

**Researcher:** Hannah Mathers, PhD **Date:** 5/12/2020  
**Project Title:** 2018 In Season Pre-Emergent Herbicide Crop Safety  
**Protocol #:** 18-012 **PRnumbers:** 31978

**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 for one species (Table 4) that received applications of Gallery SC (isoxaben 45.45%) (Dow AgroSciences LLC, Indianapolis, IN) as part of protocol 18-012. *Acorus gramineus* 'Ogon' measured by rated scores were never injured by Gallery SC at 1.0, 2.0 and 4.0 lb ai/ac after one or after two applications (Table 4). By growth index and height all plants increased in growth compared to the controls even after two applications (Table 4B).

**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 4.** Phytotoxicity ratings on selected ornamentals at Acorn Farms, Galena, OH

*Acorus gramineus* 'Ogon' #1 pots - PR# 319781 - Acorn

Treatment	Rate(ai) <sup>y</sup>	1 WAT <sup>z</sup>	2 WAT	4 WAT	6WAT	1 WA2T	2 WA2T	4 WA2T
Gallery SC	1.0 lb	0.0	0.0	0.0	0.0	0.0✓	0.0	0.0
Gallery SC	2.0 lb	0.0	0.0	0.0	0.0	0.0✓	0.0	0.0
Gallery SC	4.0 lb	0.0	0.0	0.0	0.0	0.0✓	0.0	0.0
Untreated	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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).

✓ indicates reapplication at this date

<sup>y</sup> = All rates of Gallery SC (isoxaben 45.45%) are listed as active ingredient (ai) per ac.

**Table 4B.** Phytotoxicity measures as a companion table to Table 4 above.

*Acorus gramineus* 'Ogon' #1 pots - PR# 319781 - Acorn

Treatment	Rate (ai) <sup>v</sup>	HT <sup>i</sup> WAT <sup>t</sup>	HT6WA2T	GI <sup>0</sup> WAT <sup>t</sup>	GI6WA2T	Δ <sup>w</sup> HT	ΔGI
Gallery SC	1.0 lb	9.7 <sup>y</sup>	12.4	312.9	3037.0	2.7	2724.1
Gallery SC	2.0 lb	9.4	12.7	593.5	3243.3	3.3	2649.8
Gallery SC	4.0 lb	9.8	12.2	714.7 *	2675.8	2.4	1961.1
Untreated	--	9.5	11.9	481.2	1968.1	2.4	1486.9

y = All measures are in inches and the calculated Growth Index measures are in in<sup>3</sup>.

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

v = All rates of Dimension (dithiopyr 24%) are listed as active ingredient (ai) per ac.

i = HT represents Height at start of trial and at the end of the trial or 4WA2T in inches.

t = GI represents Growth index (in<sup>3</sup>) and was calculated as GI=Pi (Ht)(r<sup>2</sup>), where Ht. (in) was the starting or final height, respectively, r was half of the average of W1+W2 (two perpendicular measurements taken of plant diameter (in)) and Pi was "π". The GI provides a volume measure of the plant which helps with quality determinations not necessarily evident by heights and widths alone or by visual observations.

w = Δ represents delta or the change in average heights and average GI's from the start to completion of the trial.

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**Materials & Methods/Recordkeeping**

*Please fill out the information below or attach a separate document with comparable information.*

Protocol 18-012 was followed with no changes, including four replications with three plants per replication and four treatments. 0, 1, 2 and 4X rates of Gallery SC (isoxaben 45.45%) with 1-gallon containers (Table 4) for 48 plants per protocol (PR#: 31978). Evaluations were conducted at 1, 2 and 4 weeks after treatment (WAT). A reapplication was conducted at 7 WAT, and evaluations occurred 1, 2, and 4 weeks after second treatment (WA2T). Rates are listed in pounds of active ingredient (a.i)/acre with 1X being 1.0 lb ai/ac (Table 4). Pictures were also taken at 6WA2T but no evaluations. *Acorus gramineus* 'Ogon' were located at Acorn Farms Inc., 7679 Worthington Rd., Galena, OH. Weather records for Columbus, OH are presented as Acorn Farms is in the greater Columbus, OH region. All plants were grown in standard container media (85% pine bark and 15% Comtil) (Kruz 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 at Acorn were conducted on May 23, 2018. All herbicides were applied within 7 days after potting as over the top applications and all were watered within 2 hours following applications.

