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**IR-4 Ornamental Horticulture Program
Early Post Emergence Efficacy**

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Acknowledgements

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Abstract

From 2008 through 2011, fourteen pre-emergent herbicides were tested across the United States through the IR-4 Ornamental Horticulture Program to determine whether they can control emerged weeds at the cotyledon to 1 leaf or 2 to 4 leaf stage. Three troublesome weeds were targeted initially including bittercress oxalis and spurge with Eclipta and Phyllanthus added later. Bittercress (*Cardamine sp.*) was controlled at the early postemergence application timings with Certainty at 0.035 and 0.094 lb ai/A, EXC3898 at 2.1 and 3.1 lb ai/A, Gallery 75 DF at 1.0 lb ai/A and V-10142 (imzasulfuron) at 0.38 and 0.75 lb ai/A. Emerged oxalis (*Oxalis sp.*) seedlings showed significant impact with early postemergence applications of Casoron 4G at 4 lb ai/A, Certainty at 0.035 and 0.094 lb ai/A, Gallery at 0.5 and 1.0 lb ai/A, indaziflam at 50 and 100 g/ha, SureGuard at 0.562 lb ai/A, Tower at 0.97 lb ai/A and V-10142 0.75 lb ai/A applications. Spurge (*Chamaesyce sp.*) control was demonstrated at early postemergence timings with 1.5 lb ai/A of Tower and 4.0 lb ai/A of Pendulum. Limited experiments with Broadstar 0.25G and Broadstar VC1604, FreeHand, and HGH-63 showed promise on at least one of these weed species. Additionally, eclipta (*Eclipta sp.*) was found to be controlled in limited testing by Casoron 4 (lb ai/A), Certainty (0.035 and 0.094 lb ai/A), SureGuard (0.383 lb ai/A), Tower (0.97 and 1.94 lb ai/A) and Basagran (1.0 lb ai/A) when applied early postemergence. Phyllanthus (*Phyllanthus sp.*) was also controlled by these products with the exception of Basagran. These findings benefit growers by identifying select preemergence herbicides which control specific weeds at early emergence stages in container grown ornamental horticulture crops.

Introduction

Nursery growers have had a longstanding battle to control weeds in container grown ornamental horticulture crops. Several chemical tools are available for preemergent control. However, there remains a need for effective control of emerged weed seedlings. At the 2007 Biennial Ornamental Horticulture Workshop, IR-4 initiated a study to determine whether preemergent herbicides could provide efficacy up to the 2-4 leaf stage. Research was conducted from 2008 through 2011 on the control of three troublesome weeds – bittercress, oxalis and spurge – from preemergence to the 2-4 leaf stage. At the 2009 Ornamental Horticulture Workshop this list was expanded to include eclipta and phyllanthus.

Materials and Methods

From 2008 to 2011, fourteen herbicides were tested through the IR-4 Program as over the top applications to evaluate early postemergence control of weeds (Table 1). Genera tested included: *Cardamine sp.* (bittercress), *Chamaesyce sp.* (spurge), *Eclipta sp.*, *Phyllanthus sp.* and *Oxalis sp.* (yellow wood sorrel). *Chamaesyce maculata* is the new genera name for *Euphorbia maculata*. Because the common name for *C. maculata* varies depending on geographic location, all tests done on this species will refer to spurge as the common name.

Target weeds were grown in containers in the greenhouse or field with suitable soilless substrate or soil. A minimum of three replications with three plants per treatment were required with most researchers exceeding this minimum.

Three application timings were made including:

- 1) Stage 0 – Same day as sowing or preemergence. (Senesac also included a “newly emerged” stage for 2011 data.)
- 2) Stage 1 – When the majority of the seedlings were between cotyledon and the one leaf stage
- 3) Stage 2 – When the majority of the seedlings are at the two to four leaf stage.
- 4) Stage 3 – In limited cases, weeds with 4 or more leaves were evaluated.

In 2008, the protocol focused on 3 products – Broadstar VC1604 and 0.25G, EXC3898 G, and V-10142G. In 2009, the protocol expanded to include 6 additional products – Certainty, Casoron 4G, FreeHand, HGH-63 2G, Pendulum, and Tower EC. The protocol for 2010 included Certainty, Casoron 4G, Basagran, SureGuard, and Tower. In 2011, Gallery, indaziflam, and Tower were selected for evaluation. Please visit <http://ir4.rutgers.edu/ornamental/OrnamentalDrafts.cfm> to view and download these protocols.

Data collection included a minimum of an efficacy rating at 1 to 2 weeks after treatment (WAT) and phytotoxicity recorded on a scale of 0 to 10 (0 = no phytotoxicity; 10 = complete kill). Detailed weather conditions including temperature, precipitation, soil or soilless media type, application equipment, irrigation, liner size, plant height, width, growth stage at application and at data collection date were also collected.

For the purpose of this summary the term commercially acceptable will mean greater than or equal to 70% weed control.

Products were supplied to researchers by their respective manufacturers.

For contact information please see the list of researchers in Appendix 1.

Table 1. List of Products and Rates Tested from 2008 to 2011.

Product ¹	Active Ingredient(s)	Rate(s) Tested/A		Manufacturer
		Pounds active Ingredient	Product	
Basagran	bentazon	1.0	1 quart	BASF
Broadstar 0.25G original formulation	flumioxazin	0.19	75 lb	Valent
		0.375	150 lb	
		0.75	300 lb	
Broadstar VC1604 0.25G	flumioxazin	0.19	75 lb	Valent
		0.38	150 lb	
Casoron 4G	dichlobenil	1.0	25 lb	Chemtura Corp.
		2.0	50 lb	
Certainty	sulfosulfuron	0.035	0.75 oz	Monsanto
		0.094	2.0 oz	
EXC3898 2.1G	mesotrione + prodiamine + s-metolachlor	2.10	100 lb	Syngenta
		3.15	150 lb	
FreeHand 1.75G	pendimethalin + dimethenamid-p	3.5	200 lb	BASF
		7.0	400 lb	
Gallery 75DF	isoxaben	1.0	1.33 lb	Dow AgroSciences
HGH-63 2G	oxyfluorfen	1.0	50 lb	Harrold's
		2.0	100 lb	
Indaziflam	indaziflam	50 g/ha	150 lb	Bayer
		100 g/ha	300 lb	
Pendulum 3.3EC	pendimethalin	2.0	77.58 fl oz	BASF
		4.0	155 fl oz	
SureGuard 51WDG	flumioxazin	0.383	0.75 oz	Valent
		0.5625	8.2 oz	
Tower 6.0EC (BAS 656h EC)	Dimethenamid-p	0.97	21 fl oz	BASF
		1.5	32 fl oz	
		1.94	42 fl oz	
		3.0	64 fl oz	
V-10142	imzasulfuron	0.375	75 lb	Valent
		0.75	150 lb	

¹ In some cases surfactant such as crop oil concentrate (COC) or non-ionic surfactant (NIS) are used and noted in individual trials.

Results and Discussion

Bittercress

Ten experiments were conducted on bittercress from 2008 to 2011. Some researchers conducted the experiments within greenhouses; others held weeds in containers outdoors. For this summary, commercial or acceptable weed control is defined as >70% efficacy as to be expected. Products varied in efficacy depending on the stage treated (See Table 2). The summary table below lists the number of trials where commercial control was observed in at least one evaluation compared to the total number of trials.

Stage 0: In general, most treatments demonstrated an effect on bittercress when applied at Stage 0 or prior to emergence with the exception of Casoron, HGH-63 and Tower which were only evaluated in limited experiments and did not demonstrate effective control at this stage of growth.

Stage 1: Certainty, EXC3898, Gallery 75 DF, and V-10142 consistently provided effective postemergence bittercress control when applied in the early stages of growth. EXC3898 applied at 2.10 to 3.15 lb ai/A delivered commercially acceptable control of greater than 70% for both rates; however, this product will not be registered. In a single trial indaziflam provided very effective control at this stage (Table 19). Casoron was tested by two researchers at Stage 1 but was ineffective in controlling bittercress at this stage (Table 17, Table 18). Tower treatments were significantly different from the untreated but not at commercially acceptable levels of control. Neither formulation of Broadstar, 0.25G or VC1604, at 0.19 and 0.375 lb ai/A or either rate of HGH-63 provided consistent control of bittercress.

Stage 2: Only Certainty, Gallery 75 DF, EXC3898, and V-10142 consistently provided effective postemergence bittercress control across trials when applied at the 2 to 4 leaf growth stage. Broadstar VC1604 at 0.375 controlled bittercress in three of eight experiments at this stage while the 0.25G formulation provided no control at this stage. Casoron, HGH-63, indaziflam and Tower showed no significant impact on bittercress at Stage 2.

Table 2. General Summary of Early Post Emergence Efficacy for Bittercress

Product (active)	Rate (lb ai/A)	Number of Experiments with Acceptable Control (>70%)		
		Stage 0: Preemergence	Stage 1: Cotyledon to 1 Leaf	Stage 2: 2 to 4 Leaves
Broadstar 0.25G (flumioxazin)	0.19	1 of 1	0 of 1	0 of 1
	0.375	1 of 1	1 of 1	0 of 1
Broadstar VC1604 0.25G	0.19	4 of 6 ¹	1 of 8	0 of 8
	0.375	5 of 6	2 of 8	3 of 8
Casoron 4 G (dichlobenil)	1.0	0 of 1	0 of 2	0 of 2
	2.0	0 of 1	0 of 2	0 of 2
Casoron 1.4 CS (dichlobenil)	1.0	0 of 1	---	0 of 1
Certainty (sulfosulfuron)	0.035	---	2 of 2	2 of 2
	0.094	---	2 of 2	2 of 2
EXC3898 (mesotrione + prodiamine + s-metolachlor)	2.1	6 of 6	6 of 6	4 of 6
	3.15	6 of 6	5 of 6	4 of 6
Gallery 75 DF (isoxaben)	0.5	1 of 1	1 of 1	0 of 1
	1.0	2 of 2	4 of 4	3 of 4
HGH-63 2G (oxyfluorfen)	1.0	0 of 1	0 of 2	0 of 2
	2.0	0 of 1	1 of 3	0 of 3
Indaziflam	50 g/ha	1 of 1	1 of 1	0 of 1
	100 g/ha	1 of 1	1 of 1	0 of 1
Tower EC (dimethenamid-p)	0.97	0 of 2	0 of 4	0 of 4
	1.5	----	0 of 2	0 of 2
	1.94	0 of 2	0 of 2	0 of 2
V-10142 (imzasulfuron)	0.38	7 of 7	7 of 9	7 of 9
	0.75	7 of 7	8 of 9	7 of 9

¹ Highlighted numbers indicate efficacious treatments in the majority ($\geq 66\%$) of the trials where at least two trials were conducted.

Bittercress – Boydston, 2008

In 2008, Boydston at the USDA facility in Prosser, Washington studied whether EXC3898 and V-10142 provided postemergence efficacy for bittercress grown in field containers under shade with overhead irrigation.

In 2008 Boydston found EXC3898 applied preemergent at 2.1 and 3.15 lb ai/A controlled bittercress 97% and 98% 5 WAT, respectively (Table 3). EXC3898 applied to bittercress between the cotyledon to 1 leaf stage at 2.1 and 3.15 lb ai/A controlled bittercress 76 and 97% 4 WAT, respectively (Table 4). EXC3898 2.1 G applied to bittercress between the 2 to 4 leaf stage at 2.1 and 3.15 lb ai/A controlled bittercress 88 and 99% 4WAT, respectively.

Although the number of weeds did not differ significantly at Stage 0 and 1 for either rating date for V-10142 0.5 G (0.375-0.75 lb ai/A) those seedlings that emerged received high ratings for chlorosis and necrosis suggesting good to excellent control of bittercress at all three stages (Table 3, Table 4). At stage 2 both efficacy ratings and weed numbers were significantly different from the untreated.

Table 3. Efficacy of pre-emergent herbicides applied to Bittercress (*Cardamine sp.*) – Stage 0, Boydston, 2008.

Product - Rate (lb ai/A)	Efficacy Rating ¹		Number of Weeds per pot ²	
	3 WAT ³	5 WAT	3 WAT	5 WAT
<i>Preemergent</i>				
EXC3998 - 2.1	91.67 a	97.00 a	25.33 a	5.00 b
EXC3898 - 3.15	91.67 a	98.00 a	17.33 a	4.67 b
Untreated Check	0.00 a	0.00 b	33.33 a	33.33 a
<i>LSD (P=.05)</i>	5.973	2.267	28.021	5.474
<i>Postemergent</i>				
V-10142 - 0.375	16.67 a	80.00 a	40.00 a	69.00 a
V-10142 - 0.75	26.67 a	83.33 a	39.33 a	49.00 a
Untreated Control	0.0 b	0.0 b	41.00 a	55.33 a
<i>LSD (P=.05)</i>	38.893	24.336	55.270	47.838

¹Efficacy Rating: stunting and chlorosis, 0= live plant, 100= dead

²No significant difference in number of live plants per pot on Day of Application

³ WAT = weeks after treatment

Table 4. Efficacy of pre-emergent herbicides for Stage 1&2 Bittercress (*Cardamine hirsute*), Boydston, 2008.

