

VIRGINIA TECH



Evaluating Plant Growth Regulators for Growth Control of Herbaceous Perennials

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Introduction and Objectives

- Ongoing project to evaluate PGRs on “new” plant materials
- Provide grower information on growth regulation of additional herbaceous perennials
- Evaluate drench applications to reduce potential impact on flowering



Plant Materials

- *Agastache* 'Purple Haze'
- *Hypericum calycinum*
- *Penstemon* 'Pike's Peak Purple'
- *Physostegia virginiana* 'Miss Manners'

Plant Culture

- ❑ Plugs (72s) donated by Aris Horticulture (May 2010)
- ❑ Planted in 3.4-liter pots filled with Fafard 52 (peat/pine bark medium); CLF at 200 ppm N
- ❑ Treatments applied ~2 weeks after potting; actively growing
- ❑ Sprays applied at 1 gal/200 sq.ft.
- ❑ Drenches applied at 10 fl.oz./pot
- ❑ Data collected: plant height and width, days to flower, number of flowers

Treatments and Rates

- Untreated control
- Concise (uniconazole)
 - Spray rates 30 or 60 ppm (~0.11 or 0.22 mg a.i./pot)
 - Drench rates 1 or 2 ppm (0.3 or 0.6 mg a.i./pot)
- Piccolo 10XC (paclobutrazol)
 - Spray rates 80 or 160 ppm (~0.3 or 0.6 mg a.i./pot)
 - Drench rates 4 or 8 ppm (1.2 or 2.4 mg a.i./pot)
- Dazide (daminozide)
 - Spray rate 5000 ppm applied twice
- Dazide/Citadel (chlormequat Cl) tank mix
 - Spray rate 5000 ppm Dazide/1500 ppm Citadel

Effect of Concise on *Agastache*

PGR	Rate (ppm)	Vegetative plant ht (cm)	
		4 WAT	6 WAT
Control	--	39.0ab	44.5a
Concise	Dr 1	30.8cd	38.5abc
	Dr 2	27.8d	29.8e
	Spr 30	27.3d	30.7de
	Spr 60	26.8d	30.3e
Rate effect		<0.0001	0.0003
LSD		5.7	7.3

Agastache 'Purple Haze' – 4 WAT

Concise



Control

**1 ppm
drench**

**2 ppm
drench**

**30 ppm
spray**

**60 ppm
spray**

Effect of Piccolo 10 XC on *Agastache*

PGR	Rate (ppm)	Vegetative plant ht (cm)	
		4 WAT	6 WAT
Control	--	39.0ab	44.5a
Piccolo 10XC	Dr 4	40.3a	42.5abc
	Dr 8	31.8cd	35.7cde
	Spr 80	38.7ab	43.2ab
	Spr 160	34.2bc	38.0abcd
Rate effect		<0.0001	0.0003
LSD		5.7	7.3

Agastache 'Purple Haze' – 4 WAT

Piccolo 10XC



Control

**4 ppm
drench**

**8 ppm
drench**

**80 ppm
spray**

**160 ppm
spray**

Effect of Dazide/Citadel on *Agastache*

PGR	Rate (ppm)	Vegetative plant ht (cm)	
		4 WAT	6 WAT
Control	--	39.0ab	44.5a
Dazide	Spr 5000x2	30.5cd	35.8bcde
Daz/Citadel	5000/1500	36.2abc	39.8abc
Rate effect		<0.0001	0.0003
LSD		5.7	7.3

Agastache 'Purple Haze' – 4 WAT



Control

**Dazide
5000x2**

**Dazide/Citadel
5000/1500x1**

Results: *Agastache* 'Purple Haze'

□ Concise

- All treatments reduced plant height (up to 31%) at 4WAT
- Similar reductions persisted through 6WAT with all treatments except the 1 ppm drench.
- No significant effect on days to flower or number of flowers.