Name(s) of Personnel Conducting Research: Dr. Hannah Mathers  
Location of Trial (city/state): Acorn Farms Inc., Galena, OH  
Use Site (greenhouse/shade house/field container/etc.): Field container

**Crop History**

Crop Cultivar/Variety:	<i>Acorus gramineus</i> 'Ogon'
Purchased from:	Hoffman Nursery, Inc., Rougemont, NC
Date of Transplanting:	May 16, 2018
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
Gallery SC	0			Shoot expansion
	1.0 lb a.i./ac	Liquid - applied via CO <sub>2</sub> backpack	05/23/2018	Shoot expansion
	2.0 lb a.i./ac	Liquid - applied via CO <sub>2</sub> backpack	05/23/2018	Shoot expansion

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	4.0 lb a.i./ac	Liquid - applied via CO <sub>2</sub> backpack	05/23/2018	Shoot expansion
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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. 4.1.** (Above) *Acorus gramineus* 'Ogon' located at Acorn Farms, Galena, OH. This photo was taken on July 12, 2018 or 7WAT, just before the 2<sup>nd</sup> application of Gallery SC was conducted. From left to right 4X, 2X, 1X and control are shown. At the time of the 2<sup>nd</sup> application all *Acorus gramineus* 'Ogon' showed no injury from the first application and no reduction in growth relative to the controls. Photo taken by: H. Mathers.

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**Fig. 4.2.** (Above) *Acorus gramineus* 'Ogon' located at Acorn Farms, Galena, OH. This photo was taken on Aug. 18, 2018 or 6 WA2T. From left to right Control, 1X, 2X and 4X plants are shown. Even after two applications of Gallery SC there was no injury (Table 4) or growth reduction (Table 4B) relative to the control. Photo taken by: H. Mathers.

### **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,  $\geq 3$  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.). Starting and ending heights, and two perpendicular measurements of diameter were taken per plant. These measures were used to calculate Growth index (GI) ( $\text{in}^3$ ) as  $GI = \pi (Ht)(r^2)$ , where Ht. (in) was the starting or ending height, r was half of the average of W1+W2 [two perpendicular measurements taken of plant diameter (in)] and  $\pi$  was " $\pi$ ". The GI provides a volume measure of the plant which helps with quality determinations not necessarily evident by heights and widths alone or by visual observations. Symptoms were also noted if significant, and photos were conducted *in situ*.

### **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 experiment.*

**Source:** <https://www.wunderground.com/history/monthly/us/oh/columbus/KCMH/date/2018-8>

Date	Temperature (° F)			Humidity (%)			Precipitation
	Max	Avg	Min	Max	Avg	Min	Total
<b>May</b>							
1	81	64.6	45	68	38.2	17	0
2	85	73.0	59	60	46.8	36	0
3	80	74.1	69	87	61.1	47	0
4	82	70.8	60	84	63.5	42	0.09
5	68	60.8	51	93	71.5	50	1.8
6	77	64.4	56	90	65.9	27	0
7	72	62.1	52	93	63.4	38	0.06
8	79	64.8	49	80	52.0	32	0
9	83	73.9	56	84	49.1	28	0
10	80	72.0	64	90	55.8	29	0.17
11	78	66.5	57	83	60.3	46	0
12	85	72.7	62	78	57.5	40	0
13	86	72.2	59	87	67.4	46	0
14	84	74.4	64	90	66.7	46	0
15	86	73.7	66	100	75.5	35	0
16	78	68.2	62	93	82.2	62	0.66
17	80	71.7	61	87	69.8	52	0.05
18	74	69.7	66	84	70.9	61	0.03
19	81	73.5	66	87	71.7	56	0.09
20	78	70.1	66	93	76.1	54	0.01
21	82	69.4	61	94	75.9	52	0.08
22	81	71.8	66	96	80.1	58	0.82
<b>23 -Start</b>	77	67.6	63	87	69.0	43	0.04
24	83	70.7	55	84	51.9	29	0
25	87	74.4	58	87	52.6	29	0
26	84	73.8	65	100	71.9	25	0
27	89	78.0	68	97	70.2	45	1.57
28	91	80.0	68	93	64.9	40	0
29	89	80.0	69	90	61.5	40	0
<b>30 -1WAT</b>	85	77.4	71	93	74.5	55	0
31	86	77.2	71	87	75.9	53	0.28
Date	Temperature (° F)			Humidity (%)			Precipitation (in)
<b>Jun</b>	Max	Avg	Min	Max	Avg	Min	Total
1	81	73.2	68	87	77.5	62	0.42
2	83	73.5	67	90	74.0	53	0.00
3	83	73.6	65	90	65.5	29	0.00
4	76	68.2	59	78	50.8	31	0.08
5	67	62.1	59	96	78.3	49	0.00
<b>6 -2WAT</b>	68	59.4	50	93	68.3	45	0.57



