

# Current Herbaceous Perennial Weed Controls: Liquid OTT and Granular Applications

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# Introduction:

- ▶ **3 Research Studies** - conducted in 2018 on HP crops
  - ▶ Specialty Crop Block Grant - thru USDA via MDARD and grant recipient **MNLA**
  - ▶ OHP, BASF, Syngenta, Dow, NuFarm and Bayer = product
- 1. Ray Wiegand's Nursery, Lenox, MI** – Container dormant applications liquids OTT and granular applications
  - 2. Walters Gardens, Zeeland, MI** – Pre-plant field/ followed by liquids Over-The- Top (OTT) applications on newly planted small plugs
  - 3. Walters Gardens, Zeeland, MI** – Field HP's mid-summer – granular applications



# 1. Five Herbaceous Perennial (HP) Species in Containers, Liquid and Granular Formulations Applied Dormant

Ray Wiegand's Nursery, Lenox, MI





# More Label Expansion Work in HP Crops Req'd:

## Unlike:

- Woody crop ex. *Berberis* sp. = 17 registered herbicides
- HP crop ex. *Lobelia* sp. = 4 (Stamps et al., 2012)



*Berberis* orange rocket

- 1. Biathlon
- 2. FreeHand
- 3. Prodiamine
- 4. Tower



Blue lobelia - *Lobelia siphilitica*



# Preemergence herbicides labeled for herbaceous listed by Weed Science Society of America (WSSA) site of action group number and number of labelled sp./genus

WSSA Group	Herbaceous Genus/Sp.	Location	Trade Name	Company	REI
<b>3 + 21</b>	<b>39</b>	<b>N and L</b>	<b>Snapshot</b>	<b>Dow</b>	<b>12</b>
<b>3 + 15</b>	<b>26</b>	<b>N and L</b>	<b>FreeHand</b>	<b>BASF</b>	<b>24</b>
<b>3 + 14</b>	<b>6 (1<sup>st</sup> label)</b>	<b>N and L</b>	<b>Biathlon</b>	<b>OHP</b>	<b>24</b>
3 + 21	<b>64 (03/10/17)</b>	N and L	<b>Gemini G</b>	Everris	<b>12</b>
29	<b>9</b>	N- only (dir)	<b>Marengo G</b>	Bayer	<b>12</b>
<b>3 + 21</b>	<b>131</b>	<b>N – No L</b>	<b>Fortress</b>	<b>OHP</b>	<b>12</b>
15	<b>33 (2017)</b>	N and L	<b>Tower</b>	BASF	<b>12</b>
3	<b>49 (07/24/12)</b>	N and L (dir)	<b>Dimension 2EW</b>	DOW	<b>12</b>



# FreeHand = 26 genus/sp.

- ▶ Dimethenamid- p + pendimethalin (*Freehand G*) – BASF
- ▶ Freehand 1.75G, 150 lb/A = 1X, 450 lb/A = 3X
- ▶ Excellent, broad-spectrum weed control
- ▶ One of the longest-lasting preemergence herbicides in container nurseries – Joe Neal
- ▶ **Landscape and nursery** control weeds other products not controlling



# Freehand

## SENSITIVE Ornamental Species - Special Precautions

Ornamental grasses		Unacceptable phytotoxicity may occur to ornamental grasses. <b>FreeHand® 1.75G</b> herbicide should not be applied.
Herbaceous perennials		<p>Unacceptable phytotoxicity may occur to the following herbaceous perennials. <b>FreeHand 1.75G</b> should not be applied.</p> <p>           Black-eyed Susan    <i>Rudbeckia fulgida</i>            Blue star              <i>Amsonia</i> spp.            Butterfly flower      <i>Asclepias tuberosa</i>            Butterfly weed        <i>Asclepias tuberosa</i>            Cape leadwort        <i>Plumbago</i> spp.            Columbine             <i>Aquilegia</i> spp.            Dead nettle            <i>Lamium</i> spp.            Periwinkle             <i>Vinca minor</i>            Phlox                    <i>Phlox paniculata</i>            Pincushion flower    <i>Scabiosa</i> spp.            Speedwell, spiked    <i>Veronica spicata</i>            other <i>Veronica</i> spp.            Tickseed                <i>Coreopsis auriculata</i> </p>
Annual bedding plants		Applications of <b>FreeHand 1.75G</b> to begonia, gomphrena, and impatiens (including New Guinea hybrids) may result in injury; therefore, <b>FreeHand 1.75G</b> should not be applied.
Chelone spp. Coneflower Creeping phlox Hydrangea Loropetalum  Magnolia Salvia spp. Solidago spp. Spirea Thrift Viburnum spp. Western hemlock	<i>Echinacea</i> spp. <i>Phlox subulata</i> <i>Hydrangea</i> spp. <i>Loropetalum chinense</i> <i>Magnolia</i> spp.  <i>Spiraea</i> spp. <i>Armeria</i> spp.  <i>Tsuga heterophylla</i>	<p><b>DO NOT</b> apply <b>FreeHand 1.75G</b> sequentially to these species. During the growing season, a second application of <b>FreeHand 1.75G</b> can be made if a herbicide of a different mode of action is applied between <b>FreeHand 1.75G</b> applications. <b>FreeHand 1.75G</b> applications must be separated by at least 16 weeks.</p>
Ferns		Applications of <b>FreeHand 1.75G</b> to immature ferns during periods of new growth of fronds may result in some injury.
Hydrangea		Not all hydrangea cultivars may respond to the herbicide application with the same tolerance. Before treating an entire block of plants, apply only to a small number of plants and evaluate for 2 months for tolerance.



# FreeHand 1.75G Control

*Dr. Joe Neal, North Carolina State Univ.*

spurge

doveweed

eclipta

crabgrass

bittercress



10 WAT



**2007 Trial, Wilmington, NC**



# Biathlon = 6 G/Sp.

- ▶ Biathlon- oxyfluorfen and prodiamine
- ▶ New - Verge granule technology
- ▶ The rate is 100 lbs. per acre with a max. two/ac/year.
- ▶ Re-applications may be made at 3-month intervals.
- ▶ Controls grass and broadleaf weeds in field and container ornamentals, ground maintenance and other non-crop areas.
- ▶ Biathlon may also be used on evergreens and conifer trees including Christmas tree and conifer farms.