Results: *Agastache* 'Purple Haze'

□ **Piccolo 10 XC**

- Only the higher drench rate, 8 ppm, significantly reduced vegetative plant height, by 18% at 4WAT and 20% at 6WAT.
- No significant effect on days to flower or number of flowers.

Results: *Agastache* 'Purple Haze'

□ **Dazide**

- Reduced plant height ~20% through 6WAT
- Reduced plant width
- Did not affect days to flower but reduced the number of flowers by 44%

□ **Tank mix of Dazide and Citadel**

- Did not affect plant height but reduced plant width
- Did not affect days to flower or number of flowers

Effect of Concise on *Hypericum*

PGR	Rate (ppm)	Plant width (cm)	
		4 WAT	6 WAT
Control	--	37.4a	56.3a
Concise	Dr 1	29.6c	39.9e
	Dr 2	29.8c	35.0f
	Spr 30	30.8bc	45.7cd
	Spr 60	30.1bc	48.1bcd
Rate effect		<0.0001	<0.0001
LSD		4.2	4.9

Hypericum calycinum – 4 WAT

Concise



Control



**1 ppm
drench**



**2 ppm
drench**



**30 ppm
spray**

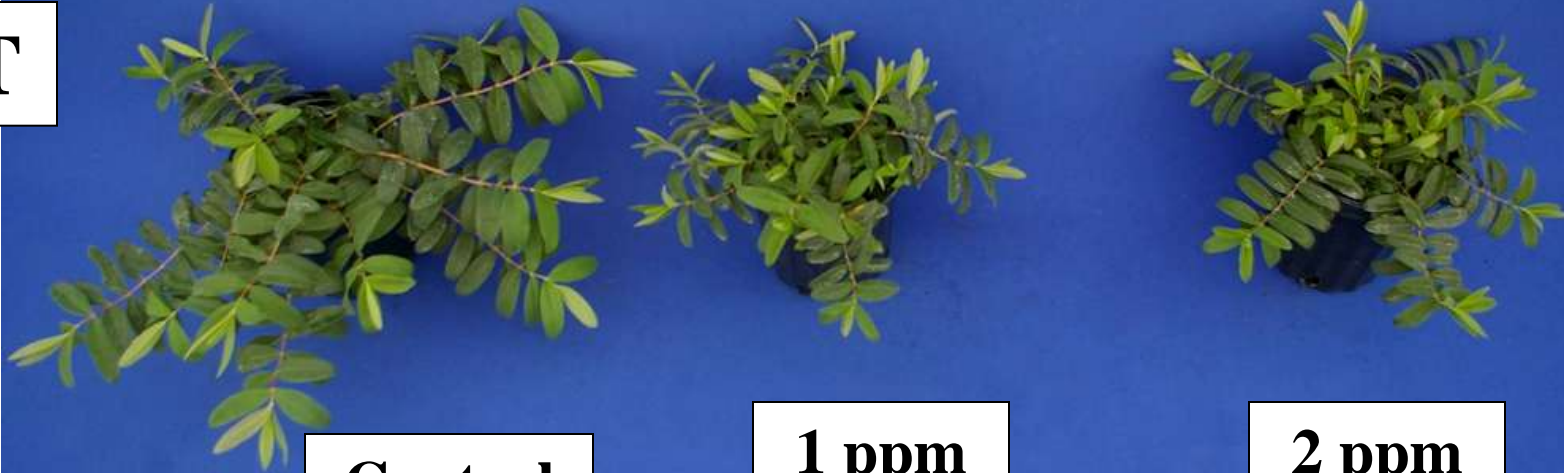


**60 ppm
spray**



Hypericum calycinum – Concise

6 WAT



Control

**1 ppm
drench**

**2 ppm
drench**

8 WAT



Effect of Piccolo 10 XC on *Hypericum*

PGR	Rate (ppm)	Plant width (cm)	
		4 WAT	6 WAT
Control	--	37.4a	56.3a
Piccolo 10XC	Dr 4	21.7d	26.2g
	Dr 8	19.0d	18.7h
	Spr 80	35.5a	47.8bcd
	Spr 160	27.9c	45.5d
Rate effect		<0.0001	<0.0001
LSD		4.2	4.9