Product Rate (lb ai/A)	Efficacy Rating ¹		Number of Weeds per pot ²	
	2 WAT ³	4 WAT	0 WAT	4 WAT
<i>Cotyledon to one leaf stage</i>				
EXC3898 - 2.1	78.33 b	75.67 a	21.00 b	9.67 b
EXC3898 - 3.15	96.67 a	96.67 a	28.00 ab	2.67 b
Untreated Check	0.00 c	0.00 b	33.33 a	31.67 a
<i>LSD (P=.05)</i>	<i>15.567</i>	<i>24.212</i>	<i>7.996</i>	<i>8.730</i>
<i>Two to four leaf stage</i>				
V-10142 - 0.375	83.33 a	91.67 a	56.67 a	23.67 a
V-10142 - 0.75	88.33 a	90.00 a	50.67 a	27.00 a
Untreated Control	0.00 b	0.00 b	41.00 a	49.00 a
<i>LSD (P=.05)</i>	<i>11.014</i>	<i>13.621</i>	<i>28.077</i>	<i>20.746</i>
<i>Two to four leaf stage</i>				
EXC3898 - 2.1	66.67 a	88.33 a	19.00 a	6.67 b
EXC3898 - 3.15	81.67 a	99.33 a	12.00 a	2.00 b
Untreated Check	0.00 b	0.00 b	33.33 a	31.67 a
<i>LSD (P=.05)</i>	<i>51.033</i>	<i>21.356</i>		<i>8.811</i>
<i>Two to four leaf stage</i>				
V-10142 - 0.375	93.33 a	94.67 a	37.67 b	12.67 b
V-10142 - 0.75	95.67 a	98.33 a	30.33 b	3.00 b
Untreated Control	0.00 b	0.00 b	55.33 a	49.00 a
<i>LSD (P=.05)</i>	<i>4.7</i>	<i>6.477</i>	<i>16.673</i>	<i>16.38</i>

¹Efficacy Rating: 0= live plant, 100= dead

²No significant difference in number of live plants per pot on Day of Application

³ WAT = weeks after treatment

Bittercress – Gilliam, 2008

Gilliam, in 2008, compared the impact of Broadstar VC1604 0.25G, EXC3898 G, and V-10142 G to Gallery for postemergent control of bittercress. This experiment was conducted in the Auburn University greenhouse located in Auburn, AL. Overhead sprinklers were the source of irrigation.

Stage 0: No bittercress was present at 7 or 14 DAT in any containers. At the 21 DAT evaluation the mean weed numbers remained low in all treated containers (Table 5). Bittercress was observed only in pots receiving Broadstar VC1604 at 0.19 lb ai or V-10142 at 0.75 lb ai/A (0.1 weeds/pot for each treatment). Untreated control containers had a mean weed number of 5.1.

Stage 1: EXC3898 G at 3.15 lb ai/A, Gallery (1.0 lb ai/A) and V-10142 G (0.375 and 0.75 lb ai/A) provided good to excellent control throughout the experiment. There was no injury to bittercress treated with Broadstar VC1604 G at 7 DAT. Plants treated with the high rate of Broadstar VC 1604 (0.375 lb ai/A) demonstrated injury but not at a commercially acceptable level.

All treated bittercress, except those treated with Broadstar VC1604 at the lower rate, had significantly less fresh weed weights than that of the non-treated control group (15.9 g vs. 17.9 g). Other fresh weights ranged from 0.0 g, for plants receiving V-10142 at the higher rate, to 11.6 g for bittercress treated with Broadstar VC1604 at 0.38 lb ai/A.

Stage 2: Excellent control of seedlings with 2 to 4 leaves was observed with the high rate of EXC 3898, Gallery and both rates of V-10142. Bittercress receiving Broadstar VC1604 at the lower rate (0.19 lb ai/A) fully recovered by 14 DAT and exhibited no injury symptoms for the rest of the study. Damage to weeds treated with Broadstar VC1604 at 0.375lb ai/A was greater but did not reach an acceptable level of control during the evaluation period.

Fresh weed weights for all treated containers were significantly smaller than that of the non-treated control group (15.4g). Containers treated with Gallery, EXC3898, and V-10142 had mean weights less than 3.0g. Fresh weed weights ranged from 0.0g for pots treated with either rate of V-10142 to 12.0g for containers receiving Broadstar VC1604 at 0.19 lb ai/A.

Table 5. Efficacy of pre-emergent herbicides for Bittercress (*Cardamine sp.*), Gilliam, 2008.

Product - Rate (lb ai/A)	Number of emerged weeds or Efficacy			Fresh Weights ²
	7 DAT ³	14 DAT	21 DAT	21 DAT
<i>Preemergent</i>				
Number of emerged weeds				
Broadstar VC1604 - 0.19	0.0 a ⁴	0.0 a	0.1 b	0.0 b
Broadstar VC1604 - 0.375	0.0 a	0.0 a	0.0 b	0.0 b
EXC3898 - 2.1	0.0 a	0.0 a	0.0 b	0.0 b
EXC3898 - 3.15	0.0 a	0.0 a	0.0 b	0.0 b
V-10142 - 0.375	0.0 a	0.0 a	0.1 b	0.0 b
V-10142 - 0.75	0.0 a	0.0 a	0.0 b	0.0 b
Gallery - 1.0	0.0 a	0.0 a	0.0 b	0.0 b
Untreated Control	0.0 a	0.0 a	5.1 a	4.1 a
<i>Cotyledon to one leaf stage</i>				
Efficacy Rating¹				
Broadstar VC1604 - 0.19	1.0 d	1.0 d	1.0 e	15.9 a
Broadstar VC1604 - 0.375	1.1 d	3.6 c	6.7 d	11.6 b
EXC3898 - 2.1	6.0 c	6.8 b	7.9 c	7.5 c
EXC3898 - 3.15	6.8 b	7.2 b	8.4 bc	5.8 c
V-10142 - 0.375	7.1 b	8.4 ab	9.1 ab	1.8 d
V-10142 - 0.75	7.0 b	9.4 a	10.0 a	0.0 d
Gallery - 1.0	8.4 a	9.9 a	10.0 a	0.6 d
Untreated Control	1.0 d	1.0 d	1.0 e	17.9 a
<i>Two to four leaf stage</i>				
Efficacy Rating¹				
Broadstar VC1604 - 0.19	1.8 e	1.0 d	1.0 d	12.0 b
Broadstar VC1604 - 0.375	2.9 d	4.6 c	5.2 c	8.4 c
EXC3898 - 2.1	6.4 c	7.1 b	7.9 b	3.0 d
EXC3898 - 3.15	7.6 b	8.8 a	9.7 a	1.9 de
V-10142 - 0.375	8.0 ab	9.0 a	10.0 a	0.0 e
V-10142 - 0.75	8.0 ab	8.9 a	10.0 a	0.0 e
Gallery - 1.0	8.4 a	8.9 a	10.0 a	0.07 de
Untreated Control	1.0 f	1.0 d	1.0 d	15.4 a

¹ Plant injury ratings on scale of 1 to 10. 1 = no injury, 10 = dead

² Fresh weights measured in grams.

³ DAT = Days after treatment

⁴ Means separated using Duncan's Multiple Range Test at p = 0.05

Bittercress – Neal, 2008

In North Carolina, Neal initiated two field container experiments in 2008. The summer experiment had poor germination of bittercress and significant insect feeding which reduced data quality. Only data from the fall experiment are presented in this report although comments are included from both the summer and fall experiments.

Stage 0: In the summer experiment, the original and new formulations of flumioxazin provided preemergence control of bittercress. Control was greater when applied at the higher dose. In the repeat of the experiment in the fall, all treatments provided effective control of bittercress when applied preemergently.

Stage 1: Significant differences between treatments were observed when applied at early postemergence in the fall (Table 7). EXC3898, the high dose of Broadstar 0.25G and V-10142 controlled bittercress effectively through 12 WAT. Broadstar 0.25G at 0.19 lb ai/A and either rate of Broadstar VC1604 did not provide postemergent control of bittercress.

Stage 2: The two to four leaf stage was evaluated through 6 WAT. Broadstar VC1604 was not included in this evaluation. Bittercress at the 2 to four leaf stage was injured by V-10142 and by EXC3898 (Table 7). The high rate of Broadstar 0.25G provided some control (64%) of bittercress at this growth stage but the new formulation (VC1604 at 0.375 lb ai/A) did not demonstrate adequate efficacy.

In summary, commercial control of emerged bittercress was achieved by V-10142, EXC3898 and the high rate of Broadstar 0.25G, but not by Broadstar VC1604.

Table 6. Efficacy of pre-emergent herbicides for Bittercress (*Cardamine flexuosa*) – Stage 0, Neal, 2008

Product – Rate (lb ai/A)	Efficacy Rating ¹			
	8 WAT ³	12 WAT	14 WAT	18 WAT
<i>Preemergent</i>				
Broadstar 0.25G - 0.19	10.0 a	10.0 a	10.0 a	10.0 a
Broadstar 0.25G - 0.375	10.0 a	10.0 a	10.0 a	10.0 a
Broadstar VC1604 0.25G - 0.19	9.0 ab	9.0 a	8.6 a	9.2 a
Broadstar VC1604 0.25G - 0.375	10.0 a	10.0 a	10.0 a	10.0 a
EXC3898 - 2.1	8.5 b	8.4 a	8.0 a	8.0 b
EXC3898 - 3.15	9.9 a	10.0 a	10.0 a	9.8 a
V-10142 0.5G - 0.375	9.8 a	10.0 a	10.0 a	9.9 a
V-10142 0.5G - 0.75	9.8 a	10.0 a	10.0 a	10.0 a
Untreated Control	0.0 c	0.0 b	0.0 b	0.0 c

¹ Efficacy was rated on a scale of 0 to 10 with 0 being no control and 10 being 100 percent.

Table 7. Efficacy of preemergent herbicides for emerged Bittercress (*Cardamine flexuosa*) – Stages 1 and 2, Neal, 2008

Product – Rate (lb ai/A)	Efficacy Rating ¹			
	2 WAT	6 WAT	8 WAT	12 WAT
<i>One leaf stage</i>				
Broadstar 0.25G - 0.19 lb ai/A	1.0 d	4.0 c	4.4 b	5.9 c
Broadstar 0.25G - 0.375 lb ai/A	3.8 c	6.4 b	7.9 a	9.2 ab
Broadstar VC1604 0.25G - 0.19 lb ai/A	0.0 d	0.6 d	0.8 c	0.6 d
Broadstar VC1604 0.25G - 0.375 lb ai/A	1.0 d	0.8 d	2.0 c	3.8 c
EXC3898 - 2.1 lb ai/A	5.0 bc	8.4 a	9.2 a	8.8 ab
EXC3898 - 3.15 lb ai/A	5.6 b	10.0 a	10.0 a	10.0 a
V-10142 0.5G - 0.375 lb ai/A	4.6 bc	4.8 bc	7.6 a	7.6 ab
V-10142 0.5G - 0.75 lb ai/A	7.0 a	9.2 a	9.7 a	9.6 a
Untreated Control	0.0 d	0.0 d	0.0 c	0.0 d
<i>Two to Four leaf stage</i>				
Broadstar 0.25G - 0.19 lb ai/A	0.0 a	2.4 c		
Broadstar 0.25G - 0.375 lb ai/A	1.2 a	6.4 b		
Broadstar VC1604 0.25G - 0.19 lb ai/A	---	---		
Broadstar VC1604 0.25G - 0.375 lb ai/A	0.0 a	0.8 cd		
EXC3898 - 2.1 lb ai/A	0.4 a	7.2 ab		
EXC3898 - 3.15 lb ai/A	0.2 a	8.8 a		
V-10142 0.5G - 0.375 lb ai/A	1.9 a	9.4 a		
V-10142 0.5G - 0.75 lb ai/A	0.6 a	9.4 a		
Untreated Control	0.0 a	0.0 d		

LSD (P=0.05)

¹ Efficacy was rated on a scale of 0 to 10 with 0 being no control and 10 being 100 percent.

Bittercress – Regan, 2008

In 2008, Regan conducted research in Aurora, Oregon using field containers with overhead irrigation. This experiment evaluated Broadstar VC1604 0.25G, EXC3898 G, and V-10142 for postemergent efficacy on bittercress.

EXC3898 and V-10142 G were effective tools for early postemergent control of bittercress (*Cardamine hirsute*). These two herbicides were generally effective at all three stages of early weed growth. Broadstar VC1604 was the least effective herbicide showing poor or no control of the three weed species evaluated (Table 9).

Stage 0: The EXC3898 and V-10142 G treatments were very effective in preventing germination of bittercress at both rates. The higher rate of Broadstar VC1604 significantly reduced the germination rate of bittercress while the lower rate reduced germination by approximately half compared to the control.

Stage 1: The treatments containing both rates of EXC3898 and V-10142 G gave very good to excellent results in controlling weeds at the 1-2 leaf stage. Significant damage to bittercress treated with EXC3898 and V-10142 G was observed only one week after treatment. Broadstar VC1604 at both rates had no effect on 1-2 leaf stage of bittercress.

Stage 2: At the 2-4 leaf stage bittercress was controlled by both EXC3898 and V-10142 G at a similar level when compared to the 1-2 leaf stage. Broadstar VC1604 was only slightly effective in controlling bittercress at the higher rate.

Table 8. Efficacy of pre-emergent herbicides for Bittercress (*Cardamine hirsute*) – Stage 0, Regan 2008.