# FORTRESS® 131 Herbaceous and groundcovers

## genus/SP.

- ▶ **Isoxaben (Active ingredient in Gallery®) + Dithiopyr (Active ingredient in Dimension®)**
- ▶ Broad spectrum weed control.
  - ▶ Broadleaf and grassy weeds.
- ▶ Pre-emergent activity *and \*minor post* activity.
- ▶ Exceptional plant tolerance
  - ▶ Great choice for perennials and ornamental grasses.

\*1-2 cotyledons or shoot to 1 tiller stage. Not all weed species.



# 2017 Fortress Efficacy Studies:

*Cardamine pensylvanica*  
'Pennsylvania Bittercress'



*Stellaria media* 'Common  
Chickweed'



*Capsella bursa-pastoris* 'Shepherd's Purse'



*Senecio vulgaris* 'Common Groundsel'  
Poor = reseeded as WA



# 2017 Fortress Studies

1. *Geranium sanguineum* 'Max Frei' (bloody cranesbill) (C400)
2. *Vinca minor* (common periwinkle) (C400)
3. *Hemerocallis* 'Stella de Oro' (daylily) (C400)
4. *Phlox paniculata* 'Franz Schubert' (garden phlox) (C400)
5. *Paeonia lactiflora* 'Karl Rosenfield' (peony) (C600)

Fortress = No unacceptable phyto. at 150 and 300#/ac  
Phlox only phyto. = 0.7 and 1.7, respectively.

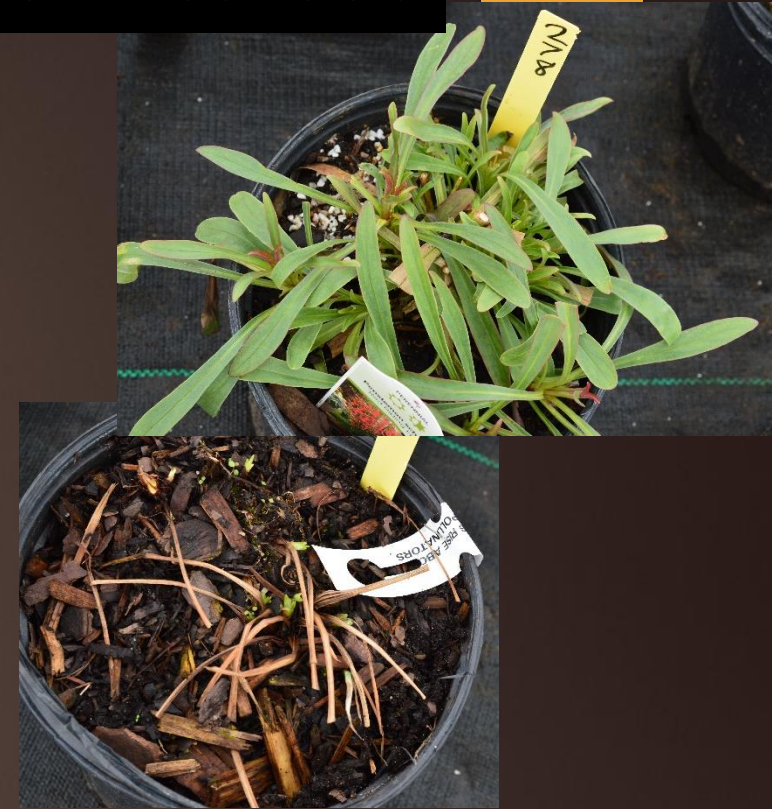


# Objectives:

## Evaluate efficacy and phytotoxicity:

- ✓ **2 rates of Fortress (150 and 300 lb/ac)**
- ✓ **2 current granular** formulations [with low numbers of HPs currently on their labels, i.e. **Biathlon and Marengo** (6 and 9, respectively)].
- ✓ **2 rates of liquid** formulation i.e. **Tower (26 and 52 oz/ac)** (33 on label 1X) and **Tower + Dimension 2EW** (33 and 49, respectively).
- ✓ **Untreated control**

# Materials and Methods



- Ray Wiegand's Nursery, Lenox, MI
- 8 treatments, 5 species
- 8 replicates
- Applied in a polyhouses with end walls open for air circulation on 03/30/2018.
- Dormant at time of application - except for the *Penstemon schmidel* 'Red Riding Hood' (active) and *Rudbeckia fulgida* 'Little Goldstar' (start)
- Hand weeding at application but weeds were germinating



# Materials and Methods:

## Liquid applications:

- ✓ CO<sub>2</sub> backpack sprayer delivering 25 gal/ac (R&D Sprayers, Opelousas, LA 70570)
- ✓ 8002 vs nozzles (TeeJet, Carol Stream, IL 60116)
- ✓ At 45-50 psi; Nozzles 18" apart
- ✓ Granules pre-measured to diameter of 1 gallon container
- ✓ All in C400 (Nursery Supplies, Inc.)

Asclepias incarnata

Treatment	Rate (/ac) <sup>v</sup>	6	6 WAT Phyto	11WAT Efficacy	11WAT Phyto.	16WAT Eff.	16 WAT Phy.	Av Eff	Av Phy
		WAT <sup>z</sup> Eff.							
Fortress	150 lb.	10.00	1.63	9.5	0.50	9.5cd	0.6a	9.7b	1.3d
Biathlon	100 lb.	9.00	2.50	8.50	0.75	7.9b	0a	8.5b	1.1ab
Fortress	300 lb.	10.00	2.00	9.88	0.13	9.9cd	0a	9.9b	0.7ab
Marengo G	200 lb.	9.63	3.88	9.00	0.38	9.5cd	0a	9.4b	1.4ab
Tower 2X	52 oz	9.63	8.38	9.75	4.63	9.3bcd	1.0a	9.6b	4.7c
Tower 1X	26oz	9.63	3.00	9.25	1.13	8.4bc	0a	9.1b	1.4ab
Tower + Dimension	(26 + 2 pt./ac)	10.00	8.13	10.00	1.88	10d	0.8a	10b	3.6c
Control	---	5.33	3.00	2.00	3.00	0a	0a	2.4a	2.0b



