Researcher: Hannah Mathers, PhD **Date:** 8/7/2016
Project Title: Premerggence Herbicide Crop Safety
Protocol #: **15-009** **PRnumbers:** 31094

Narrative Summary (Results/Discussion)

Please keep text to one page if possible. Include summary of trial results and a brief discussion including how any changes from the protocol may have affected results. Results for multiple PRnumbers can be summarized together, but please list all PRNumbers in the header and in the summary data table.

The results presented are *Penstemon* 'Purple Riding Hood' (Table 2) that received applications of Dimethamid-p (Tower 63.9 % EC) (BASF Corporation, Research Triangle Park, NC) as part of protocol 15-009. The rates are listed in pounds active ingredient (ai)/ acre, with 1X being 0.98 lb ai/ac (Table 2). The *Penstemon* had been purchased from Smith's Gardens, Delaware, OH in May, 2015 as one gallon containers. Smith's had previously acquired these in 72 count trays from James Greenhouses, Colbert, GA in late winter 2015. All *Penstemon* were watered within 2 hours following applications. Tower EC did cause some passing unacceptable commercial injury at 2WAT at the 1 and 2X rates; however, at 6 WAT plants started to decline and die. A root pathogen was suspected. The death seemed non-associated with treatment as controls were equally impacted. Although, evaluations were conducted at 6WAT and 1WA2T; unfortunately, the data was considered to be confounded by the possible pathogen. At 1WA2T, all but three control plant was dead and it was barely alive. 1, 3 and 4 plants were alive in the 1X, 2X and 4X rates, respectively, 1WA2T.

Results Table

Please insert results table here. Include PRnumbers for each treatment if multiple PRnumbers are included in this summary. Please include product, active ingredient, and statistics.

Table 2. Phytotoxicity on one selected ornamentals at Mathers Environmental, Gahanna, OH.

Penstemon 'Purple Riding Hood' #2 pot – **PR 31094** – Mathers Environmental Science Services, LLC.

Treatment	Rate(ai)[v]	1 WAT[z]	2 WAT	Dead≠	4 WAT	Dead	6WAT	Dead	1WA2T	Dead/Alive
Tower 63.9 EC	0.98 lb/ac	0.1[y]	1.2	0	1.6	0	2.3✓	2	8.6	11/1
Tower 63.9 EC	1.97 lb/ac	1.8[y]	3.1*[x]	0	2.3	0	3.2✓	2	9.3	9/3
Tower 63.9 EC	3.94 lb/ac	1.3[y]	3.4*[x]	0	2.7	0	4.3✓*	3	9.2	8/4
Untreated	--	0.6	0.8	0	1.8	0	2.8	1	9.2	9/3

z = weeks after treatment

y = Phytotoxicity Ratings based on a 0-10 scale with 0 being no phytotoxicity and 10 death with ≤3 commercially acceptable.

x = Phytotoxicity ratings followed by *,** are significantly different from control based on Dunnett's t-test (α = 0.10, 0.05, respectively).

≠ = Number dead of original 12 plants per treatment/rate.

✓ indicates reapplication at this date.

[v] = All rates for Tower 63.9% EC (Dimethamid –p) are listed as active ingredient (ai) per ac.

Materials & Methods/Recordkeeping

Protocol 15-009 was followed with no changes including four replications, with three plants per replication and four treatments 0, 1, 2, 4 X rates of Tower 63.9% EC were grown in the pot sizes listed in the Table 2, for 48 plants per protocol (PR# 31094). Rates are listed in pounds of active ingredient (ai)/acre with 1X being 0.98 lb ai/ac (Table 2). Evaluations were conducted at 1, 2, 4, and 6 weeks after treatment (WAT). A reapplication was conducted at 6WAT and evaluations occurred 1 week after the second treatment (1WA2T). All plants were dying or dead by this point in the study from an unrelated cause. All plants were located at Mathers Environmental Science Services, LLC,

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Gahanna, OH. All plants were grown in standard container media (85% pine bark and 15% Comtil) (Krutz Bros. Central Ohio, LLC, Groveport, OH) and fertilized with The Anderson's 18-6-12 + minors, slow-release 8-9 month formulation and over-head irrigation. Applications were conducted on June 3, 2015. On June 3 in Gahanna, OH at the time of application it was clear, sunny and 63ºF wind was 2 mph. All plants were freshly upshifted two weeks or less before the applications and all were watered within 2 hours following applications.