Product - Rate (lb ai/A)	Percent Germination
	4 WAT
Broadstar VC1604 - 0.19	28.0 c ¹
Broadstar VC1604 - 0.375	9.0 b
EXC3898 - 2.1	0.0 a
EXC3898 - 3.15	0.0 a
V-10142 - 0.375	0.0 a
V-10142 - 0.75	0.0 a
Untreated Control	51.5 d

¹ Column mean numbers followed by the same letter are not significantly different.

Table 9. Efficacy of pre-emergent herbicides for emerged Bittercress (*Cardamine hirsute*) – Stages 1 and 2, Regan 2008.

Product - Rate (lb ai/A)	Efficacy Rating		
	1 WAT	2 WAT	3 WAT
<i>One to two leaf stage</i>			
Broadstar VC1604 - 0.19	0.0 a ¹	0.0 a	0.0 a
Broadstar VC1604 - 0.375	0.0 a	0.0 a	0.0 a
EXC3898 - 2.1	7.3 c	8.7 d	8.7 d
EXC3898 - 3.15	7.5 c	7.9 c	7.9 c
V-10142 - 0.375	4.3 b	5.1 b	5.1 b
V-10142 - 0.75	9.7d	9.7 e	9.7 e
Untreated Control	0.0 a	0.0 a	0.0 a
<i>Two to four leaf stage</i>			
Broadstar VC1604 - 0.19	0.0 a	0.0 a	0.0 a
Broadstar VC1604 - 0.375	1.2 b	1.7 b	1.7 b
EXC3898 - 2.1	6.9 c	7.9 d	7.9 cd
EXC3898 - 3.15	7.7 c	8.7 de	8.7 de
V-10142 - 0.375	6.7 c	7.5 c	7.5 c
V-10142 - 0.75	9.2 d	9.8 e	9.8e
Untreated Control	0.0 a	0.0 a	0.0 a

¹ Column mean numbers followed by the same letter are not significantly different.

Bittercress – Senesac, 2008

During 2008, Senesac tested the impact of Broadstar VC1604, EXC3898, and V-10142 for postemergent control of bittercress at the Long Island Horticulture Research and Extension Center. This experiment was conducted in a greenhouse without temperature controls; weeds were misted hourly during daylight hours.

Broadstar VC1604 (0.375 and 0.75 lb ai/A) yielded 70% or greater weed control, at the first and third timing (Table 10.) EXC3898 was generally more effective providing commercial weed control when applied preemergently or at the cotyledon to one leaf stage but not at the two to four leaf stage (Table 11). V-10142 generally yielded 70% or greater control of bittercress at 2, 3, and 5 WAT (Table 12).

Table 10. Efficacy of Broadstar VC1604 for emerged Bittercress (*Cardamine hirsute*) - Senesac, 2008.

Product - Rate (lb ai/A)	Efficacy Rating			
	1 WAT	2 WAT	3 WAT	5 WAT
<i>Preemergent</i>				
Broadstar VC1604 - 0.190	--	33	40	50
Broadstar VC1604 - 0.375	--	77	83	93
Broadstar VC1604 - 0.75	--	87	90	100
Untreated	--	0	0	0
<i>Cotyledon to one leaf stage</i>				
Broadstar VC1604 - 0.190	13	13	13	5
Broadstar VC1604 - 0.375	20	27	20	27
Broadstar VC1604 - 0.75	37	50	60	53
Untreated	0	0	0	0
<i>Two to four leaf stage</i>				
Broadstar VC1604 - 0.190	23	57	50	
Broadstar VC1604 - 0.375	37	70	73	
Broadstar VC1604 - 0.75	40	77	73	
Untreated	0	0	0	
<i>Fisher's LSD@ 0.05</i>	16	26	27	17

Table 11. Efficacy of EXC3898 for emerged Bittercress, Senesac, 2008.

Product	Rate (lb ai/A)	Efficacy Rating			
		1 WAT	2 WAT	3 WAT	5 WAT
<i>Preemergent</i>					
EXC3898	2.10	--	80	77	87
EXC3898	3.15	--	70	67	83
EXC3898	4.20	--	80	87	87
Untreated		--	00	0	0
<i>Cotyledon to one leaf stage</i>					
EXC3898	2.10	40	63	87	70
EXC3898	3.15	40	40	27	17
EXC3898	4.20	53	70	67	53
Untreated		0	0	0	0
<i>Two to four leaf stage</i>					
EXC3898	2.10	27	57	57	
EXC3898	3.15	23	40	53	
EXC3898	4.20	23	47	67	
Untreated		0	0	0	
<i>Fisher's LSD@ 0.05</i>		16	30	26	28

Table 12. Efficacy of V-10142 for emerged Bittercress, Senesac, 2008.

Product - Rate (lb ai/A)	Efficacy Rating			
	1 WAT	2 WAT	3 WAT	5 WAT
<i>Preemergent</i>				
V-10142 - 0.38	--	83	80	90
V-10142 - 0.75	--	87	83	73
V-10142 - 1.50	--	90	87	97
Untreated	--	0	0	0
<i>Cotyledon to one leaf stage</i>				
V-10142 - 0.38	47	63	67	50
V-10142 - 0.75	47	73	77	73
V-10142 - 1.50	47	77	78	77
Untreated	0	0	0	0
<i>Two to four leaf stage</i>				
V-10142 - 0.38	30	73	80	
V-10142 - 0.75	23	67	73	
V-10142 - 1.50	23	80	80	
Untreated	0	0	0	
<i>Fisher's LSD@ 0.05</i>	20	13	14	26

Bittercress – Wilen, 2008

In 2008 Wilen conducted two experiments in the Los Angeles region of California examining Broadstar VC1604 0.25G, EXC3898 and V-10142 for control of postemergent hairy bittercress. The first experiment solely tested Stage1 pots which were seeded on 5/15/09 and grown in a temperature controlled greenhouse. The second experiment examined Stage 0 and 2 pots which were seeded on 6/12/09 and grown under shade in an open lath house with overhead irrigation.

Stage 0: All of the treatments reduced cover and provided some control of hairy bittercress when compared to the untreated control during this stage. Throughout stage 0 Broadstar VC1604 applied at a rate of 0.375 lb ai/A proved to be most effective, achieving over 90% control at 3 and 4 WAT. None of the other treatments provided > 80% control although Broadstar VC1604 at 0.19 lb ai/A showed a trend of increasing percent control over time. There was a purple cast to some emerged bittercress plants treated with V-10142.

Stage 1: At 2 WAT and 3 WAT only Broadstar VC1604 at 0.375 lb ai/A provided acceptable reduction in percent cover (i.e. <10%) and adequate percent control (>80%) of hairy bittercress.

Stage 2: None of the treatments proved successful in adequately controlling hairy bittercress at this stage until 40 DAT. As in the Stages 1 and 2, there was an increase in control over time with Broadstar VC1604 which at 0.375 lb ai/A provided at least 80% control of bittercress 40 DAT.

Summary: Overall, only Broadstar VC1604 at 0.375 lb ai/A was acceptable for preemergence and early post-emergence control of hairy bittercress. Increasing application rates of Broadstar VC1604 provided significantly better results during Stage 1 for percent cover 2 WAT and percent control 3 WAT and for Stage 2 for percent control at 2 WAT and percent cover at 3 WAT. Increasing application rates of EXC3898 only provided significantly better results during Stage 1 for percent cover 2 WAT and percent control at 3 and 4 WAT. Increasing application rates of V-10142 did not improve performance at any stage.

Because of space constraints, weed-containing pots could not be held more than 3 WAT for Stage 2 and 40 DAT for Stage 3. However, based on the limited data obtained, there are indications that possibly EXC3898 and more likely Broadstar VC1604 have post-emergence activity but the activity is slow to develop.

Table 13. Efficacy of pre-emergent herbicides for Hairy Bittercress (*Cardamine hirsute*), - Wilen, 2008.

Product - Rate (lb ai/A)	Percent Cover		Percent Control	Percent Cover	Percent Control
	2 WAT	3 WAT	3 WAT	4 WAT	4 WAT
<i>Preemergent</i>					
Broadstar VC1604 - 0.19	2.17 bc	3.25 ab	75.83 d	3.67 ab	80.83 de
Broadstar VC1604 - 0.375	0.50 a	1.00 a	91.67 e	0.92 a	93.33 e
EXC3898 - 2.10	2.67 c	5.33 b	52.92 b	14.83 c	47.08 b
EXC3898 - 3.15	1.67 b	4.17 ab	75.00 cd	10.58 bc	63.33 c
V-10142 - 0.375	2.17 bc	4.92 b	72.92 cd	4.58 ab	77.92 d
V-10142 - 0.75	2.00 bc	4.17 ab	61.25 bc	7.92 abc	71.25 cd
Untreated Control	4.42 d	19.17 c	0.00 a	42.92 d	0.00 a
Level of significance	***	***	***	***	***

Mean Separation done by LSD at P=0.05

*** P<0.00

Table 14. Efficacy of pre-emergent herbicides for emerged Hairy Bittercress – Stage 1, Wilen, 2008.

Product - Rate (lb ai/A)	Percent Cover	Percent Control	Percent Cover	Percent Control	Percent Cover	Percent Control
	1 WAT ³	1 WAT	2 WAT	2 WAT	3 WAT	3 WAT
	<i>Cotyledon to one leaf stage</i>					
Broadstar VC1604 - 0.19	14.00	0.56	16.67 ab	59.44 c	16.89 b	74.44 de
Broadstar VC1604 - 0.375	9.89	3.33	7.22 a	81.67 d	4.22 a	86.67 e
EXC3898 - 2.10	11.78	0.00	16.44 ab	71.67 cd	14.78 ab	61.67 d
EXC3898 - 3.15	14.44	5.00	12.44 a	72.22 cd	11.11 ab	72.78 d
V-10142 - 0.375	13.11	0.00	26.11 bc	36.11 b	28.89 c	36.11 c
V-10142 - 0.75	13.89	0.00	32.22 c	27.22 b	38.33 cd	16.11 b
Untreated Control	15.56	0.00	48.89 d	0.00 a	49.44 d	0.00 a
Level of Significance	NS	NS	***	***	***	***

Mean Separation done by LSD at P=0.05

*** P<0.00

Table 15. Efficacy of pre-emergent herbicides for emerged Hairy Bittercress – Stage 2, Wilen, 2008.

Product - Rate (lb ai/A)	Percent Cover	Percent Control	Percent Cover	Percent Control	Percent Cover	Percent Control
	1 WAT	1 WAT	2 WAT	2 WAT	40 DAT	40 DAT
	<i>2 to 4 leaf stage</i>					
Broadstar VC1604 - 0.19	27.08 a	19.17 bc	12.08 ab	53.75 c	7.42 ab	69.25 d
Broadstar VC1604 - 0.375	29.17 ab	22.92 c	7.00 a	69.58 c	1.58 a	91.67 e
EXC3898 - 2.10	36.25 bcd	5.42 a	17.67 b	34.17 b	15.81 bc	42.13 bc
EXC3898 - 3.15	41.25 cd	3.75 a	12.33 ab	52.50 c	14.67 bc	56.25 cd
V-10142 - 0.375	37.92 cd	4.58 a	29.17 c	15.83 a	22.50 cd	41.83 bc
V-10142 - 0.75	33.75 abc	10.42 ab	32.92 c	12.08 a	27.50 d	37.92 b
Untreated Control	43.75 d	0.00 a	35.83 c	0.00 a	46.67 e	0.00 a
Level of Significance	***	***	***	***	***	***

Mean Separation done by LSD at P=0.05

*** P<0.00

Bittercress – Gilliam, 2009

In 2009, Gilliam (AL) conducted two greenhouse experiments to evaluate selected herbicides for early postemergence bittercress control at two different stages of growth. Experiment 2 included Casoron.

Experiment 1: Stage 1

At 7 DAT, bittercress treated with HGH-63 (2.0 lb ai/A) and Gallery had more injury than any other treatment. Bittercress treated with HGH-63 (1.0 lb ai/A) along with Certainty, Tower (1.5 lb ai/A), and V-10142 all had similar injury ratings at 7 DAT, and provided only marginal control. Bittercress treated with Broadstar VC1604 provided the least control of any treatment, and were similar to the non-treated control.

By 28 DAT, Gallery provided the greatest control followed by Certainty and V-10142. The only remaining herbicide treatment not statistically similar to the control was Broadstar VC1604 (0.375 lb ai/A) which only provided minimal damage not sufficient for efficacy.

Fresh weights indicate that Gallery provided excellent control, however, V-10142, and Certainty had similar fresh weights. Fresh weights also show Broadstar VC1604 (0.375 lb ai/A) and Tower (1.5 lb ai/A) had some control (fresh weights of 4.6 and 5.5) while HGH-63 and Tower (0.97 lb ai/A) had little effect on bittercress growth. Bittercress treated with Broadstar VC1604 (0.19 lb ai/A) had similar fresh weights to the non-treated control.

Experiment 1: Stage 2

At 14 DAT, bittercress treated with Gallery and V-10142 (0.75 lb ai/A) had higher injury ratings than any other treatment followed by V-10142 (0.375 lb ai/A) and Certainty. Tower (1.5 lb ai/A) provided only marginal control while Tower at 0.97 lb ai/A, Broadstar VC1604 and HGH-63 were similar to non-treated plants.

By 28 DAT Gallery and V-10142 (both rates) again had the highest injury ratings at, followed by Certainty (0.094 lb ai/A) which was similar to V-10142 at 0.375 lb ai/A. Tower, HGH-63 and Broadstar VC1604 (0.19 lb ai/A) were similar to non-treated plants.