## *Asclepias incarnata*

Tower 2X = tmt 5 = most phytotoxic treatment = 4.7 av. Over 16 weeks  
Delay in dormancy and reduced shoot numbers



## B. *Penstemon schmidel* 'Red Riding Hood'

Treatment	Rate (/ac) <sup>v</sup>	6 WAT <sup>z</sup> Efficac y	6 WAT Phyto	11WAT Eff	11WAT Phyto	16 WAT Eff.	16 WAT Phyto	Av Eff	Av Phyto						
Fortress	150 lb.	10	a	1.38	a	9.75	a	2.38	b	9.5cd	1.0a	9.8	b	1.6	bc
Biathlon	10 lb.	9.38	a	0.00	a	3.00	b	2.00	b	5.4b	4.8d	5.9	a	2.3	bc
Fortress	300 lb.	10	a	1.38	a	10	a	0.63	a	10d	0.4a	10	b	0.8	ab
Marengo G	200 lb.	9.75	a	1.00	a	10	a	0.00	a	6.4b	2.5bc	8.7	b	1.2	ab
Tower 2X	52 oz	8.75	a	0.63	a	9.38	a	2.38	b	8.3c	1.9b	8.8	b	1.6	bc
Tower 1X	26oz	10	a	0.00	a	9.88	a	0.38	a	9cd	1.3ab	9.6	b	0.6	ab
Tower + Dimension	(26 + 2 pt./ac	10	a	6.88	c	10	a	6.63	c	9.1cd	6.4e	9.7	b	6.6	d
Control	---	9.60	a	2.80	b	9.60	a	2.80	b	0a	3c	6.4	a	2.9	c



## *Penstemon schmidel* 'Red Riding Hood'

Tower + Dimension = tmt 7 = most phytotoxic treatment = 6.6 av. Over 16 week  
Delay in dormancy, reduced shoot number and stunting

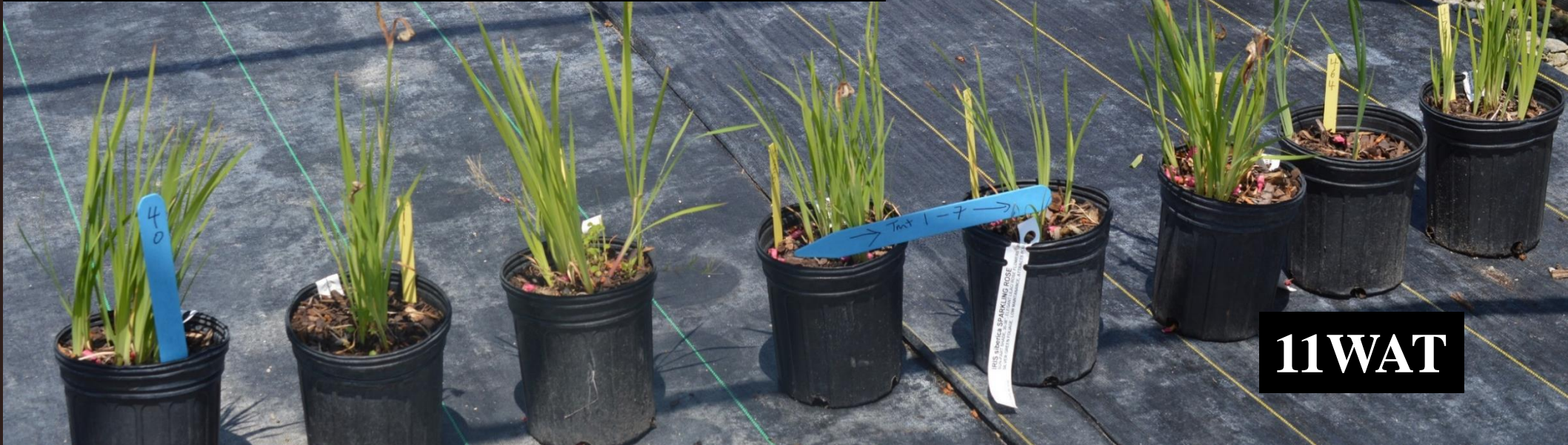


*Iris sibirica* ‘Sparkling Rose’

Treatment	Rate (/ac) <sup>v</sup>	6 WAT <sup>z</sup> Eff		6 WAT Phyto		11WAT Eff		11WAT Phyto		16 WAT Eff	16 WAT Phyto	Av Eff	Av Phyto.	
Fortress	150 lb.	8.88	ab	2.25	bc	8.4	bc	1.9	b	8.9cd	0.8ab	8.7bc	1.7	b
Biathlon	10 lb.	8.00	a	2.0	bc	6.0	a	2.0	b	7.0b	1.8bc	7.0a	1.9	b
Fortress	300 lb.	9.5	b	1.25	ab	10	d	0.3	a	9.5d	0.1a	9.7c	0.6	ab
Marengo G	200 lb.	8.63	ab	2.25	bc	7.5	b	0.4	a	7.8bc	1.0ab	8.0ab	1.2	ab
Tower 2X	52 oz	9.13	b	0.88	a	9.6	cd	0.0	a	9.6d	1.8bc	9.4c	0.9	ab
Tower 1X	26oz	10	b	3.38	c	10	d	1.3	ab	10d	0.4ab	10c	1.7	b
Tower + Dimension	(26 + 2 pt./ac)	9.88	b	0.75	a	9.8	d	0.4	a	9.4d	2.9c	9.7c	1.4	ab
Control	---	10	b	0.0	a	9.8	d	1.0	ab	0a	0a	6.6a	0.3	a