Name(s) of Personnel Conducting Research: Dr. Hannah Mathers
Location of Trial (city/state): Mathers Enviro. Sci. Serv., LLC, Gahanna, OH
Use Site (greenhouse/shadehouse/field container/etc): Field container

Crop History

Crop Cultivar/Variety:	*Penstemon 'Purple Riding Hood'*
Purchased from:	Smith's Gardens, Inc., Delaware, OH, 43015 as 30 ct. tray
Date of Transplanting:	May 27, 2015
Potting Mix:	See above
Pot size & spacing:	1 gallon pots on 1 foot centers

Product(s) applied prior to start of experiment:

Product	Rate	Application Type	Date of Application	Crop Growth Stage	Application Volume
Tower 63.9% EC (Dimethamid-p)	0			Shoot expansion	25 gal/ac
	21 fl oz (0.98 lb a.i/ac	Liquid - applied via CO2 backpack	06/03/2015	Shoot expansion	25 gal/ac
	42 fl oz (1.97 lb a.i./ac)	Liquid - applied via CO2 backpack	06/03/2015	Shoot expansion	25 gal/ac
	84 fl oz (3.94 lb a.i./ac)	Liquid - applied via CO2 backpack	06/03/2015	Shoot expansion	25 gal/ac

Add more rows as needed.

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Experiment Information

Experimental Design: Completely randomized design with species
Number of Reps: Four replicates with three plants per replicate or 12 plants/tmt/rate/species

Photos

Please embed photos here or send jpg, tiff, or bmp.

Fig. 2. 1. A. (Above) **and B.** (Below). *Penstemon* 'Purple Riding Hood' at Mathers Environmental Science Services, LLC, Gahanna, OH. **A.** Photo taken at 1WAT with Tower EC at 4X rate. Note the stem appears to be falling over and there is a reduction in growth versus the control. All plants even the controls were weak and seemed to be suffering from some sort of growth hormone effect (unrelated to treatment). Note **B**. (Below) many of the plants are falling, seem poorly rooted and some have strange callus growth along the stems (B. Foreground, center). Eventually, all plants seemed to succumb to a root rot disease. Photos by: H. Mathers.

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Data Collected

Please describe data collected and scoring system. Also include the dates data were collected.

All rated score evaluations of phytotoxicity (defined in report) were measured on a 0 to 10 scale, where 0 represented no phytotoxicity, ≥3 represents commercially unacceptable injury and 10 represented plant death (Barolli et al., 2005; Collins et al. 1999; Duray and Davies, 1989; Mathers and Case, 2010; Samtami et al., 2007). This rated score is a standard measure accepted in all major weed and horticultural science journals with each interval representing a 10% increase in injury over the whole plant ex. 3 would be 30% injury and 5 would be 50%, etc. Symptoms were also noted if significant and photos were conducted *in situ.*

Raw Data

Insert raw data below or send separate file containing raw data.

See attached excel files

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Environmental conditions during the experiment:
Insert temperature, precipitation and/or irrigation, and relative humidity with a minimum of high, low and average daily temperatures. Or send separate file with this information.
Include a statement about any significant weather or environmental events during the course of the experiment.