Fresh weights indicate all herbicides provided some degree of efficacy when compared to non-treated plants; however Gallery, Certainty, and V-10142 were the only treatments providing acceptable control.

Table 16. Efficacy of pre-emergent herbicides for emerged Bittercress (*Cardamine hirsuta*) - Gilliam, 2009, Experiment 1.

Product - Rate (lb ai/A)	Efficacy Rating ¹				Fresh Weights ²
	7 DAT ³	14 DAT	21 DAT	28 DAT	
<i>Cotyledon to one leaf stage</i>					
Broadstar VC1604 - 0.19	1.7 d ⁴	1.6 e	2.2 b	2.1 c	4.6 c
Broadstar VC1604 - 0.375	1.0 d	1.1 e	1.0 b	1.1 d	10.4 a
Gallery - 1.0	5.6 a	8.8 a	8.9 a	10.0 a	0.0 d
HGH-63 - 2.0	5.2 a	2.0 de	1.0 b	1.1 d	8.0 b
HGH-63 - 1.0	3.1 bc	1.3 e	1.9 b	1.0 d	7.8 b
Certainty - 0.094	3.9 b	7.7 ab	8.4 a	8.3 b	0.0 d
Certainty - 0.035	3.9 b	7.8 ab	8.9 a	8.9 b	0.0 d
Tower - 1.5	3.1 bc	4.1 c	2.1 b	1.0 d	6.1 bc
Tower - 0.97	2.7 c	3.0 cd	1.0 b	1.0 d	8.0 b
V-10142 - 0.75	3.7 b	7.7 ab	8.8 a	8.9 b	0.0 d
V-10142 - 0.38	3.4 bc	6.9 b	8.2 a	8.1 b	0.1 d
Control	1.0 d	1.0 c	1.0 b	1.0 d	11.4 a
<i>Two to four leaf stage</i>					
Broadstar VC1604 - 0.19	1.2 e	2.1 d	2.9 c	2.8 d	7.3 cd
Broadstar VC1604 - 0.375	1.0 e	1.3 d	1.6 cd	1.7 de	9.0 bc
HGH-63 - 2.0	4.7 ab	1.7 d	1.0 d	1.0 e	9.2 bc
HGH-63 - 1.0	4.1 bc	1.2 d	1.0 d	1.0 e	10.1 b
Certainty - 0.094	4.3 abc	5.9 b	7.1 b	7.1 bc	0.4 e
Certainty - 0.035	4.2 abc	6.6 b	7.3 ab	6.4 c	0.5 e
Tower - 1.5	3.6 bc	3.2 c	1.6 cd	1.1 e	4.9 d
Tower - 0.97	2.6 d	1.4 d	1.0 d	1.0 e	10.1 b
V-10142 - 0.75	4.1 bc	7.7 a	8.3 ab	9.4 a	0.9 e
V-10142 - 0.38	3.6 c	6.0 b	8.2 ab	8.2 ab	0.2 e
Gallery - 1.0	5.1 a	7.7 a	8.9 a	8.9 a	0.0 e
Control	1.0 e	1.0 d	1.0 d	1.0 e	13.0 a

¹ Plant injury ratings on scale of 1 to 10. 1 = no injury, 10 = dead

² Fresh weights measured in grams.

³ DAT = Days after treatment

⁴ Means separated using Duncan's Multiple Range Test at p = 0.05

Experiment 2: Stage 1

At 7 DAT, bittercress treated with Gallery or Certainty (0.094 lb ai/A) had higher injury ratings than any other treatments (Table 17). Bittercress treated with Broadstar VC1604 and Casoron had injury ratings that were similar to non-treated plants. At 14 DAT, Gallery, V-10142, and Certainty provided the best control.

At 21 DAT, bittercress treated with Gallery and Certainty (0.094 lb ai/A) had higher injury ratings than any other treatment, and plants were almost completely dead. V-10142 (0.75 lb ai/A) (injury rating of 8.0) and Certainty (0.035 lb ai/A) also provided acceptable control (rating of 8.8). All other treatments were similar to the non-treated control with the exception of V-10142 (0.75 lb ai/A) which had an injury rating of 6.8.

Injury ratings at 28 DAT were similar to ratings taken at 21 DAT. While all herbicide treated pots had less fresh weights than the nontreated control, Gallery, V-10142, Certainty and Tower (1.5 lb ai/A) provided the best control.

Experiment 2: Stage 2

At 7 DAT, injury ratings were highest in treatments containing Certainty, however Tower (1.5 lb ai/A), V-10142, and Gallery were similar to Certainty at the lower rate (0.035 lb ai/A). Broadstar VC1604, Casoron, and HGH-63 (1.0 lb ai/A), provided the least control at 7 DAT and had similar injury to non-treated plants.

By 21 DAT, bittercress treated with Certainty, V-10142 and Gallery had higher injury ratings than bittercress treated with any other treatment. All other herbicide treatments were similar to the non-treated control plants.

At 28 DAT, Certainty (0.035 lb ai/A), V-10142 and Gallery treatments had the highest injury ratings, followed by Certainty (0.095 lb ai/A) which had slightly lower injury ratings. Broadstar VC1604, Casoron, HGH-63, and Tower (0.97 lb ai/A) provided no control and had similar injury ratings to non-treated plants, while Tower (1.5 lb ai/A) provided very little control with a rating of 2.1.

Fresh weights taken at 28 DAT show that Gallery, V-10142 and Certainty provided better control than all other treatments. All other treatments had similar fresh weights to non-treated plants with the exception of Tower at 1.5 lb ai/A (fresh weight of 4.7), and at 0.97 lb ai/A (fresh weight 7.8) which provided slightly more control than Broadstar VC1604, Casoron, or HGH-63.

Summary

In conclusion, data from Gilliam's 2009 studies indicate herbicides Gallery (1.0 lb ai/A), V-10142 (at 0.375 and 0.75 lb ai/A) and Certainty (at 0.035 and 0.094 lb ai/A) provide excellent bittercress control when applied postemergence to weeds in either the cotyledon to one leaf stage or the two to four leaf stage. Fresh weights from both experiments indicate that Broadstar VC1604, Casoron, HGH-63, and Tower herbicides provided some degree of control when compared to the untreated but control was minimal and would not successfully control bittercress. Bittercress treated with these less effective herbicides were slightly smaller than the control plants; however, plants were uninjured in most cases by 28 days after herbicide application and began to produce flowers and seeds which would lead to an escalating weed problem. While no herbicide will provide season-long bittercress control, Gallery, V-10142, and Certainty could provide effective postemergence bittercress control when applied in the early stages of growth.

Table 17. Efficacy of pre-emergent herbicides for emerged Bittercress (*Cardamine hirsuta*), Gilliam, 2009, Experiment 2.

Product – Rate (lb ai/A)	Efficacy Rating ¹				Fresh Weights ²
	7 DAT ³	14 DAT	21 DAT	28 DAT	
<i>Cotyledon to one leaf stage</i>					
Broadstar VC1604 – 0.19	1.0 g	1.0 c	1.0 d	1.0 d	11.7 b
Broadstar VC1604 – 0.375	1.0 g ⁴	2.5 bc	1.0 d	1.0 d	9.0 bc
Casoron – 1.0	2.0 gf	1.4 bc	1.0 d	1.0 d	10.3 b
Casoron – 2.0	1.5 g	2.0 bc	1.0 d	1.0 d	9.3 bc
Gallery – 1.0	7.8 ab	7.7 a	9.9 a	9.9 a	0.0 f
HGH-63 – 1.0	2.6 f	3.0 bc	1.0 d	1.0 d	6.7 cd
HGH-63 – 2.0	4.9 e	2.4 bc	1.6 d	1.5 d	4.5 de
Certainty – 0.035	6.9 bc	9.0 a	8.8 b	8.8 b	0.0 f
Certainty – 0.094	8.0 a	8.8 a	9.8 a	9.8 a	0.0 f
Tower – 0.97	4.6 e	2.5 bc	1.0 d	1.0 d	7.5 c
Tower – 1.5	5.4 de	4.1 b	1.4 d	1.4 d	2.5 ef
V-10142 – 0.75	5.5 de	6.6 a	6.8 c	6.8 c	0.6 f
V-10142 – 3.75	6.0 dc	7.0 a	8.0 b	8.0 b	0.0 f
Control	1.0 d	1.0 c	1.0 d	1.0 d	14.5 a
<i>Two to four leaf stage</i>					
Broadstar VC1604– 0.19	1.0 e	1.0 d	1.0 b	1.0 d	11.0 abc
Broadstar VC1604 – 0.375	1.0 e	1.4 d	1.0 b	1.0 d	9.4 bc
Casoron - 1.0	1.0 e	1.3 d	1.0 b	1.0 d	9.6 bc
Casoron - 2.0	1.0 e	1.1 d	1.0 b	1.0 d	13.0 a
Gallery – 1.0	4.9 bc	7.4 b	7.9 a	8.0 a	0.0 e
HGH-63 - 1.0	2.1 de	1.0 d	1.0 b	1.0 d	11.0 abc
HGH-63 - 2.0	3.4 cd	1.0 d	1.0 b	1.0 d	10.5 abc
Certainty - 0.035	6.4 ab	8.6 a	7.9 a	8.1 a	0.0 e
Certainty - 0.094	7.7 a	7.6 ab	7.0 a	6.7 b	0.0 e
Tower - 0.97	3.4 cd	1.4 d	1.0 b	1.0 d	7.8 c
Tower - 1.5	4.9 bc	3.0 c	2.0 b	2.1 c	4.7 d
V-10142 – 0.75	5.0 bc	7.7 ab	7.6 a	7.6 ab	0.1 e
V-10142 – 3.75	5.1 b	8.0 ab	8.1 a	8.4 a	0.0 e
Control	1.0 e	1.0 d	1.0 b	1.0 d	12.1 ab

¹ Plant injury ratings on scale of 1 to 10. 1 = no injury, 10 = dead

² Fresh weights measured in grams

³ DAT = Days after treatment

⁴ Means separated using Duncan's Multiple Range Test at p = 0.05

Bittercress – Senesac, 2009

During 2009, Senesac (NY) tested the impact of six herbicides for postemergent control of bittercress. This experiment was conducted in a greenhouse without temperature controls; weeds were misted hourly during daylight hours.

Stage 0: Certainty and V-10142 were the only treatments to provide acceptable control preemergently.

Stage 1: At the cotyledon to one leaf stage commercially acceptable levels of control (>70%) were achieved with applications of Broadstar VC1604 (high rate) and both rates of Certainty, HGH-63, and V-10142 by 4 WAT.

Stage 2: All treatments demonstrated some measure of bittercress control at the two to four leaf stage but not to an acceptable degree.

Bittercress – Senesac, 2011

In 2011, Senesac (NY) evaluated Gallery, indaziflam and Tower for postemergent control of bittercress. This experiment was conducted in a greenhouse without temperature controls; weeds were misted hourly during daylight hours.

Stage 0: Both rates of Gallery and indaziflam effectively controlled bittercress preemergently. Tower exhibited up to 50% efficacy.

Stage 1: At the cotyledon to one leaf stage commercially acceptable levels of control (>70%) were achieved with applications of Gallery and indaziflam but not Tower.

Stage 2: Interestingly, none of the treatments were effective in controlling bittercress at the two to four leaf stage.

Table 18. Efficacy of pre-emergent herbicides for emerged Bittercress (*Cardamine hirsuta*), Senesac, 2009.

Product	Rate (lb ai/A)	Percent Control		
		1 WAT	2 WAT	4 WAT
<i>Preemergent</i>				
Broadstar VC1604	0.19	1	3	0
Broadstar VC1604	0.375	6	3	0
Certainty	0.035	6	68	73
Certainty	0.094	10	70	78
Casoron 4G	1.0	4	10	0
Casoron 4G	2.0	8	10	10
Casoron 1.4CS	1.0	5	20	18
HGH-63	2.0	6	48	33
Tower	0.97	6	10	0
Tower	1.94	10	20	15
V-10142	0.38	3	63	63
V-10142	0.75	6	65	78
Untreated	~	0	0	0
<i>Cotyledon to one leaf stage</i>				
Broadstar VC1604	0.19	5	20	13
Broadstar VC1604	0.375	10	73	78
Certainty	0.035	1	65	88
Certainty	0.094	3	75	93
Casoron 4G	1.0	0	20	0
Casoron 4G	2.0	0	15	5
HGH-63	2.0	10	75	78
Tower	0.97	0	45	33
Tower	1.94	10	45	65
V-10142	0.38	1	58	90
V-10142	0.75	8	80	100
Untreated	~	0	0	0
<i>Two to four leaf stage</i>				
Broadstar VC1604	0.19	50	65	43
Broadstar VC1604	0.375	71	65	48
Certainty	0.035	30	35	53
Certainty	0.094	60	50	60
Casoron 4G	1.0	73	43	15
Casoron 4G	2.0	78	35	20
Casoron 1.4 CS	1.0	100	60	55
HGH-63	2.0	15	33	20
Tower	0.97	23	38	53
Tower	1.94	79	43	53
V-10142	0.38	28	45	55
V-10142	0.75	48	48	60
Untreated	~	0	0	0 i
<i>Fisher's LSD @ 0.05</i>		13	18	20

Table 19. Postemergent control of bittercress (*Cardamine hirsuta*) with selected pre-emergent herbicides, Senesac, 2011.