# *Iris sibirica* 'Sparkling Rose'



11WAT



16WAT – all commercially acceptable



# *Rudbeckia fulgida* var. *Sullivantii* 'Little Goldstar'

Treatment	Rate (/ac) <sup>v</sup>	6 WAT <sup>z</sup> Eff.		6 WAT Phyto		11WAT Eff		11WAT Phyto		16 WAT Eff	16 WAT Phy.	Av Eff		Av Phy	
Fortress	150 lb.	10	a	7.50	d	10	a	4.88	d	9.3d	4.4c	9.8	d	5.6	d
Biathlon	100 lb.	6.00	b	3.50	b	10	a	0.00	a	<b>7c</b>	<b>2a</b>	7.7	b	2.5	b
Fortress	300 lb.	10	a	4.00	b	10	a	3.50	c	9d	3.1a b	9.7	d	3.5	bc
Marengo G	200 lb.	9.63	a	4.00	b	10	a	1.25	b	4.9b	3.5a b	8.2	bc	2.6	b
Tower 2X	52 oz	9.88	a	6.13	cd	9.25	a	3.63	c	5.6bc	5bc	8.3	bc	<b>4.9</b>	c
Tower 1X	26oz	10	a	5.38	bc	9.75	a	2.50	bc	<b>8.9d</b>	<b>2.4a</b>	9.6	cd	3.4	bc
Tower + Dime	(26 + 2		a	7.38	d	10	a	7.00	d	9d	6c	9.6	cd	<b>7.0</b>	d
Contr				Phyto with Tower 2X in June							4ab	6.7	a b	3.0	b



*Rudbeckia fulgida* var.  
Sullivantii 'Little Goldstar'

Tower + Dimension = tmt 7 = most phytotoxic  
treatment = 6.6 av. over 16 week

11WAT

Biathlon

Tower 1X\* and 2X

16WAT





# *Panicum virgatum* 'Shenandoah'



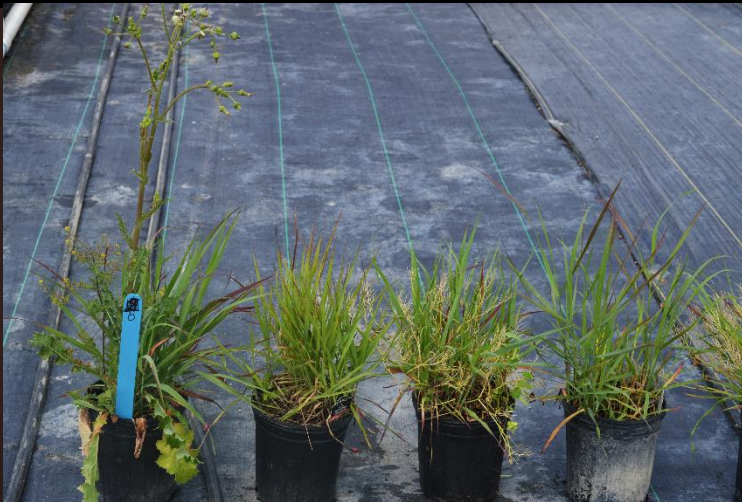
Treatment	Rate (/ac) <sup>v</sup>	6 WAT <sup>z</sup> Eff.		6 WAT Phyto		11WAT Eff		11WAT Phyto		16 WAT Eff	16 WAT Phy	Av Eff		Av Phyto	
Fortress	150 lb.	9.4	ab	0.25	ab	7.1	c	3.3	b	<b>7.9c</b>	<b>1.0a</b>	8.1	d	1.5	ab
Biathlon	10 lb.	4.5	c	0.00	a	3.1	b	3.1	b	2a	3.3c	3.6	b	2.1	b
Fortress	300 lb.	8.1	b	1.25	ab	6.4	c	2.0	ab	5.3b	2.5bc	6.6	c	1.9	b
Marengo G	200 lb.	4.9	c	1.88	b	3.8	b	2.4	b	5.0b	2.6bc	4.6	b	2.3	b
Tower 2X	52 oz	8.0	b	1.63	b	8.0	c	2.3	ab	5.9b	1.4ab	7.3	cd	1.6	b
Tower 1X	26oz	8.1	b	2.75	c	8.0	c	1.9	ab	5.8b	1.6b	7.3	cd	2.1	b
Tower + Dimension	(26 + 2 pt./ac)	10	a	1.88	b	10	d	0.9	a	<b>10d</b>	<b>0a</b>	10	e	0.9	ab
Control	---	0.0	d	5.00	d	0	a	5.0	c	0a	2bc	0	a	<b>4.0</b>	<b>c</b>



# *Panicum virgatum* 'Shenandoah'



Control= tmt 0 = most phytotoxic treatment = 4.0 av. over 16 week – lots of weeds – 2<sup>nd</sup> Biathlon = poor weed control



Mugwort



# Conclusions: Based on high efficacy and low phyto.

<b>Rudbeckia fulgida 'Little Goldstar'</b>	<b>Tower 1X</b>	<b>8.9</b>	<b>2.4</b>	<b>No</b>
<b>Penstemon schmidel 'Red Riding Hood'</b>	Fortress 1X	9.5	1.0	No
	Tower 1X	9	1.3	No
<b>Panicum virgatum 'Shenandoah'</b>	Fortress 1X	7.9	1.0	<b>Nothing</b>
	Tower + Dimension	10	0	
<b>Iris sibirica 'Sparkling Rose'</b>	Fortress 1X	8.9	0.8	Yes
	Tower 1X	10	0.4	Iris sp.
	Biathlon	7	1.8	No
	Marengo G	7.8	1.0	No
<b>Asclepias incarnata</b>	Fortress 1X	9.5	0.6	No
	Tower 1X	8.4	0	No
	Biathlon	7.9	0	No
	Marengo G	9.5	0	No
	Tower + Dimension	10	0.8	No

## 2. Herbaceous perennial field production:

- **Major cost = weed control**
- **Many - relying solely or primarily upon hand-weeding**
  - **Walters Gardens, Zeeland, MI = 1,500 ac in field HP crops - daylilies and hostas (called their large acreage)**
  - Sandy soil (90-95% sand) with 1-3% OM.
  - Current program: 30 gal/A with Gallery + Surflan - immediately after spring planting – no rotation
  - Every 2 months cultivate &/or hand weed
  - **Spend \$400k annually on hand weed control**



# Several Reasons to Prefer Liquid Preemergence:

## TREATMENT PROTOCOL FOR SPRAYING VS GRANULE APPLICATIONS

- ▶ **Spray - Wet foliage – dew or 5 to 10 minutes irrigation.**
- ▶ **Granule – Dry foliage**
- ▶ **Granules – Phyto. worse with whorled leaves**

# Several Reasons Why Prefer Liquid Preemergence:

1. **Have equipment for liquid applications**
2. **More uniform application**
3. **Ease of calibration**
4. **Higher efficacy**
5. **Less expensive**