Hypericum calycinum – 4 WAT

Piccolo 10 XC



Control



**4 ppm
drench**



**8 ppm
drench**



**80 ppm
spray**



**160 ppm
spray**



Hypericum calycinum – Piccolo 10 XC

6 WAT



Control

**4 ppm
drench**

**8 ppm
drench**

8 WAT



Phytotoxicity on *Hypericum*

- Piccolo 10 XC phyto with all treatments at 2WAT – minor but observed on most plants (only 17% of 4ppm drench). Not present at 4WAT.



Control

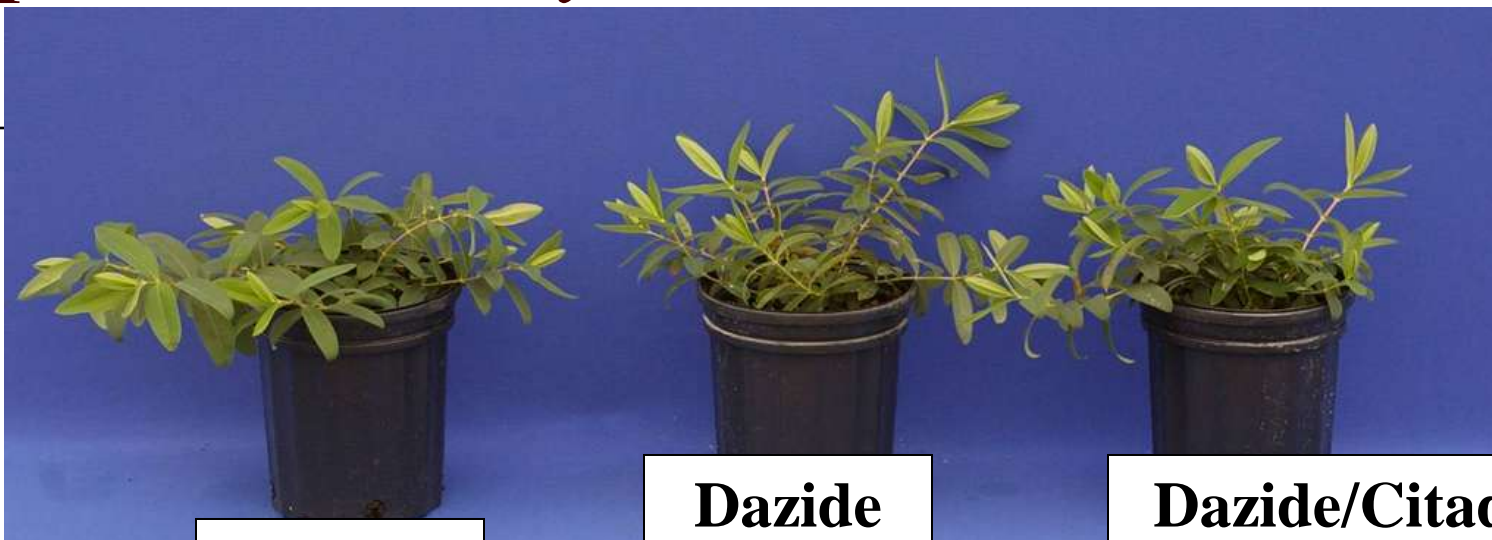


**4 ppm
drench**

Effect of Dazide/Citadel on *Hypericum*

PGR	Rate (ppm)	Plant width (cm)	
		4 WAT	6 WAT
Control	--	37.4a	56.3a
Dazide	Spr 5000x2	34.0ab	52.4ab
Daz/Citadel	5000/1500	31.3bc	50.4bc
Rate effect		<0.0001	<0.0001
LSD		4.2	4.9

