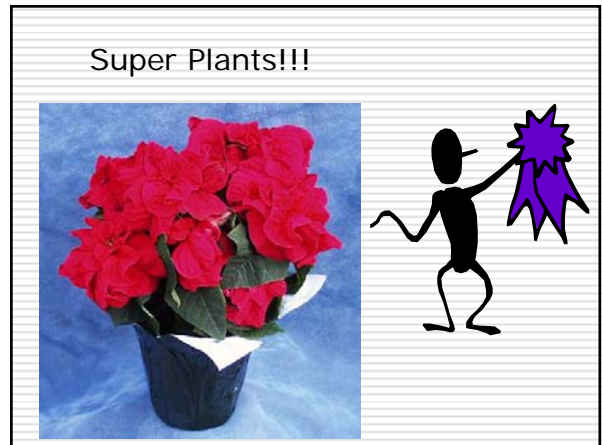
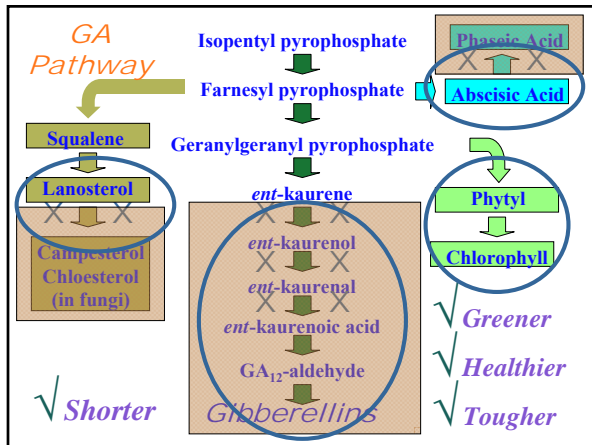
Disease Suppression

- Applying paclobutrazol to trees reduced the incidence of fungal diseases.
- Thought due to the inhibition of sterol production in fungi.
 - Sterols essential constituents of membranes.
 - Same mode of action as sterol biosynthesis inhibitor class of fungicides.



Disease Suppression (Paclobutrazol)





Benefits of Growth Retardants

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

Benefits of Growth Retardants

- Improve plant quality
 - Deeper color
 - Strengthen stems
 - Plant height impacts perceived quality (balance)

Benefits of Growth Retardants

- ❑ May increase disease resistance
- ❑ Increase stress resistance
 - Have less shrinkage (production losses)
 - Have longer shelf life (production and retail)



Benefits of Using PGRs

- ❑ Growers using PGRs:
 - Reduce cost of production
 - Reduce shrinkage
 - Can ship more plants per load
- ❑ PGRs → higher quality and more saleable plants

Benefits of Using PGRs

Growers using PGRs.....

Make more money!!!



Growth Retardants

PGRs – NO Soil Activity

- ❑ Typically short-term responses
- ❑ Uptake by leaves; good coverage required
- ❑ Daminozide
 - **B-Nine WSG** (OHP)
 - **Dazide** (Fine Americas)

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)

Cycocel

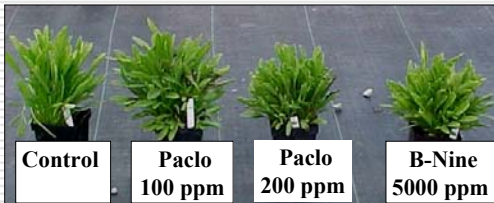
- ❑ Labeling includes outdoor use.
- ❑ Guidelines
 - Sprays only
 - Limited to 3 applications per crop
 - 12 hour REI (same as greenhouse use)
 - Mechanical (tractor) multi-nozzle sprayer applications on gravel/landscaped fabric cannot exceed 1 acre of plants per mixer/loader/applicator/day.

Veronica x 'Sunny Border Blue'

- ❑ B-Nine effective on a wide variety of perennials
- ❑ Multiple applications required at 7 to 14 day intervals



Coreopsis grandiflora 'Sunray'



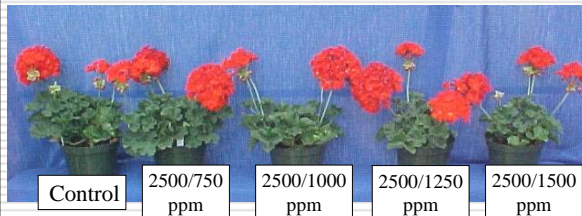
- ❑ Crop specific responses
- ❑ B-Nine 5000 ppm x 2

Cycocel Phytotoxicity



- ❑ Chlorotic halos on geranium
- ❑ Minimal with rates below 750 ppm

B-Nine/Cycocel Tank Mix on 'Tango'