Treatment	Rate	1 WAT	2 WAT	4 WAT	8 WAT
<i>Preemergent</i>					
Gallery	0.5 lb ai/A	~	100	100	60
Gallery	1.0 lb ai/A	~	100	100	65
Indaziflam	50 g/ha	~	100	100	100
Indaziflam	100 g/ha	~	100	100	100
Tower	0.97 lb ai/A	~	10	50	20
Tower	1.94 lb ai/A	~	10	50	50
Untreated		~	0	0	0
<i>Newly Emerged</i>					
Gallery	0.5 lb ai/A	98	100	100	90
Gallery	1.0 lb ai/A	100	100	100	90
Indaziflam	50 g/ha	93	100	98	90
Indaziflam	100 g/ha	100	100	100	98
Tower	0.97 lb ai/A	48	65	83	73
Tower	1.94 lb ai/A	53	65	93	90
Untreated		0	0	0	0
<i>Cotyledon to one leaf</i>					
Gallery	0.5 lb ai/A	45	90	100	93
Gallery	1.0 lb ai/A	50	90	100	93
Indaziflam	50 g/ha	35	88	93	98
Indaziflam	100 g/ha	40	88	98	98
Tower	0.97 lb ai/A	0	10	10	8
Tower	1.94 lb ai/A	0	10	10	10
Untreated		0	0	0	0
<i>Two to four leaf stage</i>					
Gallery	0.5 lb ai/A	25	40	40	20
Gallery	1.0 lb ai/A	30	43	50	30
Indaziflam	50 g/ha	20	20	15	8
Indaziflam	100 g/ha	25	28	25	8
Tower	0.97 lb ai/A	0	0	0	0
Tower	1.94 lb ai/A	0	0	3	0
Untreated		0	0	0	0
<i>Fisher's LSD @ 0.05</i>		21	8	10	13

Eclipta

Senesac, 2010

Senesac (NY) tested five products in a single experiment on four growth stages including a 4+ leaf stage. All treatments were tested in field grown containers.

Stage 0: All treatments provided preemergent control except for Basagran. (Table 20)

Stage 1: Eclipta at the cotyledon to one leaf stage was effectively controlled by all treatments at 4WAT except for Casoron (both rates).

Stage 2: Acceptable control was observed at the 1WAT evaluation for all treatments but control was lost by 4WAT for Casoron at 3.0 lb ai/A and for Basagran.

Stage 3: By 4 WAT Casoron (4.0 lb ai/A) provided excellent control at the 4+ leaf stage while SureGuard provided 100% control at 1, 2, and 4 WAT. The highest injury rating for Certainty at 0.094 was at 70% at 4 WAT.

Summary: SureGuard at 0.383 lb ai/A and Casoron at 4.0 lb ai/A delivered reliable control at all stages including the 4+ leaf stage while Certainty, Tower and Basagran may be considered for controlling smaller stages of emerged Eclipta sp.

Table 20. Efficacy of pre-emergent herbicides for emerged Eclipta, Senesac, 2010.

Product	Rate (lb ai/A)	Percent Control		
		1 WAT	2 WAT	4 WAT
<i>Preemergent</i>				
Certainty 75WDG + NIS ¹	0.035	-	90	83
Certainty 75 WDG + NIS	0.094	-	90	93
Casoron 4G	3.0	-	90	100
Casoron 4G	4.0	-	97	90
SureGuard 51 WDG + NIS	0.383	-	100	100
Tower 6EC	0.97	-	93	90
Tower 6EC	1.94	-	77	100
Basagran 4L + COC	1.0	-	23	0
Untreated	~	-	0	0
<i>Cotyledon to one leaf stage</i>				
Certainty 75WDG + NIS	0.035	70	93	90
Certainty 75 WDG + NIS	0.094	70	93	93
Casoron 4G	3.0	43	37	37
Casoron 4G	4.0	57	63	63
SureGuard 51 WDG + NIS	0.383	100	100	100
Tower 6EC	0.97	70	93	100
Tower 6EC	1.94	100	93	93
Basagran 4L + COC	1.0	100	100	80
Untreated	~	0	0	0
<i>Two to four leaf stage</i>				
Certainty 75WDG + NIS	0.035	70	83	90
Certainty 75 WDG + NIS	0.094	70	83	93
Casoron 4G	3.0	63	60	40
Casoron 4G	4.0	77	90	83
SureGuard 51 WDG + NIS	0.383	100	100	100
Tower 6EC	0.97	50	83	93
Tower 6EC	1.94	70	97	73
Basagran 4L + COC	1.0	93	93	0
Untreated	~	0	0	0
<i>Four + leaf stage</i>				
Certainty 75WDG + NIS	0.035	30	30	27
Certainty 75 WDG + NIS	0.094	37	37	70
Casoron 4G	3.0	10	7	0
Casoron 4G	4.0	33	43	100
SureGuard 51 WDG + NIS	0.383	100	100	100
Tower 6EC	0.97	40	40	17
Tower 6EC	1.94	33	43	30
Basagran 4L + COC	1.0	77	77	27
Untreated	~	0	0	0
<i>Fisher's LSD @ 0.05 20 28 27</i>				

¹Non-ionic surfactant

Oxalis

Several experiments were conducted during 2008-2011 looking primarily at postemergent applications of Broadstar VC1604, Certainty, EXC3898, Gallery, indaziflam and Tower on oxalis. A limited number of experiments included Basagran, Broadstar 0.25G, Casoron 4G and 1.4CS, HGH-63, and SureGuard. . For this summary, commercial or acceptable weed control is defined as >70% efficacy as to be expected. Products varied in efficacy depending on the stage treated (See Table 21). The summary table below lists the number of trials where commercial control was observed in at least one evaluation compared to the total number of trials

Overall, Certainty at 0.035 and 0.094 lb ai/A, indaziflam (50 and 100g/ha), SureGuard (0.562 lb ai/A) and V-10142 at 0.75 lb ai/A were the only treatments that demonstrated effective weed control in multiple tests on oxalis at all evaluation periods (Table 21.) Tower at 1.94 lb ai/A also demonstrated efficacy at all stages, however, this is above the labeled rate. Tower at 0.97 lb ai/A effectively controlled the cotyledon to 1 leaf stage of oxalis as did Gallery (1 and 2 lb ai/A), HGH-63 (2 lb ai/A).

Stage 0: All products except HGH-63 provided acceptable control of oxalis at germination. In one study (Table 24) both rates of V-10142 and the high rate of Broadstar VC1604 showed long term control through 91 DAT.

Stage 1: At the cotyledon to one leaf stage Certainty, Gallery, indaziflam, SureGuard, and V-10142 demonstrated very good to excellent control of oxalis. In more than half of the trials involving Tower the 0.97, 1.5 and 1.94 lb ai/A rates were also effective at this stage of growth. Casoron 4G (4 lb ai/A) and HGH-63 were efficacious in limited trials.

Stage 2: Certainty and indaziflam delivered excellent control of oxalis at this stage in three out of three experiments. Tower at 1.94 lb ai/A provided control in three of four trials while V-10142 (0.75 lb ai/A) controlled oxalis at the 2-4 leaf stage in four of seven experiments. Broadstar VC1604 at 0.375 was efficacious in three out of six trials. In limited tests, Broadstar 0.25G (0.375 lb ai/A), Casoron 4G, Casoron 1.4 CS, and SureGuard exhibited greater than 70% control at this growth stage.

Table 21 General Summary of Early Post Emergence Efficacy for Oxalis

Product (active)	Rate (lb ai/A)	Number of Experiments with Acceptable Control (>70%)		
		Stage 0: Preemergence	Stage 1: Cotyledon to 1 Leaf	Stage 2: 2 to 4 Leaves
Basagran + COC	1.0	0 of 1	1 of 2	1 of 2
Broadstar 0.25G (flumioxazin)	0.19	1 of 1	0 of 1	0 of 1
	0.375	1 of 1	0 of 1	1 of 1
Broadstar VC1604 0.25G (flumioxazin)	0.19	4 of 6 ¹	0 of 6	2 of 5
	0.375	4 of 6	1 of 6	2 of 6
	0.75	1 of 1	0 of 1	1 of 1
Casoron 4 G (dichlobenil)	1.0	0 of 1	0 of 1	1 of 1
	2.0	0 of 1	0 of 1	1 of 1
	3.0	2 of 2	1 of 2	1 of 2
	4.0	2 of 2	2 of 2	1 of 2
Casoron 1.4 CS (dichlobenil)	1.0	0 of 1	----	1 of 1
Certainty (sulfosulfuron)	0.035	3 of 3	3 of 3	3 of 3
	0.094	3 of 3	3 of 3	3 of 3
EXC3898 (mesotrione + prodiamine + s-metolachlor)	2.1	5 of 6	2 of 6	1 of 6
	3.15	5 of 6	3 of 6	1 of 6
Gallery (isoxaben)	0.5	4 of 4	2 of 3	0 of 3
	1.0	2 of 4	3 of 3	1 of 3
HGH-63 2G (oxyfluorfen)	2.0	0 of 1	1 of 1	0 of 1
indaziflam	50 g/ha	3 of 3	3 of 3	3 of 3
	100 g/ha	3 of 3	3 of 3	3 of 3
SureGuard (flumioxazin)	0.562	2 of 2	2 of 2	2 of 2
Tower EC (dimethenamid-p)	0.97	4 of 6	4 of 6	3 of 6
	1.5	0 of 2	1 of 2	0 of 2
	1.94	3 of 4	3 of 4	3 of 4
V-10142 (imzasulfuron)	0.38	6 of 7	5 of 7	2 of 7
	0.75	6 of 7	7 of 7	4 of 7

¹ Highlighted numbers indicate efficacious treatments in the majority (≥ 66%) of the trials where at least two trials were conducted.

Oxalis – Boydston, 2008

In 2008, Boydston (WA) conducted an experiment to examine EXC3898 and V-10142 for postemergent control of oxalis grown in field containers under shade with drip irrigation. Phytotoxicity ratings were collected and number of weeds was counted. Although in several cases weed counts for treated pots did not differ from the untreated, seedlings were significantly injured by the treatments as indicated by the efficacy ratings.

EXC3898 2.1G applied preemergently at 2.1 and 3.15 lb ai/A controlled oxalis 90 and 94% 4 WAT, respectively. EXC3898 2.1G applied to oxalis between the cotyledon to 1-leaf stage at 2.1 and 3.15 lb ai/A controlled oxalis 27 and 80% 4 WAT, respectively. EXC3898 2.1 G applied to oxalis between the 2 to 4 leaf stage at 2.1 and 3.15 lb ai/A controlled oxalis 30 and 92% 4-WAT, respectively.

V-10142 0.5G applied at Stage 0 at 2.1 and 3.15 lb ai/A controlled oxalis 93 and 95% 4 WAT, respectively. V-10142 0.5G applied to oxalis between the cotyledon to 1-leaf stage at 2.1 and 3.15 lb ai/A controlled oxalis 92 and 97% 4 WAT, respectively. V-10142 0.5G applied to oxalis between the 2 to 4 leaf stage at 2.1 and 3.15 lb ai/A controlled oxalis 62 and 70% 4 WAT, respectively.

Table 22. Efficacy of pre-emergent herbicides for Oxalis, Stage 0, Boydston, 2008.

Product	Efficacy Rating		Number of Weeds per pot	
	2 WAT	4 WAT	2 WAT	4 WAT
<i>Preemergent</i>				
EXC3898 – 2.1	68.33 a	90.00 a	71.00 a	24.00 b
EXC3898 – 3.15	80.00 a	94.00 a	103.67 a	12.00 b
Untreated Check	0.00 b	0.00 b	98.00 a	98.00 a
LSD (P=.05)	47.784	13.756	107.082	65.004
<i>Postemergent</i>				
V-10142 – 0.375	91.67 a	93.33 a	37.33 a	49.33 a
V-10142 – 0.75	86.67 a	95.00 a	46.67 a	46.00 a
Untreated Control	0.00 b	0.00 b	60.00 a	61.33 a
LSD (P=.05)	9.995	4.596	44.714	32.5411

Table 23. Efficacy of pre-emergent herbicides for emerged Oxalis, Stages 1 and 2, Boydston, 2008.

Product - Rate (lb ai/A)	Efficacy Rating ¹		Number of Weeds per pot ²		
	2 WAT ³	4 WAT	0 WAT	2 WAT	4 WAT
<i>Cotyledon to one leaf stage</i>					
EXC3898 - 2.1	48.33 b	26.67 b	98.00 a	105.33 a	83.67 a
EXC3898 - 3.15	76.67 a	80.00 a	68.67 a	52.33 a	27.33 a
Untreated Check	0.00 c	0.00 c	98.00 a	98.00 a	98.00 a
<i>LSD (P=,05)</i>	26.172	16.466	143.456	79.534	73.329
<i>Two to Four leaf stage</i>					
V-10142 - 0.375	75.00 a	91.67 b	39.0 a		33.33 a
V-10142 - 0.75	78.33 a	97.00 a	62.00 a		46.33 a
Untreated Control	0.00 b	0.00 c	60.00 a		61.33 a
<i>LSD (P=,05)</i>	9.995	5.289	26.368		31.434
<i>Two to Four leaf stage</i>					
EXC3898 - 2.1	33.33 b	30.00 b	143.33 a	113.33 a	50.67 ab
EXC3898 - 3.15	90.00 a	91.67 a	101.67 a	80.33 a	10.00 b
Untreated Check	0.00 c	0.00 c	98.00 a	98.00 a	103.33 a
<i>LSD (P=,05)</i>	14.385	17.719	108.828	103.91	10.00 b
V-10142 - 0.375	43.33 a	61.67 a	124.0 ab		27.33 b
V-10142 - 0.75	58.33 a	70.00 a	165.67 a		15.33 b
Untreated Control	0.00 b	0.00 b	61.33 b		52.00 a
<i>LSD (P=,05)</i>	32.276	40.511	66.714		21.114

Oxalis – Gilliam 2008

Gilliam (AL), in 2008, examined Broadstar VC1604 0.25G, EXC3898 and V-10142 for efficacy against oxalis grown in field containers in the shade with overhead irrigation.