Hypericum calycinum – 4 WAT



Control

**Dazide
5000x2**

**Dazide/Citadel
5000/1500x1**



Results: *Hypericum calycinum*

□ Concise

- Drench and spray treatments reduced plant width up to 21% at 4WAT
- Persistence of the drench effect - up to 38% reductions at 8WAT
- 60 ppm Concise spray provided moderate control, ~20% reduction in plant width at 6WAT

Results: *Hypericum calycinum*

□ **Piccolo 10 XC**

- Drenches also caused excessive reductions in plant width with 49% reductions at 4WAT and over 60% at 6 and 8WAT with the 8 ppm drench
- Drench rates less than 4 ppm would be recommended for this crop as a spray the 160 ppm was required to give moderate control of *Hypericum* growth



Results: *Hypericum calycinum*

□ **Dazide**

- Had no effect on plant width

□ **Tank mix of Dazide and Citadel**

- Reduced plant width 16% and 10% at the 4 and 6 WAT measurement dates

Penstemon 'Pike's Peak Purple'

- ❑ No significant PGR responses at 2 WAT
- ❑ Photo is a representative plant at 2 WAT
- ❑ All plants overgrown at 4 WAT



Phyto on *Penstemon*

- Leaf tip dieback at 4WAT on plants treated with the second application of 5000 ppm Dazide
- Not noted at 6WAT



Results: *Penstemon* 'Pike's Peak Purple'

- There were no significant PGR responses at 2WAT
- At 4WAT, the plants were severely overgrown and were not erect as is the habit described for this cultivar. Therefore, height and width data are not presented
- **Dazide** delayed flowering by 5 days
- **Dazide** phytotoxicity symptoms were seen at 4WAT, two weeks after applying the second Dazide treatment but not apparent at 6WAT