- ❑ Significant reductions in stem height
- ❑ Improved plant form

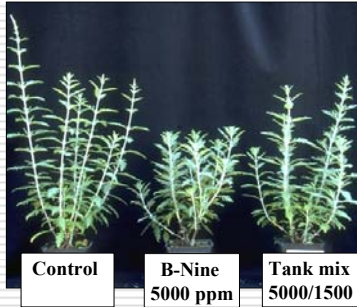
Helenium 'Coppelia'



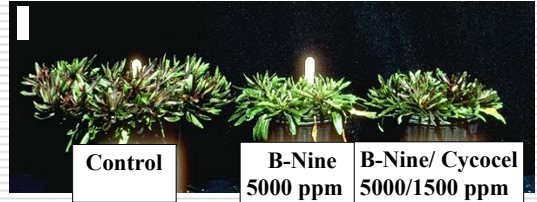
- ❑ B-Nine or B-Nine/Cycocel (5000/1500 ppm) tank mix sprays, 6WAT

Perovskia atriplicifolia

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



Gaura lindheimeri
'Siskiyou Pink'

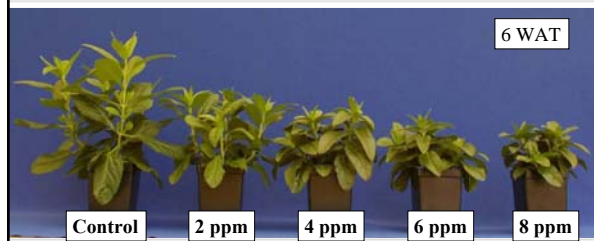


- For many plants, width more important than height

PGRs – Soil ACTIVE

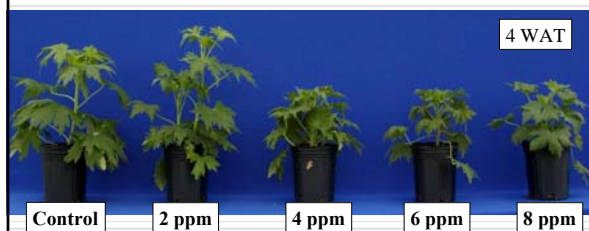
- Taken up by shoot and root tissues
- Typically more potent than foliar only
- Ancymidol (labeled for chemigation)
 - **A-Rest** (SePRO)
 - **Abide** (Fine Americas)
- **Topflor** (flurprimidol) (SePRO)
 - (labeled for chemigation)

Veronica 'Icicle'



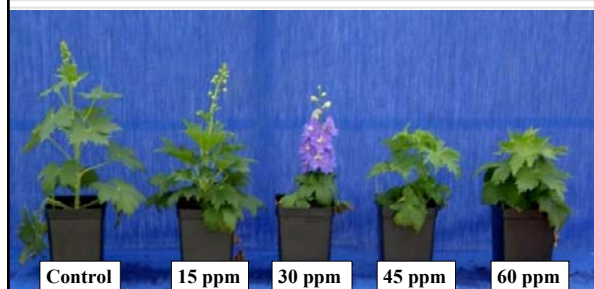
- Abide drenches at 2 fl.oz. per quart pot
- Plant ht: Control 10 inches vs. 8 ppm drench 4 inches

Delphinium 'Blue Bird'



- Abide drenches 10 fl.oz per trade gallon pot
- Control 13 inches vs. 8 ppm drench 7 inches

Delphinium elatum 'Blue Bird'



- Topflor foliar spray, 4 WAT, linear response

Erysimum linifolium



- ☐ Topflor foliar spray, 6 WAT, persistent

PGRs – Soil ACTIVE

- ☐ Paclobutrazols
 - labeled for chemigation
 - much more potent than ancymidol & daminozide
- ☐ Uniconazoles
 - not labeled for chemigation
 - 8-10x more potent than paclobutrazols
- ☐ Primary uptake by stems and roots

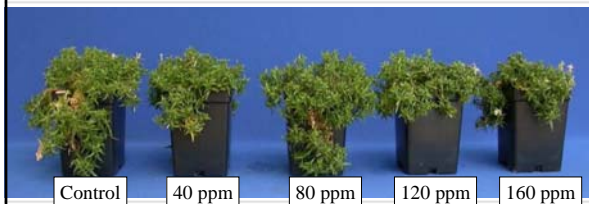
PGRs – Soil ACTIVE

- ☐ Paclobutrazols
 - **Paczol** (OHP)
 - **Bonzi** (Syngenta Professional Products)
 - **Piccolo** (Fine Americas, Inc.)
 - **Florazol** (Prokoz)
 - **Downsize** (Greenleaf Chemical)

PGRs – Soil ACTIVE

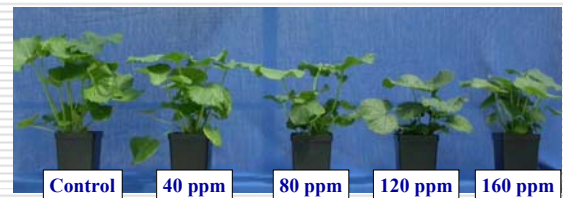
- ☐ Uniconazoles
 - **Sumagic** (Valent USA)
 - **Concise** (Fine Americas, Inc.)