Some broadleaf weeds but mostly grasses

Pennant Magnum @ 2-2.5pt/ac  
\$19.00 - \$24.00 (3' band)



# Two Problems with Liquid Preemergence:

## 1. Not many

**Surflan (Group 3)**

**Pendulum (3)**

**Gallery (21)**

**Tower (15)**

**Pennant Magnum (15)**

**Dimension 2EW**

**SureGuard (WDG and SC)**

**Pendulum Aqua Cap**

## 2. Liquids: Higher Phytotoxicity



# **GOAL — Help Walters' find others with using liquids**

## **Objectives:**

- ▶ Evaluate efficacy and phytotoxicity of over the top (OTT) liquid preemergence herbicides applied alone or in combination, compared to untreated control.
- ▶ Season long: Evaluate following (Dec. 20, 2017) winter pre-plant application of SureGuard WDG (flumioxazin 51%) (NuFarm Americas, Alsip, IL) (Group 14)
- ▶ Determine best spray —low phyto., high eff.

# Materials and Methods:

## Pre-Plant:

**SureGuard 10 oz/ac**

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## In-season:

1. **Tower 6EC** (dimethamid-p 63%) BASF Corp., Research Triangle Park, NC (21 oz/ac) (Group 15) registered **2011**
2. **Tower 6EC + Dimension 2EW** (dithiopyr 24%) (Dow AgroSciences LLC, Indianapolis, IN) (2 pt/ac) (Group 3).
3. **Pennant Magnum** (S-metolachlor 83.7%) Syngenta Crop Protection, LLC, Greensboro, NC) (2 pt/ac) (Group 15) registered **2001**.
4. **Pennant Magnum + Tower 6EC**
5. **Untreated control**

# Materials and Methods:

- Efficacy  $\geq 7$  = commercially acceptable (0-10),  
10 = complete control
- Phytotoxicity  $\leq 3$  = commercially acceptable (0-10),  
0 = is no injury, 10 is dead
- Plots 4' X 5' (20 ft<sup>2</sup>), 3 rows/plot of 6 plants, 3 replicates  
= 54 experimental units/ tmt/ sp. (sprayed to right of tag)
- ✓ CO<sub>2</sub> backpack sprayer delivering 25 gal/ac (R&D  
Sprayers, Opelousas, LA 70570)
- ✓ 8002 vs nozzles (TeeJet, Carol Stream, IL 60116)
- ✓ 45-50 psi, nozzles 18" apart



**Planted May 7, 2018**  
**Treated May 16, 2018**  
**❖ 9 DAP**

## Materials and Methods:

Looking west



Looking east

## Planted as small plugs:

1. Amsonia 'Blue Ice'
2. Coreopsis verticillata 'Sassy Saffron'
3. Sanguisorba minor 'Little Angel'
4. Kniphofia thomsonii 'Gold Rush'
5. Kniphofia pyromania 'Orange Blaze'
6. Penstemon 'Prairie Dusk'
7. Penstemon 'Midnight Masquerade'

# Materials and Methods:

- Shoot heights were collected at the initiation of in-season applications on May 16, 2018
- Trial conclusion = shoot height and two perpendicular measures of width collected used to calculate growth index values (GI).
- Evaluations at (4WA2T) or 25 weeks after the first treatment (25 WAT), and 9 WA2T, 13 WA2T and 20 WA2T.
- ANOVA conducted with LSD for mean separation  $p=0.05$ .



Materials and Methods:		# tmt. tests	Last Eval. (WAT)	Registration (Yes or No)
Species				
Amsonia ‘Blue Ice’		5	20	Nothing Reg.
Coreopsis verticillata ‘Sassy Saffron’		5	20	Pennant Yes
				Dimension Yes (dir)
				Tower No
Sanguisorba minor ‘Little Angel’		5	20	Nothing Reg
Kniphofia thomsonii ‘Gold Rush’		5	20	Tower No
				Dimension No ( <i>K. uvaria</i> ) (only) (dir)
				Pennant No ( <i>K. uvaria</i> ) (only)
Kniphofia pyromania ‘Orange Blaze’		8	20	Tower No
				Pennant No ( <i>K. uvaria</i> ) (only)
Penstemon ‘Prairie Dusk’		5	20	Pennant No (Mexicali Penstemon-only)
				Tower No
				Dimension No
Penstemon ‘Midnight Masquerade’		8	20	

Amsonia 'Blue Ice'



Dec 20, 17 1 <sup>st</sup> round: Pre-plant SureG applied across field	21 WAT Plant 5/07 /18	20 WA2T Ht (in)	20 WA2T GI (in) <sup>3</sup>	21 WAT 1 <sup>st</sup> Shoot Wt. (g) Plant 5/07/ 18	Treat 2 <sup>nd</sup> Applied 05/16 /18 21 WAT 1 <sup>st</sup> round	Rate /ac	4 WA2T <sup>z</sup> & 25 WAT Phyto. <sup>y</sup>	4 WA2 T 25 WAT Eff	9 WA2T Phyto.	9 WA2T Eff.	13 WA2T Phyto	13 WA2T Eff.	20 WA2T Phyto.	20 WA2T Eff
10 oz/ac	2.8	9.8	949.9	0.73	Control	--	1.2a	9.8a	2.2a	8.3b	1.6a	7.0a	1.8a	3.8a
10 oz/ac	4.7	7.9	235.4	1.39	Tower	21 oz	3.2b	10b	6.4bc	8.3b	6.4b	8.7b	5.3b	4.0a
10 oz/ac	3.7	9.3	674.4	0.9	Tower + Dimension	21 oz + 2pt	4.5bc	10b	5.3b	10c	6.4b	10b	4.7b	4.0a
10 oz/ac	3.7	5.3	96.7	1	Pennant	2 pt	4.8c	10b	6.9c	10c	8.1c	8.7b	6.0b	7.0b
10 oz/ac	3.1	6.6	171.9	1.1	Pennant + Tower	2pt + 21 oz	4.2bc	10b	7.6c	10c	8.8c	10b	5.3b	4.0a



Coreopsis verticillata ‘Sassy Saffron’