# Ornamental Horticulture Program Research Report Form

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Date	Temperature (° F)			Humidity (%)			Precipitation
7	81	67.5	53	83	62.2	45	0.00
8	84	71.4	66	93	75.9	47	0.00
9	87	72.9	66	93	76.6	46	0.54
10	82	73.7	67	93	76.2	56	0.44
11	73	70.5	67	87	81.6	73	0.00
12	80	71.8	65	93	84.4	67	0.02
13	86	74.3	69	97	84.1	57	0.42
14	83	71.8	58	87	55.3	27	1.11
15	86	74.7	61	84	55.2	32	0.00
16	88	77.6	68	85	67.1	49	0.00
17	91	81.8	70	93	68.8	50	0.04
18	93	84.1	73	87	62.8	45	0.00
19	87	80.6	75	90	75.3	63	0.00
20 -4WAT	87	77.2	72	93	81.5	55	0.38
21	74	70.1	66	94	88.3	76	0.15
22	84	74.4	69	93	79.9	49	1.67
23	79	72.5	68	90	75.7	60	0.22
24	83	75.7	69	84	63.7	46	0.03
25	79	71.7	63	87	69.1	52	0.00
26	83	70.1	64	93	80.3	54	0.00
27	83	72.8	67	93	80.5	58	0.99
28	86	75.9	68	90	70.3	48	0.05
29	88	79.5	68	90	67.6	46	0.00
30	91	81.4	69	90	63.8	36	0.00

Date	Temperature (° F)			Humidity (%)			Precipitation (in)
Jul	Max	Avg	Min	Max	Avg	Min	Total
1	94	82.8	71	87	63.7	43	0.00
2	90	78.9	74	85	73.8	55	0.00
3	92	80.7	71	93	71.4	48	0.00
4	92	81.2	74	91	75.3	50	0.94
5	93	82.2	74	94	72.4	48	0.36
6	81	74.0	63	93	66.9	42	0.66
7	80	69.5	58	90	57.1	32	0.00
8	86	72.4	59	78	54.0	31	0.00
9	89	77.0	62	84	58.1	32	0.00
10	91	78.9	69	87	68.9	42	0.00
11	84	74.9	64	78	53.4	37	0.00
12 -7WAT Reapply	85	74.4	63	72	51.5	33	0.00
13	89	79.0	67	68	51.2	35	0.00
14	92	82.5	70	87	58.7	33	0.00
15	86	81.5	75	84	66.2	51	0.00
16	88	79.5	74	91	76.9	55	0.00
17	86	78.2	70	91	59.8	33	0.24
18	83	73.7	64	84	58.3	37	0.00
19 -1WA2T	84	74.2	63	75	52.3	33	0.00



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Date	Temperature (° F)			Humidity (%)			Precipitation
20	77	71.6	67	91	81.8	66	0.00
21	78	70.0	65	93	83.7	64	0.53
22	80	71.8	66	94	78.4	58	0.32
23	82	72.1	66	94	82.2	60	0.01
24	81	73.5	69	97	81.8	58	1.30
25	87	77.1	69	90	68.4	51	0.00
<b>26 -2WA2T</b>	85	75.2	66	93	68.9	46	0.00
27	80	73.0	67	93	67.1	46	0.24
28	80	70.7	61	81	60.4	42	0.00
29	80	71.5	61	90	66.7	39	0.00
30	81	73.0	66	93	70.8	41	0.03
31	75	71.9	68	96	86.5	76	0.05

Date	Temperature (° F)			Humidity (%)			Precipitation (in)
Aug	Max	Avg	Min	Max	Avg	Min	Total
1	75	71.2	68	93	81.8	66	0.78
2	81	73.7	67	93	76.6	50	0.01
3	84	76.2	67	93	71.4	47	0.00
4	89	79.1	69	87	66.3	39	0.06
5	89	81.0	72	91	68.2	46	0.00
6	89	81.3	73	90	69.1	50	0.00
7	86	76.3	72	91	77.3	54	0.00
8	83	75.3	71	96	83.3	60	0.31
<b>9 -4WA2T</b>	85	75.0	68	93	72.9	44	0.11
10	81	73.5	69	96	84.3	67	0.00
11	79	72.1	68	93	83.5	60	0.00
12	84	73.9	61	93	65.1	44	0.19
13	84	73.3	64	93	70.6	46	0.00
14	84	74.7	63	93	68.6	46	0.00
15	84	75.4	67	93	75.4	51	0.00
16	77	73.6	70	93	84.2	76	0.24
<b>17 -Photos</b>	81	74.8	72	94	88.0	77	0.51