Phlox subulata 'Apple Blossom'

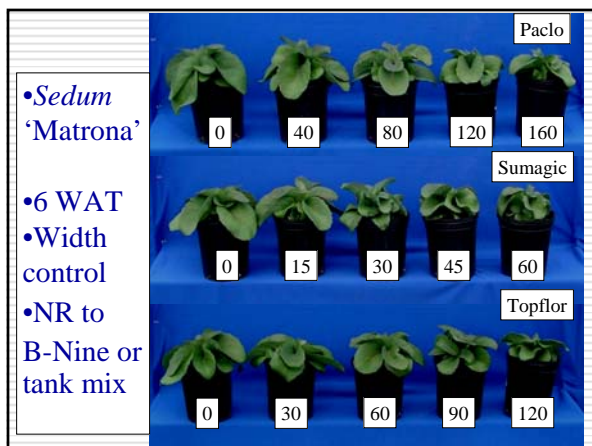
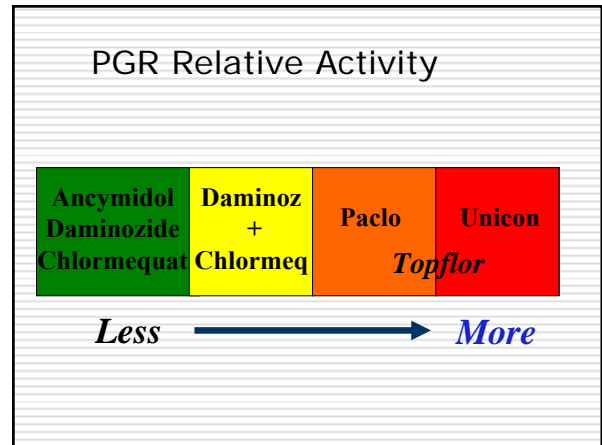
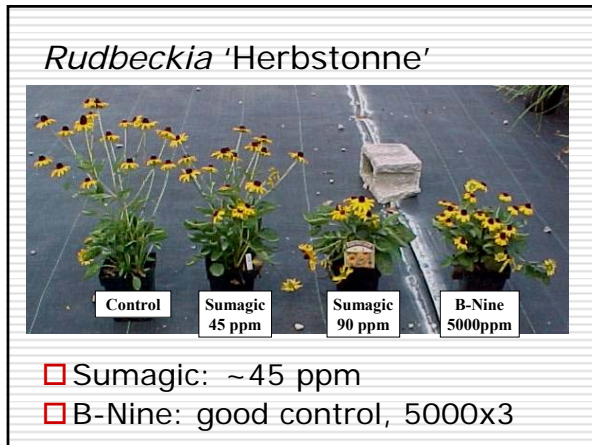
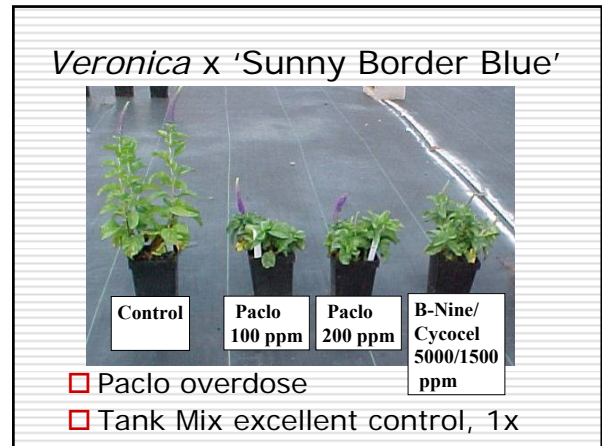
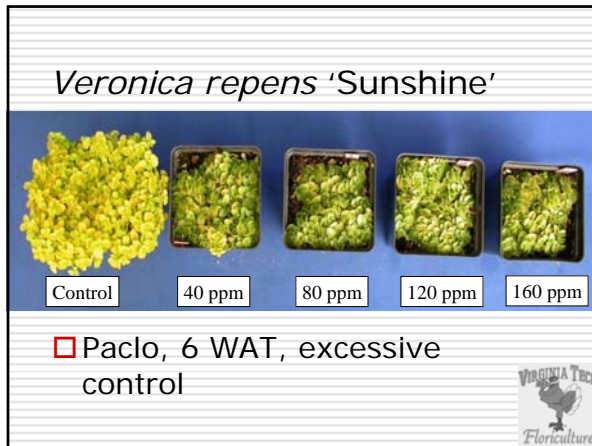


- ☐ Paclo, 6 WAT, moderate control of plant width

Alcea 'Chaters Double'



- ☐ Paclo sprays, 2 WAT, multiple applications necessary for long term control



VIRGINIA TECH

For more information

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Floriculture