Stage 0: Efficacy was not rated at 1 WAT. All treatment groups had some weeds present at 18 DAT and were rated with a + (oxalis present) or – (no oxalis present) only. Data not shown. At 18 and 25 DAT, weed numbers were significantly lower in pots treated with any herbicide relative to those of the non-treated control group. Fresh weights at 91 DAT for Broadstar VC1604 (0.375 lb ai/A), and both rates of V-10142 were significantly different from the control (Table 24.)

Stage 1: Efficacy was most notable in pots treated with EXC3898 G at 2.1 lb ai/A or either rate of V-10142. V-10142 treatments at 0.375 and 0.75 lb ai/A received greater than 70% plant injury ratings at 51 and 85 DAT despite fresh weights remaining high in some cases (Table 25.) Fresh weed weight, at 61 DAT, among containers receiving either rate of EXC3898 or V-10142 was substantially less than that of the non-treated control group. However, by 85 DAT, pots receiving EXC3898 G at 3.15 lb ai/A or Broadstar VC1604 at either rate had greater fresh weed weights than did the non-treated control containers.

Stage 2: Plant injury at 21 DAT was significant among oxalis treated with V-10142 at 0.75 lb ai/A or either rate of EXC3898 G. By 85 DAT pots treated with EXC3898 G at 0.75 lb ai/A were significantly different but not at a commercial level. The high rate of V-10142 achieved 88% control at this stage. Injury to oxalis treated with either rate of Broadstar VC1604 was not noteworthy at any evaluation period during the trial. (Table 25). Fresh weed weights, at 61 DAT, were notable only among those containers receiving V-10142 at either rate. At 85 DAT, fresh weed weight among pots receiving V-10142 remained

outstanding (0.6g). Substantial differences in weed weight were also noted among containers treated with V-10142 at 0.375 lb ai/A or either rate of Broadstar VC1604.

Table 24. Efficacy of pre-emergent herbicides on Oxalis, Stage 0, Gilliam, 2008.

Product - Rate (lb ai/A)	Weed Numbers ⁵		Fresh Weights ²	
	18 DAT ³	25 DAT	57 DAT	91 DAT
<i>Preemergent Timing</i>				
Broadstar VC1604 – 0.19	1.3c ⁴	1.8cd	2.4b	5.7a
Broadstar VC1604 – 0.375	0.3c	0.2d	0.0c	0.8bc
EXC3898 – 1.57	3.4b	2.7bc	2.3b	3.9ab
EXC3898 – 3.15	1.6bc	3.7bc	1.1bc	4.1ab
V-10142 – 0.375	1.7bc	4.5b	0.1c	1.8bc
V-10142 – 0.75	0.4c	2.6bc	0.0c	0.0c
Untreated Control	8.3a	10.1a	4.4a	6.7a

Table 25. Efficacy of pre-emergent herbicides on emerged Oxalis, Stages 1 and 2, Gilliam, 2008.

Product – Rate (lb ai/A)	Plant Injury ¹				Fresh Weight	
	21 DAT ³	28 DAT	51 DAT	85 DAT	61 DAT	85 DAT
<i>Cotyledon to one leaf stage</i>						
Broadstar VC1604 - 0.19	1.0d ⁴	1.0e	1.4c	1.5c	6.1ab	9.9ab
Broadstar VC1604 - 0.375	1.0d	1.5e	1.0c	1.0c	7.3a	12.0ab
EXC3898 - 1.57	6.3a	8.1a	7.8a	6.6b	3.7cd	5.7ab
EXC3898 - 3.15	3.4b	3.4d	3.1b	1.0c	4.9bc	21.1a
V-10142 - 0.375	1.8c	6.2c	7.4a	8.3a	2.3d	8.5ab
V-10142 - 0.75	2.1c	7.2b	8.2a	8.9a	0.1e	0.8b
Untreated Control	1.0d	1.0e	1.0c	1.0c	7.8a	9.3ab
<i>Two to four leaf stage</i>						
Broadstar VC1604 - 0.19	1.0d	1.3c	1.0b	1.0d	6.3a	7.2b
Broadstar VC1604 - 0.375	1.0d	2.2c	2.6b	2.0d	6.7a	5.20b
EXC3898 - 1.57	3.1b	3.6b	2.1b	1.3d	7.0a	12.7a
EXC3898 - 3.15	4.2a	5.6a	5.4a	4.6c	7.0a	10.6a
V-10142 - 0.375	1.0d	4.7ab	6.4a	6.9b	1.8b	5.5b
V-10142 - 0.75	1.7c	5.1a	6.6a	8.8a	0.0b	0.6c
Untreated Control	1.0d	1.0c	1.0b	1.0d	6.7a	11.5a

¹Plant injury ratings on scale of 1 to 10. 1 = no injury, 10 = dead

²Fresh weights measured in grams.

³DAT = Days after treatment

⁴Means separated using Duncan's Multiple Range Test at $p = 0.05$. Means with the same letter are not significantly different ($P < 0.05$).

⁵Mean weed numbers per treatment group

Oxalis – Neal, 2008

In 2008, Neal (NC) tested whether two different formulations of Broadstar (VC1604 and 0.25 G), EXC3898, and V-10142 0.5G provided effective control of *Oxalis stricta* grown in field containers with overhead irrigation.

Stage 0: All treatments provided effective control of oxalis when applied at preemergence (Table 26).

Stage 1: Oxalis was not well controlled at the cotyledon to one leaf stage by any treatments except for the high rate at V-10142 0.5 G which received a 73% efficacy rating at 12 WAT (Table 27).

Stage 2: Only the high rate of Broadstar 0.25G provided commercial control of oxalis at this growth stage 6 WAT (Table 28)

Summary: The original formulation of Broadstar 0.25G tended to provide better efficacy for oxalis at each stage than the newer Broadstar VC1604 formulation. Broadstar 0.25G at 0.375 lb ai per acre exhibited the highest level of control at Stage 2. While EXC3898 and V-10142 showed some promise for Stage 1 control of oxalis, neither product will be registered.

Table 26. Efficacy of pre-emergent herbicides for Yellow Woodsorrel (*Oxalis stricta*), Stage 0, Neal, 2008.

Product – Rate (lb ai/A)	Efficacy Rating for Preemergence¹			
	8 WAT²	12WAT	14 WAT	18 WAT
Broadstar 0.25G - 0.19	9.8 a	10.0 a	9.9 a	10.0 a
Broadstar 0.25G - 0.375	10.0 a	10.0 a	10.0 a	10.0 a
Broadstar VC1604 0.25G - 0.19	8.8 a	8.2 b	8.2 b	7.8 b
Broadstar VC1604 0.25G - 0.375	9.2 a	9.4 a	9.2 a	9.4 a
EXC3898 - 2.1	9.6 a	9.8 a	9.4 a	9.8 a
EXC3898 - 3.15	10.0 a	10.0 a	10.0 a	10.0 a
V-10142 0.5G - 0.375	9.9 a	10.0 a	9.9 a	10.0 a
V-10142 0.5G - 0.75	9.8 a	10.0 a	10.0 a	10.0 a
Untreated Control	0.0 b	0.0 c	0.0 c	0.0 c

¹ Efficacy was rated on a scale of 0 to 10 with 0 being no control and 10 being 100 percent.

² Weeks after Treatment

Table 27. Efficacy of pre-emergent herbicides for emerged Yellow Woodsorrel (*Oxalis stricta*), Stage 1, Neal, 2008.

Product – Rate (lb ai/A)	Efficacy Rating for Cotyledon to 1 Leaf¹			
	2 WAT	6 WAT	8 WAT	12 WAT
Broadstar 0.25G - 0.19 lb ai/A	0.0 b	2.0 bc	0.8 c	0.5 c
Broadstar 0.25G - 0.375 lb ai/A	1.7 ab	3.5 abc	2.1 bc	3.0 bc
Broadstar VC1604 0.25G - 0.19 lb ai/A	0.1 b	0.0 c	0.0 c	0.0 c
Broadstar VC1604 0.25G - 0.375 lb ai/A	0.0 b	1.5 c	0.8 c	1.7 bc
EXC3898 - 2.1 lb ai/A	1.4 ab	0.8 c	0.1 c	2.5 bc
EXC3898 - 3.15 lb ai/A	3.4 a	6.1 a	5.1 a	6.8 a
V-10142 0.5G - 0.375 lb ai/A	1.7 ab	4.1 abc	3.8 ab	4.3 ab
V-10142 0.5G - 0.75 lb ai/A	2.2 ab	5.6 ab	4.9 a	7.3 a
Untreated Control	0.0 b	0.0 c	0.0 c	0.0 c

¹ Efficacy was rated on a scale of 0 to 10 with 0 being no control and 10 being 100 percent.

Table 28. Efficacy of pre-emergent herbicides for emerged Yellow Woodsorrel (*Oxalis stricta*), Stage 2, Neal, 2008.

Product – Rate (lb ai/A)	Efficacy Rating ¹ for 2 to 4 leaf stage	
	10 DAT	6 WAT
Broadstar 0.25G - 0.19 lb ai/A	0.1 b	1.4 cd
Broadstar 0.25G - 0.375 lb ai/A	2.4 a	7.4 a
Broadstar VC1604 0.25G - 0.19 lb ai/A	--- ²	---
Broadstar VC1604 0.25G - 0.375 lb ai/A	0.0 b	0.0 d
EXC3898 - 2.1 lb ai/A	0.2 b	2.6 cd
EXC3898 - 3.15 lb ai/A	0.4 b	4.4 bc
V-10142 0.5G - 0.375 lb ai/A	0.1 b	3.9 bc
V-10142 0.5G - 0.75 lb ai/A	1.0 b	6.2 ab
Untreated Control	0.0 b	0.0 d

¹ Efficacy was rated on a scale of 0 to 10 with 0 being no control and 10 being 100 percent.

² Inadequate numbers of plants were available therefore the low rate of VC1604 was omitted.

Oxalis – Regan, 2008

In an experiment conducted within a greenhouse having a retractable roof, Regan (OR) examined the impact of preemergent herbicides for the postemergent control of *Oxalis corniculata*. Weeds were watered via overhead irrigation.

Stage 0: Broadstar VC1604, EXC3898 and V-10142 G treatments were very effective in preventing germination of oxalis.

Stage 1: Treatments containing both rates of EXC3898 and V-10142 G gave very good to excellent results in controlling weeds at the 1-2 leaf stage in the 3 WAT evaluation while the high rate of Broadstar VC1604 was slightly less injurious but commercially acceptable.

Stage 2: At the 2-4 leaf stage, oxalis control by both EXC3898 and V-10142 G was only slightly less compared to the 1-2 leaf stage ratings.. Broadstar VC1604 was not effective in controlling oxalis at both rates.

Summary: Overall, EXC3898 and V-10142 G were shown to be effective tools for early post-emergent control of oxalis (*Oxalis corniculata*). These two herbicides were generally effective at all three stages of early weed growth (germination, 1-2 leaf stage, 2-4 leaf stage). Broadstar VC1604 was the least effective treatment.

Table 29. Efficacy of pre-emergent herbicides for Oxalis (*Oxalis corniculata*), Regan 2008.

Product - Rate (lb ai/A)	Percent Germination
	4 WAT ¹
Broadstar VC1604 0.25G – 0.19	0.0 a ²
Broadstar VC1604 0.25G – 0.375	0.0 a
EXC3898 – 2.1	0.0 a
EXC3898 – 3.15	0.0 a
V-10142 – 0.375	0.0 a
V-10142 – 0.75	0.0 a
Untreated Control	33.0 b

¹Weeks After Treatment

² Column mean numbers followed by the same letter are not significantly different (Alpha=0.05) as determined by Fishers LSD multiple-comparison test (NCSS, 2004)

Table 30. Efficacy of pre-emergent herbicides for emerged Oxalis (*Oxalis corniculata*), Regan 2008.

Product - Rate (lb ai/A)	Efficacy Rating ³		
	1 WAT	2 WAT	3 WAT
<i>One to two leaf stage</i>			
Broadstar VC1604 0.25G – 0.19	0.0	0.0	5.9 b
Broadstar VC1604 0.25G – 0.375	0.0	0.0	7.8 c
EXC3898 – 2.1	0.0	0.0	9.1 cd
EXC3898 – 3.15	0.0	0.0	9.9 d
V-10142 – 0.375	0.0	0.0	10.0 d
V-10142 – 0.75	0.0	1.0	10.0 d
Untreated Control	0.0	0.0	0.8 a
<i>Two to four leaf stage</i>			
Broadstar VC1604 0.25G – 0.19	0.0 a	1.8 b	1.8 b
Broadstar VC1604 0.25G – 0.375	0.0 a	1.4 b	1.4 b
EXC3898 – 2.1	0.0 a	6.7 c	6.7 c
EXC3898 – 3.15	1.3 b	7.9 d	8.0 d
V-10142 – 0.375	0.0 a	9.0 e	9.0 e
V-10142 – 0.75	1.5 b	8.0 d	9.0 e
Untreated Control	0.0 a	0.0 a	0.0 a

¹Weeks After Treatment

²Column mean numbers followed by the same letter are not significantly different (Alpha=0.05) as determined by Fishers LSD multiple-comparison test (NCSS, 2004)

³Efficacy Rating: 0-10 (0= no damage; 10= dead)

Oxalis – Senesac, 2008

During 2008, Senesac (NY) tested whether Broadstar VC1604 0.25G, EXC3898, and V-10142 could provide postemergent control of oxalis. Weeds were grown in the greenhouse with hourly mist during daylight hours.