Environmental Conditions in Gahanna, OH. Source: http://www.accuweather.com for plants at MESS

Events in June 2015	Date (yr. 2015)	Hi/Low	Precipitation/ Irrigation	Average Hi/Low
Trial initiation	Wed 6/3	73°/59°	0 in/ 0.5in	78°/58°
	Thu 6/4	81°/60°	0 in/ 0.5in	78°/58°
	Fri 6/5	86°/62°	0.25 in/ 0.25in	79°/59°
	Sat 6/6	79°/61°	0 in/ 0.5in	79°/59°
	Sun 6/7	85°/56°	0 in/ 0.5in	79°/59°
	Mon 6/8	79°/61°	0.09 in/ 0.5in	80°/60°
	Tue 6/9	76°/57°	0.03 in/ 0.5in	80°/60°
1WA1T	Wed 6/10	91°/58°	0 in/ 0.5in	80°/60°
	Thu 6/11	92°/67°	0 in/ 0.5in	81°/60°
	Fri 6/12	93°/70°	0.04 in/ 0.5in	81°/61°
	Sat 6/13	90°/69°	0.17 in/ 0.4in	81°/61°
	Sun 6/14	91°/69°	0.10 in/ 0.4in	82°/61°
	Mon 6/15	87°/71°	0.44 in	82°/62°
	Tue 6/16	83°/71°	0.87 in	82°/62°
2WA1T	Wed 6/17	72°/61°	0.44 in	82°/62°
	Thu 6/18	87°/69°	0 in/ 0.5in	82°/62°
	Fri 6/19	76°/67°	0.01 in	83°/63°
	Sat 6/20	73°/67°	2.00 in	83°/63°
	Sun 6/21	86°/68°	0 in	83°/63°
	Mon 6/22	86°/64°	0 in/ 0.5in	83°/63°
	Tue 6/23	85°/67°	0 in/ 0.5in	84°/64°
	Wed 6/24	83°/61°	0 in/ 0.5in	84°/64°
	Thu 6/25	77°/66°	0.27 in	84°/64°
	Fri 6/26	78°/67°	0.65 in	84°/64°
	Sat 6/27	71°/58°	0.55 in	84°/64°
	Sun 6/28	75°/58°	0.03 in/ 0.5in	84°/64°
	Mon 6/29	66°/60°	0.40 in	84°/65°
	Tue 6/30	77°/60°	0.35 in	85°/65°
Events in July 2015	**Date (yr. 2015)**	**Hi/Low**	**Precipitation/ Irrigation**	**Average Hi/Low**
4WA1T	Wed 7/1	78°/59°	0 in/ 0.5in	85°/65°
	Thu 7/2	74°/62°	0 in/ 0.5in	85°/65°
	Fri 7/3	76°/61°	0 in/ 0.5in	85°/65°
	Sat 7/4	79°/59°	0 in/ 0.5in	85°/65°
	Sun 7/5	79°/61°	0 in/ 0.5in	85°/65°
	Mon 7/6	84°/64°	0 in/ 0.5in	85°/65°
	Tue 7/7	84°/69°	0.55 in	85°/65°
	Wed 7/8	70°/62°	0.17 in	85°/66°
	Thu 7/9	78°/67°	0.02 in/ 0.5in	85°/66°

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	Fri 7/10	74°/66°	0.05 in	85°/66°
	Sat 7/11	82°/60°	0 in/ 0.5in	85°/66°
	Sun 7/12	80°/65°	2.25 in	85°/66°
	Mon 7/13	74°/66°	0.18 in	85°/66°
	Tue 7/14	83°/66°	0.72 in	85°/66°
6WA1T Reapply	Wed 7/15	73°/59°	0 in/ 0.5in	85°/66°
	Thu 7/16	81°/53°	0 in/ 0.5in	85°/66°
	Fri 7/17	86°/66°	0.64 in	85°/66°
	Sat 7/18	91°/70°	0 in/ 0.5in	85°/66°
	Sun 7/19	87°/70°	0.67 in	85°/66°
	Mon 7/20	86°/68°	0 in/ 0.5in	85°/66°
	Tue 7/21	85°/65°	0 in/ 0.5in	85°/66°
1WA2T	Wed 7/22	80°/60°	0 in/ 0.5in	85°/66°
Trial completion	Thu 7/23	83°/61°	0 in/ 0.5in	85°/66°

Trial ended due to death of all plants, probable cause a root rot pathogen. When temperature got into the 80's and 90's consistently the roots were inadequate to sustain survival.