Dec 20, 17 1 <sup>st</sup> round: Pre- plant SureG applied across field	21 WAT Plant 5/07 /18	20 WA2T Ht (in)	20 WA2T Gl (in) <sup>3</sup>	21 WAT 1st Shoot Wt. (g) Plant 5/07/ 18	Treat 2 <sup>nd</sup> Applied 05/16 /18 21 WAT 1 <sup>st</sup> round	Rate /ac	4 WA2T <sup>z</sup> & 25 WAT Phyto. <sup>y</sup>	4 WA2 T 25 WAT Eff	9 WA2T Phyto.	9 WA2T Eff.	13 WA2T Phyto	13 WA2T Eff.	20 WA2T Phyto.	20 WA2T Eff
10 oz/ac	1.2	9.5	1656	0.73	Control	--	0.8a	10a	2.7a	10a	1.2a	7.5a	0.8a	4.8a
10 oz/ac	0.8	8.8	761	1.39	Tower	21 oz	6.1c	10a	5.2b	10a	2.7b	10b	2.7b	8.3b
10 oz/ac	0.6	9.8	1045	0.9	Tower + Dimension	21 oz + 2pt	6.8c	10a	6.0b	10a	3.9b	9.0b	3.2b	8.7bc
10 oz/ac	0.4	10.7	1261	1	Pennant	2 pt	3.2b	10a	3.1a	10a	1.4a	9.7b	2ab	8.7bc
10 oz/ac	1.2	9.3	1218	1.1	Pennant + Tower	2pt + 21 oz	6.7c	10a	5.8b	10a	3.0b	10b	2.3b	10c



Control



Pennant + Tower



Sanguisorba minor ‘Little Angel’

Dec 20, 17 1 <sup>st</sup> round: Pre-plant SureG applied across field	21 WAT Plant 5/07 /18	20 WA2T H† (in)	20 WA2T Gl (in) <sup>3</sup>	21 WAT 1 <sup>st</sup> Shoot Wt. (g) Plant 5/07/ 18	Treat 2 <sup>nd</sup> Applied 05/16 /18 21 WAT 1 <sup>st</sup> round	Rate /ac	4 WA2T <sup>z</sup> & 25 WAT Phyto. <sup>y</sup>	4 WA2 T 25 WAT Eff	9 WA2T Phyto.	9 WA2T Eff.	13 WA2T Phyto	13 WA2T Eff.	20 WA2T Phyto.	20 WA2T Eff
10 oz/ac	1.2	2.8	155.9	0.5	Control	--	1.0a	8.8a	1.2a	7a	1.1a	5.5a	0.8a	5.5a
10 oz/ac	0.8	1.8	53.5	0.3	Tower	21 oz	1.9ab	9.8a	5.8b	9b	5.1b	8.7bc	4.3bc	8.7bc
10 oz/ac	0.6	1.7	15.5	0.4	Tower + Dimension	21 oz + 2pt	2.8b	10a	8.4c	10b	8.1c	10c	7.1d	10c
10 oz/ac	0.4	2.3	75.6	0.2	Pennant	2 pt	1.9ab	10a	5.7b	10b	5.9b	10c	3.7b	10c
10 oz/ac	1.2	1.5	35.5	0.4	Pennant + Tower	2pt + 21 oz	1.8ab	10a	7.4c	10b	7.4c	8.3b	5.3c	10c



Control



Pennant

Kniphofia thomsonii ‘Gold Rush’

Dec 20, 17 1 <sup>st</sup> round: Pre- plant SureG applied across field	21 WAT Plant 5/07 /18	20 WA2T Ht (in)	20 WA2T Gl (in) <sup>3</sup>	21 WAT 1st Shoo t Wt. (g) Plant 5/07 /18	Treat 2 <sup>nd</sup> Applied 05/16 /18 21 WAT 1 <sup>st</sup> round	Rate /ac	4 WA2T <sup>z</sup> & 25 WAT Phyto. <sup>y</sup>	4 WA2 T 25 WAT Eff	9 WA2T Phyto.	9 WA2T Eff.	13 WA2T Phyto	13 WA2T Eff.	20 WA2T Phyto.	20 WA2T Eff
10 oz/ac	2.8	11.6	13603	0.5	Control	--	0.0a	9.2a	0a	4.8c	0a	3.8a	0.0a	3.8c
10 oz/ac	3.9	11	14927	0.3	Tower	21 oz	1.4ab	10a	2.1b	8.7c	2.7c	10c	2.3b	10a
10 oz/ac	5.1	11.7	12478	0.4	Tower + Dimension	21 oz + 2pt	0.4ab	10a	1.9b	6.7b	1.7bc	7.7b	3.0b	7.7b
10 oz/ac	4.7	11.1	14384	0.2	Pennant	2 pt	1.1ab	10a	1.4ab	10c	0.7ab	7.0b	1.7b	7.0b
		12.3	13628	0.4	Pennant + Tower	2pt + 21 oz			1.9b	10c	1.0ab	6.3b	2.0b	6.3b



Control



Not T+ P = chlorosis

Kniphofia pyromania™ series ‘Orange Blaze’

Dec 20, 17 1 <sup>st</sup> round: Pre- plant SureG applied across field	21 WAT Plant 5/07 /18	20 WA2T Ht (in)	20 WA2T Gl (in) <sup>3</sup>	21 WAT 1st Shoo t Wt. (g) Plant 5/07 /18	Treat 2 <sup>nd</sup> Applied 05/16 /18 21 WAT 1 <sup>st</sup> round	Rate /ac	4 WA2T <sup>z</sup> & 25 WAT Phyto. <sup>y</sup>	4 WA2 T 25 WAT Eff	9 WA2T Phyto.	9 WA2T Eff.	13 WA2T Phyto	13 WA2T Eff.	20 WA2T Phyto.	20 WA2T Eff
10 oz/ac	2.8	22.6	10155	0.5	Control	--	0.3a	8.6a	0a	6a	2c	6a	1.3ab	6a
10 oz/ac	3.9	24.9	12696	0.3	Tower	21 oz	0.4a	10a	1.1ab	10c	0.5ab	8.3b	1.3ab *	8.3b
10 oz/ac	5.1	19.9	596.2	0.4	Tower + Dimension	21 oz + 2pt	0.3a	10a	1ab	10c	0a	8b	1.5b	8b
10 oz/ac	4.7	23.4	8391	0.2	Pennant	2 pt	0.9a	10a	0.6ab	10c	0.8ab	9b	1.3ab	9b
		20.8	8220	0.4	Pennant + Tower	2pt + 21 oz	1.3a	10a	1.5b	10c	0.0a	9b	2.0b	9b