Physostegia virginiana 'Miss Manners' – 6WAT

Concise



Control

**1 ppm
drench**

**2 ppm
drench**

**30 ppm
spray**

**60 ppm
spray**

Physostegia virginiana 'Miss Manners' – 6WAT

Piccolo 10 XC



Control



**4 ppm
drench**



**8 ppm
drench**

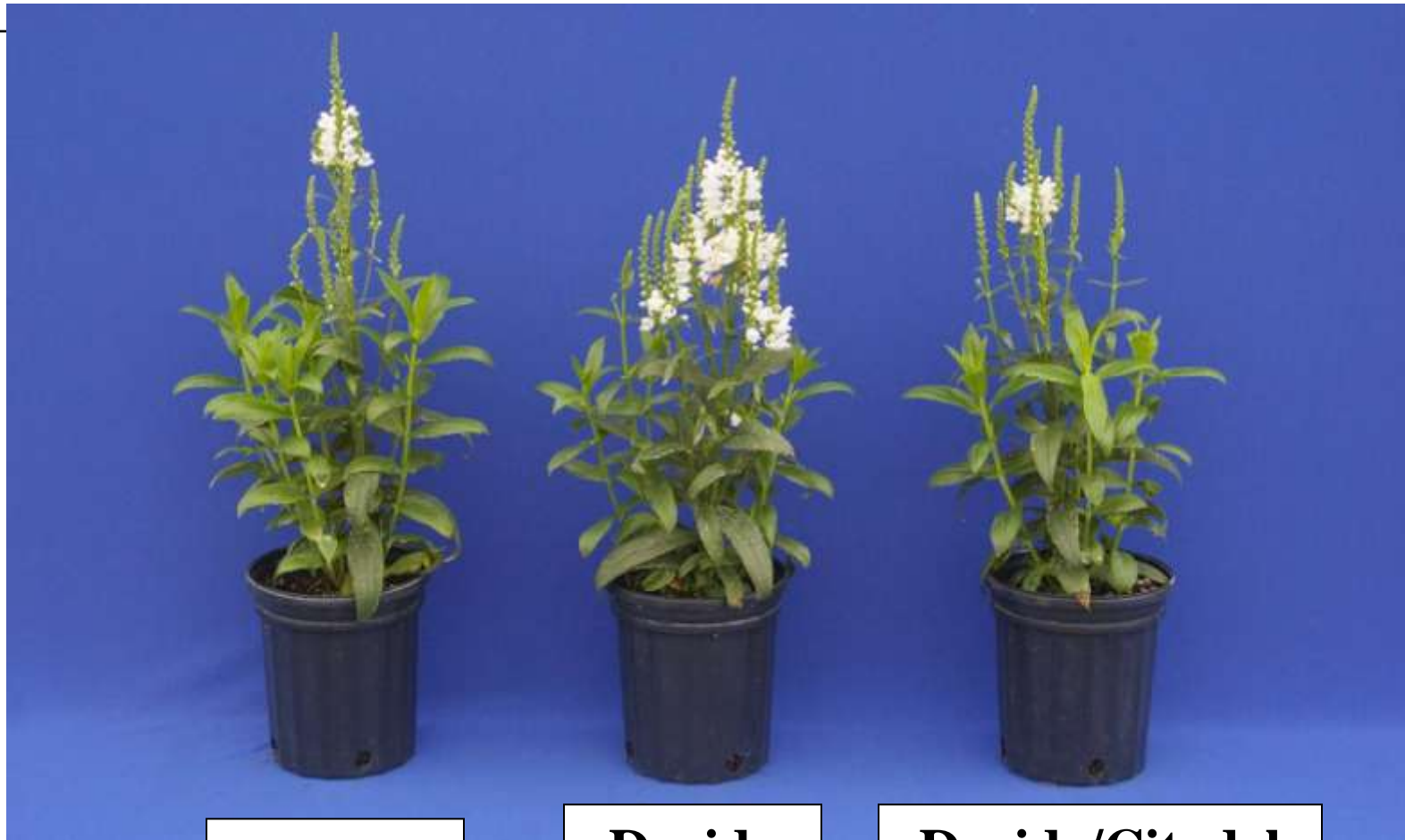


**80 ppm
spray**



**160 ppm
spray**

Physostegia virginiana 'Miss Manners' – 6WAT



Control

**Dazide
5000x2**

**Dazide/Citadel
5000/1500x1**

Results: *Physostegia virginiana* 'Miss Manners'

- Height of *Physostegia* was not responsive to any of these PGRs at the rates tested.
- **Concise** sprays reduced plant width about 10% at 2 WAT and 16% at 6 WAT
- Flower height, days to flowering and number of flowers were not affected by the treatments.
- These results confirm previous work with this crop; it is very unresponsive to PGR sprays.

Summary – *Agastache*

- Agastache was responsive to all of the Concise treatments while only the 8ppm Piccolo 10 XC treatment provided height control. The response to Concise was moderate but plant appearance was excellent.
- Recommended treatments would include: Concise as a 1 to 2 ppm drench or as a 30 ppm spray or Piccolo 10 XC as an 8 to 12 ppm drench.
- Dazide reduced plant height and width but the resulting plants that looked "thin". In addition, Dazide significantly reduced the number of flowers. Perhaps a lower rate of Dazide would provide some height control without width reduction and flower delay.

Summary – *Hypericum*

- Both Concise and Piccolo 10 XC drenches caused significant to excessive reductions in plant width of *Hypericum*.
- However, with spray applications, the higher spray rates, 60 ppm Concise or 160 ppm Piccolo 10 XC, were required to give moderate growth control of *Hypericum*.
- Drench rates of less than 1 ppm Concise or less than 4 ppm Piccolo 10 XC would be recommended for this crop.
- Dazide alone did not control growth and the tank mix of Dazide and Citadel gave only moderate control.

Summary

- **Penstemon** was not responsive to any of the PGR treatments with respect to growth regulation. However, Dazide delayed flowering of Penstemon by 5 days.
- Plant height of **Physostegia** was not responsive to any of these PGRs at the rates tested and only Concise spray applications affected plant width (moderately).

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