Stage 0: V-10142 at 1.50 lb ai/A provided effective control up to 5 WAT when applied prior to weed emergence. The high rate of Broadstar VC1604 (0.75 lb ai/A) achieved 70% control 2 WAT but efficacy decreased over time. EXC3898 treated pots showed some reduction in germination at 4.20 lb ai/A but not at a commercial level. (Table 31 Table 32 Table 33)

Stage 1: Both V-10142 (at 0.75 and 1.50 lb ai/A) and EXC3898 (4.20 lb ai/A) demonstrated commercially acceptable levels of oxalis control at the cotyledon to one leaf stage. Broadstar VC1604 (0.375 to 0.75) had some reduction of oxalis at this stage.

Stage 2: Broadstar VC1604 demonstrated the greatest weed control at the two to four leaf stage with all three rates (0.190, 0.375 and 0.75 lb ai/A) providing 70% control 2 WAT. The high rates of V-10142 and EXC3898 provided 50% control or less 2 WAT.

Table 31. Efficacy of Broadstar VC1604 0.25G (flumioxazin) for emerged Oxalis, Senesac, 2008.

Product – Rate(lb ai/A)	Efficacy Rating ¹			
	1 WAT	2 WAT	3 WAT	5 WAT
<i>Preemergent</i>				
Broadstar VC1604 0.25G - 0.190	47	43	17	5
Broadstar VC1604 0.25G - 0.375	50	53	27	12
Broadstar VC1604 0.25G - 0.75	63	70	60	17
Untreated	0	0	0	0
<i>Cotyledon to one leaf stage</i>				
Broadstar VC1604 0.25G - 0.190	17	7	0	0
Broadstar VC1604 0.25G 4 - 0.375	23	23	20	23
Broadstar VC1604 0.25G - 0.75	33	43	50	30
Untreated	0	0	0	0
<i>Two to four leaf stage</i>				
Broadstar VC1604 0.25G - 0.190	60	70	53	
Broadstar VC1604 0.25G - 0.375	57	70	63	
Broadstar VC1604 0.25G - 0.75	80	70	80	
Untreated	0	0	0	
<i>Fisher's LSD@ 0.05</i>	14	14	19	12

¹ Efficacy Rating: 0-100 (0= no damage; 100= dead)

Table 32. Efficacy of V-10142 (imzasulfuron) for emerged Oxalis, Senesac, 2008.

Product – Rate (lb ai/A)	Efficacy Rating ¹			
	1 WAT	2 WAT	3 WAT	5 WAT
<i>Preemergent</i>				
V-10142 – 0.375	67	73	63	63
V-10142 – 0.75	77	82	73	63
V-10142 – 1.50	93	90	90	87
Untreated	0	0	0	0
<i>Cotyledon to one leaf stage</i>				
V-10142 – 0.375	30	40	47	47
V-10142 – 0.75	47	67	73	73
V-10142 – 1.50	57	77	80	90
Untreated	0	0	0	---
<i>Two to four leaf stage</i>				
V-10142 – 0.375	17	30	40	
V-10142 – 0.75	27	40	43	
V-10142 – 1.50	40	50	53	
Untreated	0	0	0	
<i>Fisher's LSD@ 0.05</i>	12	10	15	12

¹ Efficacy Rating: 0-100 (0= no damage; 100= dead)

Table 33. Efficacy of EXC3898 for emerged Oxalis, Senesac, 2008.

Product - Rate (lb ai/A)	Efficacy Rating ¹			
	1 WAT	2 WAT	3 WAT	5 WAT
<i>Preemergent</i>				
EXC3898 – 2.10	20	37	10	2
EXC3898 – 3.15	33	33	20	17
EXC3898 – 4.20	40	67	57	40
Untreated	0	0	0	0
<i>Cotyledon to one leaf stage</i>				
EXC3898 – 2.10	13	20	33	30
EXC3898 – 3.15	23	40	43	37
EXC3898 – 4.20	43	73	77	67
Untreated	0	0	0	0
<i>Two to four leaf stage</i>				
EXC3898 – 2.10	20	33	33	
EXC3898 – 3.15	17	40	43	
EXC3898 – 4.20	30	40	47	
Untreated	0	0	0	
<i>Fisher's LSD@ 0.05</i>	24	22	25	35

¹ Efficacy Rating: 0-100 (0= no damage; 100= dead)

Oxalis – Wilen, 2008

Wilen (CA), in 2008, examined whether oxalis grown in field containers with overhead irrigation could be managed with postemergence applications of Broadstar VC1604 0.25G, EXC3898, and V-10142.

Stage 0: All herbicides provided good preemergent oxalis control until 23 WAT. EXC3898 at 2.10 lb ai/A which was significantly less effective but commercial control was observed (Table 34.).

Stage 1: Evaluations of percent cover and percent control were estimated 9 days after treatment, and 2, 4, and 7 WAT (Table 35.) All of the herbicides reduced percent cover when compared to the control until 7 WAT. Broadstar VC1604 at 0.19 lb ai per acre was not significantly different from the untreated control at 7 WAT. EXC3898 at 2.1 lb ai per acre and V-10142 at 0.75 lb ai per acre provided about 80% control of oxalis by 7 WAT but not at the earlier dates. However, there were no statistical differences among Broadstar VC1604 at 0.375 lb ai per acre, EXC3898 at 3.15 lb ai per acre and V-10142 at both rates at 7 WAT.

Stage 2: None of the herbicides were effective at reducing cover or controlling oxalis during this stage. Overall, the herbicides tested are acceptable for preemergence control of oxalis. EXC3898 and V-10142 may have some utility for very early postemergence activity but it is unlikely that these materials will provide postemergence relief to growers at stages greater than 1-2 true leaves.

Table 34. Efficacy of pre-emergent herbicides for Oxalis, Wilen, 2008.

Product - Rate (lb ai/A)	Percent Cover ¹					Percent ² Control	
	3 WAT	4 WAT	9 WAT	12 WAT	23 WAT	12 WAT	23 WAT
	<i>Preemergent Timing</i>						
Broadstar VC1604 – 0.19	0.00 a	0.00 a	0.33 a	0.17 a	2.17 a	40.69 bc	94.00 c
Broadstar VC1604 0.375	0.00 a	0.00 a	0.17 a	0.50 a	2.75 a	35.03 bc	89.92 c
EXC3898 – 2.1	0.00 a	0.08 a	5.75 a	5.50 a	12.08 b	70.42 cd	70.67 b
EXC3898 – 3.15	0.00 a	0.00 a	0.08 a	0.67 a	0.75 a	70.83 d	91.00 c
V-10142 – 0.375	0.17 a	0.00 a	0.00 a	0.08 a	0.67 a	68.57 bcd	98.00 c
V-10142 – 0.75	0.17 a	0.00 a	0.00 a	0.08 a	0.25 a	68.57 bcd	99.17 c
Untreated Control	1.25 b	1.67 b	15.38 b	20.63 b	35.00 c	0.00 a	0.00 a
Level of significance	***	***	***	***	***	***	***

¹Percent weed cover was estimated for all containers.

²Percent control was rated as compared to the untreated containers in the same replication.

Mean Separation done by LSD at P=0.05

*** P<0.001

Table 35. Efficacy of pre-emergent herbicides for emerged Oxalis (Stage 1), Wilen, 2008.

Product - Rate (lb ai/A)	Percent ¹ Cover				Percent ² Control			
	9 DAT ³	2 WAT	4 WAT	7 WAT	9 DAT	2 WAT	4 WAT	7 WAT
	<i>Cotyledon to one leaf stage</i>							
Broadstar VC1604 – 0.19	9.0 b	14.5 b	20.00 b	14.42 cd	1.67 ab	32.78 ab	39.44 ab	42.22 ab
Broadstar VC1604 – 0.375	4.42 a	5.17 a	10.50 ab	5.00 ab	27.50 bc	48.89 bc	49.44 b	65.73 bc
EXC3898 – 2.10	6.92 ab	7.92 ab	13.67 ab	10.17 bc	44.58 cd	45.56 bc	40.0 b	43.33 ab
EXC3898 – 3.15	5.33 ab	2.83 a	3.83 a	2.58 a	62.24 d	76.11 c	78.89 c	83.33 c
V-10142 – 0.375	8.25 ab	6.92 a	8.75 ab	4.08 ab	4.17 ab	33.89 ab	63.33 bc	77.78 c
V-10142 – 0.75	4.92 a	5.75 a	5.42 a	2.83 a	39.42 cd	37.22 ab	60.55 bc	80.56 c
Untreated	16.25 c	27.00 c	43.75 c	23.25 d	0.00 ab	0.00 a	0.00 a	0.00 a
Level of Significance	**	***	***	***	***	*	**	**

¹Percent weed cover was estimated for all containers.

²Percent control was rated as compared to the untreated containers in the same replication. Mean Separation done by LSD at P=0.05 * P<0.05, ** P<0.01, *** P<0.001

Table 36. Efficacy of pre-emergent herbicides for emerged Oxalis (Stage 2), Wilen, 2008.

Product - Rate (lb ai/A)	Percent ¹ Cover	Percent ² Control		Percent Cover	Percent Control
	1 WAT	1 WAT		17 DAT	17 DAT
<i>Two to Four Leaves</i>					
Broadstar VC1604 – 0.19	24.58 a	5.83 a		24.58 a	12.92 ab
Broadstar VC1604 – 0.375	24.58 a	12.50 b		22.08 a	21.25 b
EXC3898 – 2.10	46.25 b	7.08 a		43.33 b	31.67 c
EXC3898 – 3.15	27.50 a	13.34 b		25.83 a	13.75 ab
V-10142 – 0.375	22.08 a	7.08 a		24.17 a	10.42 a
V-10142 – 0.75	25.00 a	5.00 a		27.08 a	4.17 a
Untreated Control	23.31 a	0.00 a		24.19 a	0.00 a
Level of Significance	***	**		***	***

¹Percent weed cover was estimated for all containers.

²Percent control was rated as compared to the untreated containers in the same replication.

Mean Separation done by LSD at P=0.05, * P<0.01, *** P<0.001

Oxalis – Senesac, 2009

In an experiment conducted within a greenhouse with hourly mist, Senesac (NY) tested seven products for postemergent efficacy for oxalis.

Stage 0: Certainty (0.035 and 0.094 lb ai/A) and V-10142 gave 70% and 63 % control, respectively, at 4 WAT when applied prior to emergence. Other treatments delivered poor to moderate control at this stage.

Stage 1: At the second stage treatments of Certainty at either rate, HGH-63 (2.0 lb ai/A) and V-10142 had ratings of 70% or greater 4 WAT.

Stage 2: All treatments demonstrated significant initial injury with ratings of 75% or greater 1 WAT with the exception of HGH-63 (35%). At 2 WAT both rates of Certainty and V-10142, as well as Broadstar VC1604 at 0.375 and Casoron 1.4 CS at 1.0 lb ai/a provided commercially acceptable control of oxalis at this stage. However, Certainty (0.094 lb ai/A), Casoron 1.4 CS, and both rates of V-10142 were the only treatments which continued to control oxalis at the two to four leaf stage at 4 WAT.

Table 37. Efficacy of pre-emergent herbicides for Oxalis, Senesac, 2009.

Product	Rate lb ai/A	Percent Control		
		1 WAT	2 WAT	4 WAT
<i>Preemergent</i>				
Untreated	~	0	0	0
Broadstar VC1604 0.25G	0.19	14	30	3
Broadstar VC1604 0.25G	0.375	20	33	8
Casoron 4G	1.0	1	15	0
Casoron 4G	2.0	8	20	8
Casoron 1.4CS	1.0	10	45	38
Certainty	0.035	5	55	70
Certainty	0.094	10	50	70
HGH-63	2.0	8	58	20
Tower	0.97	40	45	10
Tower	1.94	63	68	43
V-10142	0.38	0	53	63
V-10142	0.75	0	43	63
<i>One to two leaf stage</i>				
Untreated	~	0	0	0
Broadstar VC1604 0.25G	0.19	13	50	38
Broadstar VC1604 0.25G	0.375	25	53	53
Casoron 4G	1.0	3	20	3
Casoron 4G	2.0	15	43	20
Casoron 1.4CS	---	---	---	---
Certainty	0.035	5	50	70
Certainty	0.094	13	58	73
HGH-63	2.0	20	70	83
Tower	0.97	20	48	35
Tower	1.94	33	58	50
V-10142	0.38	8	48	58
V-10142	0.75	18	65	80
<i>Two to four leaf stage</i>				
Untreated	~	0	0	0
Broadstar VC1604 0.25G	0.19	78	53	8
Broadstar VC1604 0.25G	0.375	85	85	60
Casoron 4G	1.0	88	38	18
Casoron 4G	2.0	93	63	50
Casoron 1.4CS	1.0	100	85	78
Certainty	0.035	93	78	68
Certainty	0.094	93	78	80
HGH-63	2.0	35	45	48
Tower	0.97	75	38	48
Tower	1.94	93	45	63
V-10142	0.38	78	70	70
V-10142	0.75	78	80	78
<i>Fisher's LSD @ 0.05</i>		19	17	21

Oxalis – Peachey, 2010

Peachey evaluated five herbicides for early postemergence activity on oxalis in the greenhouse at Oregon State University in Corvallis, Oregon. Applications were made sequentially; therefore, evaluation dates differ by stage of weed development (Table 38 and Table 39). Phytotoxicity ratings evaluate chlorosis and necrosis as 0 = no injury, 10 = severe injury. Phytotoxicity ratings are not included if there were no surviving plants. The percent control rating evaluate reduction of growth or stunting as 0 = no reduction in growth, 100 = completely dead.