Control

T +D - stunting



Penstemon (Prairie Duck)

T +D - stunting



4 WA2 T 25 WAT Eff	9 WA2T Phyto.	9 WA2T Eff.	13 WA2T Phyto	13 WA2T Eff.	20 WA2T Phyto.	20 WA2T Eff
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Dec 20,  
17 1<sup>st</sup>  
round:  
Pre-  
plant  
SureG  
applied  
across  
field

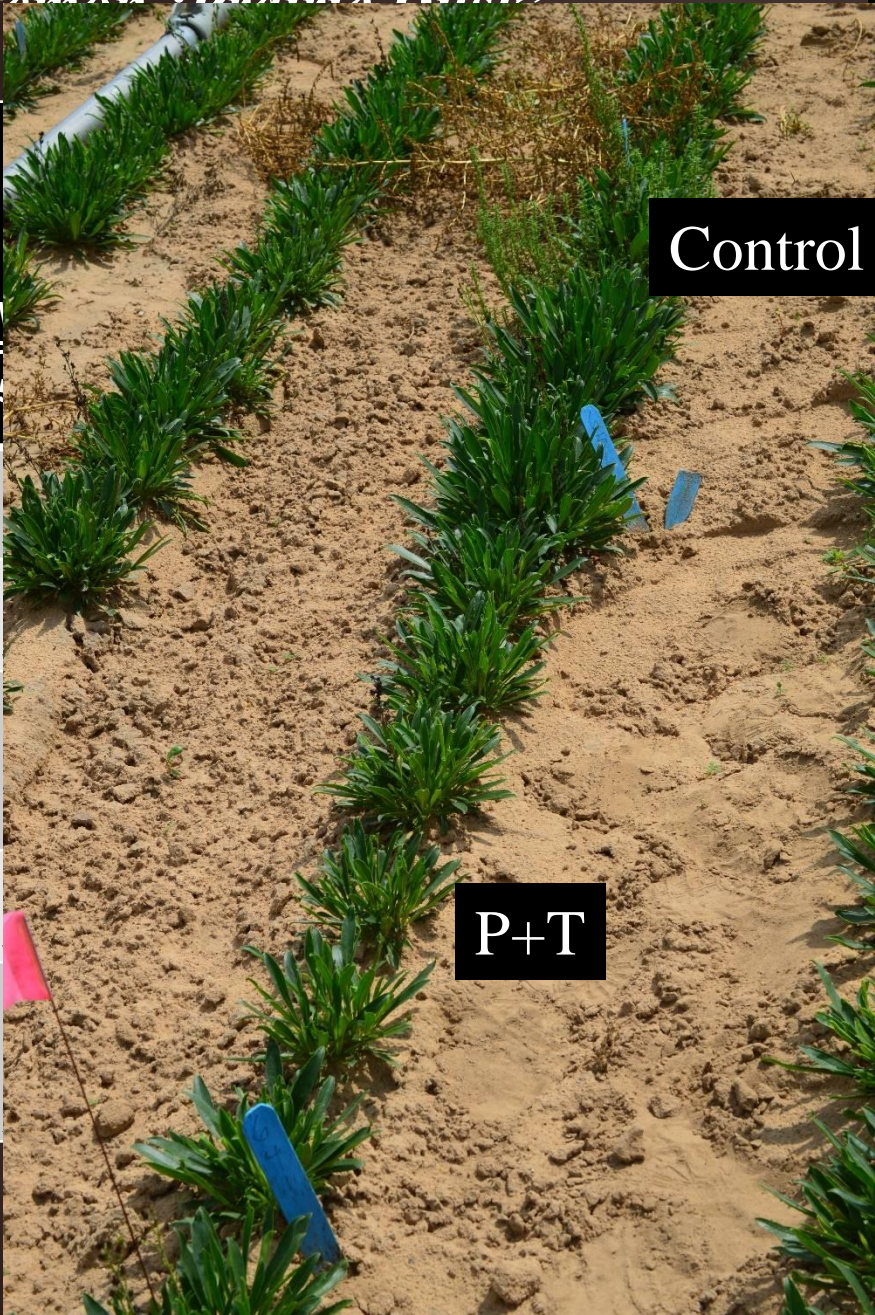
10  
oz/ac

10  
oz/ac

10  
oz/ac

10  
oz/ac

10  
oz/ac



Control

P+T

4 WA2 T 25 WAT Eff	9 WA2T Phyto.	9 WA2T Eff.	13 WA2T Phyto	13 WA2T Eff.	20 WA2T Phyto.	20 WA2T Eff
10a	0.7a	7a	2.6a	3a	0a	3a
10a	3.8b	10b	4.6bc	8bc	<b>2bc</b>	<b>8.bc</b>
10a	6c	10b	5.7c	10d	3.3c	10d
10a	3.5b	10b	3.8ab	7b	<b>1.7b*</b>	<b>7b</b>
10a	5c	10b	4.4bc	9.3cd	<b>2.3bc</b>	<b>9.3cd</b>



Penstemon ‘Midnight Masquerade’



Dec 20, 17 1 <sup>st</sup> round: Pre-plant SureG applied across field	21 WAT Plant 5/07 /18	20 WA2T Ht (in)	20 WA2T GI (in) <sup>3</sup>	21 WAT 1 <sup>st</sup> Shoot Wt. (g) Plant 5/07 /18	Treat 2 <sup>nd</sup> Applied 05/16 /18 21 WAT 1 <sup>st</sup> round	Rate /ac	4 WA2T <sup>z</sup> & 25 WAT Phyto. <sup>y</sup>	4 WA2 T 25 WAT Eff	9 WA2T Phyto.	9 WA2T Eff.	13 WA2T Phyto	13 WA2T Eff.	20 WA2T Phyto.	20 WA2T Eff
10 oz/ac	4.3	14.5	961	2.2	Control	--	0a	9.7a	1.2a	8.3ab	1.7b	9c	0a	6.6a
10 oz/ac	3.2	12.5	941	2.2	Tower	21 oz	3.4b	10b	5.2a	10c	1.7b	9c	0a	6.6a
10 oz/ac	2	10.8	574	2	Tower + Dimension	21 oz + 2pt	4.1b	10b	6.2a	10c	1.7b	9c	0a	6.6a
10 oz/ac	3.2	12.7	736	2.5	Pennant	2 pt	1a	10b	5.2a	10c	1.7b	9c	0a	6.6a
10 oz/ac	2.6	10	458	3	Pennant + Tower	2pt + 21 oz	3.2b	10b	7.3d	10c	1.7b	9c	0a	6.6a



# Conclusions

Species	Best Treatment	Eff	Phy	Registration (Yes or No)
Amsonia 'Blue Ice'	Pennant	7.0	6.0	Nothing√ NF
Coreopsis verticillata 'Sassy Saffron'	Pennant	8.7	2	Pennant Yes
	<b>Pennant + Tower</b>	<b>10</b>	<b>2.3</b>	Tower No
	Tower	8.3	2.7	Tower No
Sanguisorba minor 'Little Angel'	<b>Pennant</b>	10	3.7	Nothing√ NF
Kniphofia thomsonii 'Gold Rush'	<b>Tower</b>	<b>10</b>	<b>2.3</b>	Tower No
	Pennant	7.0	1.7	Pennant No ( <i>K. uvaria</i> ) (only)
Kniphofia pyromania 'Orange Blaze'	<b>Tower</b>	<b>8.3</b>	<b>1.3</b>	Tower No
	Pennant	9	1.3	Pennant No ( <i>K. uvaria</i> ) (only)
	Pennant + Tower	9	2	No , No (Mexicali Penstemon-only)
Penstemon 'Prairie Dusk'	Pennant	7	1.7	Pennant No
	<b>Pennant + Tower</b>	<b>9.3</b>	<b>2.3</b>	Pennant No (Mexicali Penstemon-only)
	Tower	8	2	Tower No
Penstemon 'Midnight Masquerade'	<b>Pennant</b>	8	3.3	Nothing, NF



### 3. Evaluation of Phytotoxicity and Efficacy On Four HP Field Species with July Granular Applications





## Materials and Methods:

- Walters Gardens, Zeeland, MI
- July 18, 2018
- Each mean represents 4 reps, of 3 rows of plants, with 6 plants/ row
- 72 plants/mean.
- Periodically hand weeded - thus became a phytotoxicity trial only.
- Shoot heights and two perpendicular measures of width were collected at the trial initiation and end.
- Growth index values (GI) were calculated.
- Evaluations 4 weeks after treatment (4 WAT), 11 WAT

## Four Species –

Ever tested

Coreopsis verticillata 'Red Hot Vanilla'	No
	No
	No
Coreopsis verticillata 'Curry Up'	No
	No
	No
Vernonia 'Southern Cross'	No
Aster novae-angliae 'Purple Dome'	No
	No



# ► *Coreopsis verticillata* 'Red Hot Vanilla'



g Ht	4 WAT <sup>z</sup> Eff. <sup>x</sup>		4 P
Gl (in) <sup>3</sup>			
5003	10	b <sup>≠</sup>	0
4310	9	b	0
4757	9.6	b	0
4232	10	b	1
4399	7.0	a	0





► ***B. Coreopsis verticillata* 'Curry Up'**

	Rate	Initial	Ending Ht	4 WATz	4 WAT	11WAT		Av Phy
Treatment								
Gemini G								0.4 α
Biathlon								0.3 α
FreeHand								0.4 α
Fortress								0 α
Control								0.1 α





# Vernonia 'Southern Cross'



Short stem ironweed



11WAT Phyto		$\Delta$ GI		Av Phy	
2	b	<b>6206</b>	ns	<b>3</b>	<b>c</b>
0	a	<b>7306</b>	ns	<b>1.1</b>	<b>ab</b>
2.2	b	<b>4591</b>	*	<b>1.9</b>	<b>b</b>
2	b	<b>5993</b>	ns	<b>2.5</b>	<b>bc</b>
0	a	<b>6413</b>		<b>0</b>	<b>a</b>



# Aster novae-angliae 'Purple Dome'



Treatment	Rate (/ac) <sup>v</sup>	Initial	Er	4 WAT <sup>z</sup>	4 WAT	11WAT		
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# 3. Summary

<b>Coreopsis verticillata 'Red Hot Vanilla'</b>	<b>Gemini</b>	<b>0</b>	<b>No</b>
	<b>Biathlon</b>	<b>0</b>	<b>No</b>
	<b>Freehand</b>	<b>0</b>	<b>No</b>
<b>Coreopsis verticillata 'Curry Up'</b>	<b>Biathlon</b>	<b>0.3</b>	<b>No</b>
	<b>Freehand</b>	<b>0</b>	<b>No</b>
	<b>Fortress</b>	<b>0</b>	<b>No</b>
<b>Vernonia 'Southern Cross'</b>	<b>Biathlon</b>	<b>1.1</b>	<b>No</b>
<b>Aster novae-angliae 'Purple Dome'</b>	<b>Biathlon</b>	<b>1.6</b>	<b>No</b>
	<b>Freehand</b>	<b>1.0</b>	<b>No</b>



# Conclusion:

- Granulars much safer than liquids; however, more work should be done with liquids to find safety
- Label expansion work – in general is necessary.
- New cultivars – constant
- Need for rotations

# Conclusions:



**Ronstar no mulch -  
severe damage to plants**



**Ronstar on top of mulch - no  
damage to plants**



# Preemergence Herbicides for Herbaceous Ornamentals

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**Dr. Joseph C. Neal**

➤ Cornell Cooperative Extension Department of Horticultural Science  
Raleigh NC


<http://www4.ncsu.edu/~jcneal/Extension%20Publications/per%20pmg%20table%202012%20from%20ANDY%20SENESAC%20NC%20additions%20JCN%202.29.12.pdf>

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- Ray Wiegand's Nursery, Lenox, MI
- Jim Beaver and Emma Beaver
  - Tech. assistance







# Weed ID Workshop

## Tuesday 1:00 – 4:00 PM