Stage 0: Casoron, Certainty, SureGuard and Tower effectively controlled oxalis prior to emergence at all rates through 10 WAT. Basagran was not evaluated at this stage.

Stage 1: This stage was evaluated at 2, 3, and 5 weeks after treatment. Excellent control at the cotyledon to two leaf stage was observed approximately 5 WAT with Certainty, Casoron, SureGuard and the high rate of Tower (1.94 lb ai/A). Basagran at 1 lb ai/A plus 1% COC and Tower at 0.97 lb ai/A provided good control (83 % and 73% respectively) at this evaluation as well.

Stage 2: Evaluations were taken 1, 2 and 4 weeks after treatment for this stage. All treatments provided complete control of the two to four leaf stage by 4 WAT. The low rate of Tower (0.97 lb ai/A) had a few seedlings survive but in general very good control was observed.

Table 38. Efficacy of pre-emergent herbicides for Preemergent Oxalis, Peachey, 2010.

Herbicide	Rate (lb ai/A)	Surfactant	App. Date	No./pot			Phytoxicity ¹			%Control ²
				7 WAT Dec 18	8 WAT Dec 25	10 WAT Jan 8	7 WAT Dec 18	8 WAT Dec 25	10 WAT Jan 8	10 WAT Jan 8
<i>preemergent</i>										
Certainty (sulfosulfuron)	0.035	NIS 0.25%	30-Oct	1.0	0	0	-	-	-	100
	0.094	NIS 0.25%	30-Oct	0.5	0	0	-	-	-	100
Casoron 4G (dichlobenil)	3	-	30-Oct	0.0	0	0	-	-	-	100
	4	-	30-Oct	0.0	0	0	-	-	-	100
SureGuard (flumioxazin)	0.5625	NIS 0.25%	30-Oct	0.0	0	0	-	-	-	100
Tower (dimethenamid-p)	0.97	-	30-Oct	1.0	0	0	9.0	-	-	100
	1.94	-	30-Oct	1.0	0	0	9.0	-	-	100
Untreated		-	-	5.8	5.2	5.2	-	-	-	-

¹Phyto is evaluation of chlorosis and necrosis, 0 = no injury, 10 = severe injury. Phytotoxicity ratings are not included if there were no surviving plants.

² Percent Control is evaluation of reduction of growth or stunting, 0 = no reduction in growth, 100 = completely dead.

Table 39. Efficacy of pre-emergent herbicides for emerged Oxalis, Peachey, 2010.

Cotyledon to one leaf											
Herbicide	Rate (lb ai/A)	Surfactant	App. Date	No./pot				Phytoxicity			%Control
				2 WAT Dec 18	3 WAT Dec 25	5 WAT Jan 8		2 WAT Dec 18	3 WAT Dec 25	5 WAT Jan 8	5 WAT Jan 8
Certainty (sulfosulfuron)	0.035	NIS .25%	4-Dec	4.3	0.3	0		8.7	10	-	100
	0.094	NIS .25%	4-Dec	4.0	0.7	0		9.0	10	-	100
Casoron 4G (dichlobenil)	3	-	4-Dec	4.7	0.7	0.3		6.7	9	1.0	97
	4	-	4-Dec	5.0	0.3	0		8.7	10	-	100
Basagran + COC	1	COC 1%	4-Dec	6.0	4.7	2.0		6.7	6	0.5	83
SureGuard (flumioxazin)	0.5625	NIS .25%	4-Dec	3.0	0	0		9.0	-	-	100
Tower (dimethenamid-p)	0.97	-	4-Dec	12.0	12.0	7.5		3.0	6	1.0	73
	1.94	-	4-Dec	7.0	6.5	6.0		6.0	8	4.0	95
Untreated				5.8	5.2	5.2		0	0	0	0
Two to four leaf											
Herbicide	Rate (lb ai/A)	Surfactant	App. Date	No./pot				Phytoxicity			%Control
				1 WAT Dec 18	2 WAT Dec 25	4 WAT Jan 8		1 WAT Dec 18	2 WAT Dec 25	4 WAT Jan 8	4 WAT Jan 8
Certainty (sulfosulfuron)	0.035	NIS .25%	11-Dec	6.5	3.0	0		2.5	9	-	100
	0.094	NIS .25%	11-Dec	6.0	0.5	0		2.5	-	-	100
Casoron 4G (dichlobenil)	3	-	11-Dec	5.5	0	0		1.0	-	-	100
	4	-	11-Dec	5.0	0	0		3.0	-	-	100
Basagran + COC	1	COC 1%	11-Dec	2.5	0	0		5.0	-	-	100
SureGuard (flumioxazin)	0.5625	NIS .25%	11-Dec	2.0	0	0		9.0	-	-	100
Tower (dimethenamid-p)	0.97	-	11-Dec	8.5	7.0	5.5		5.5	8	5.5	90
	1.94	-	11-Dec	6.5	1.0	0		8.5	10	-	100
Untreated				5.8	5.2	5.2		0	0	0	0

¹Phyto is evaluation of chlorosis and necrosis, 0 = no injury, 10 = severe injury. Phytotoxicity ratings are not included if there were no surviving plants.

² Percent Control is evaluation of reduction of growth or stunting, 0 = no reduction in growth, 100 = completely dead.

Oxalis – Senesac 2010

Senesac (NY) tested five products in containers in the field for control of spurge at four growth stages.

Stage 0: All treatments provided preemergent control except for Basagran (Table 40).

Stage 1: Oxalis at the cotyledon to one leaf stage was effectively controlled by all treatments at 1 WAT. However, weed control to 4 WAT was only observed with Certainty (0.035 and 0.094 lb ai/A), Casoron (4.0 lb ai/A), and SureGuard.

Stage 2: Good to very good control was achieved with Certainty (0.035 and 0.094 lb ai/A) and excellent control with SureGuard.

Stage 3: SureGuard provided excellent control at the 4+ leaf stage while Certainty at 0.094 gave acceptable control.

Summary: Oxalis at the 2-4+ leaf stage was best controlled by SureGuard at 0.383 lb ai/A and Certainty at 0.094. Smaller stages of emerged oxalis may be effectively controlled by SureGuard, Certainty (0.035 and 0.094 lb ai/A) and Casoron (4.0 lb ai/A).

Oxalis - Gilliam 2011

Gilliam (AL) evaluated Gallery, indaziflam and Tower for control of emerged *Oxalis stricta* at the cotyledon to one leaf stage and two to four leaf stage. A nonionic surfactant was included in Experiment 1 (Table 41) but not 2 (Table 42). Additionally, Experiment 2 only had 11 replications per treatment due to poor germination.

Stage 0: Preemergent control was assessed by taking weed counts at each evaluation. All treatments (except the surfactant alone) provided significant preemergent control compared to the untreated. Indaziflam demonstrated complete weed control at this stage.

Stage 1: Indaziflam provided the longest control at the cotyledon to one leaf stage with 100% control through 8 WAT. Tower at 0.97 and 1.5 lb ai/A gave very good control through 8 WAT in Experiment 2 but unacceptable in the first experiment where surfactant was used. Gallery controlled oxalis in both experiments through 4 WAT but control dropped thereafter.

Stage 2: Indaziflam delivered excellent control of oxalis by 8 WAT. Gallery at 1.0 lb ai/A provided acceptable control at 2 and 4 WAT in the second experiment only (no surfactant). Unacceptable control was observed with Tower treatments in both experiments.

Table 40. Efficacy of pre-emergent herbicides for emerged Oxalis, Senesac, 2010.

Product	Rate (lb ai/A)	Percent Control		
		1 WAT	2 WAT	4 WAT
<i>Preemergent</i>				
Casoron 4G	3.0	-	90	100
Casoron 4G	4.0	-	90	100
Certainty 75WDG + NIS	0.035	-	70	100
Certainty 75 WDG + NIS	0.094	-	70	100
SureGuard 51 WDG + NIS	0.383	-	100	100
Tower 6EC	0.97	-	70	90
Tower 6EC	1.94	-	70	100
Basagran 4L + COC	1.0	-	33	0
Untreated		-	0	0
<i>Cotyledon to one leaf stage</i>				
Casoron 4G	3.0	77	73	43
Casoron 4G	4.0	80	80	77
Certainty 75WDG + NIS	0.035	70	83	100
Certainty 75 WDG + NIS	0.094	70	83	100
SureGuard 51 WDG + NIS	0.383	100	100	100
Tower 6EC	0.97	90	57	33
Tower 6EC	1.94	90	53	53
Basagran 4L + COC	1.0	77	50	0
Untreated		-	0	0
<i>Two to four leaf stage</i>				
Casoron 4G	3.0	37	43	20
Casoron 4G	4.0	47	67	60
Certainty 75WDG + NIS	0.035	33	77	80
Certainty 75 WDG + NIS	0.094	33	77	87
SureGuard 51 WDG + NIS	0.383	100	100	100
Tower 6EC	0.97	60	43	20
Tower 6EC	1.94	50	47	23
Basagran 4L + COC	1.0	60	47	0
Untreated		-	0	0
<i>Four + leaf stage</i>				
Casoron 4G	3.0	10	17	0
Casoron 4G	4.0	50	33	0
Certainty 75WDG + NIS	0.035	30	37	60
Certainty 75 WDG + NIS	0.094	20	50	70
SureGuard 51 WDG + NIS	0.383	73	100	100
Tower 6EC	0.97	23	10	0
Tower 6EC	1.94	17	10	0
Basagran 4L + COC	1.0	30	7	0
Untreated		-	0	0
<i>Fisher's LSD @ 0.05</i>		25 21 16		

Table 41. Control of emerged oxalis (*Oxalis stricta*) with selected pre-emergent herbicides, Gilliam, 2011, Experiment 1.

Treatment	Rate	Weed Count ^v and Fresh Weight				
		1 WAT ^y	2 WAT	4 WAT	8 WAT	Fresh Weight ^x
<i>Preemergent^v</i>						
Gallery	0.5 lb ai/A	0.0 b ^w	0.0 b	0.2 c	9.6 b	1.4 c
Gallery	1.0 lb ai/A	0.0 b	0.0 b	0.0 c	6.0 b	0.5 c
Indaziflam	50 g/ha	0.0 b	0.0 b	0.0 c	0.0 c	0.0 c
Indaziflam	100 g/ha	0.0 b	0.0 b	0.0 c	0.0 c	0.0 c
Tower	0.97 lb ai/A	0.6 ab	1.2 a	1.6 b	6.1 b	0.3 c
Tower	1.5 lb ai/A	0.0 b	0.2 b	0.2 c	5.2 b	0.1 c
Non-ionic Surfactant	0.25% v/v	0.2 ab	1.3 a	6.6 a	15.0 a	22.1 a
Untreated		0.8 a	1.7 a	6.8 a	17.6 a	13.1 b
Treatment	Rate	Plant Injury ^z and Fresh Weight				
		1 WAT ^y	2 WAT	4 WAT	8 WAT	Fresh Weight ^x
<i>Cotyledon to one leaf</i>						
Gallery	0.5 lb ai/A	7.7 b	9.0 b	7.2 b	1.8 c	18.6 c
Gallery	1.0 lb ai/A	8.3 b	9.0 b	9.0 a	3.5 b	5.0 c
Indaziflam	50 g/ha	9.4 a	10.0 a	10.0 a	10.0 a	0.0 d
Indaziflam	100 g/ha	9.7 a	10.0 a	10.0 a	10.0 a	0.0 d
Tower	0.97 lb ai/A	6.7 c	7.0 c	3.5 c	1.7 c	36.0 b
Tower	1.5 lb ai/A	5.8 d	6.6 c	1.0 d	1.0 d	50.0 b
Non-ionic Surfactant	0.25% v/v	0.0 e	0.0 d	0.0 d	0.0 d	98.6 a
Untreated		0.0 e	0.0 d	0.0 d	0.0 d	91.8 a
<i>Two to four leaf stage</i>						
Gallery	0.5 lb ai/A	0.3 c ^v	2.4 c	1.8 d	0.0 b	111.3 a
Gallery	1.0 lb ai/A	1.9 b	5.0 b	3.3 c	0.0 b	80.1 b
Indaziflam	50 g/ha	6.6 a	8.3 a	9.1 b	10.0 a	0.0 c
Indaziflam	100 g/ha	7.0 a	8.7 a	10.0 a	10.0 a	0.0 c
Tower	0.97 lb ai/A	2.1 b	0.3 d	0.2 e	0.0 b	100.3 ab
Tower	1.5 lb ai/A	2.4 b	0.0 d	0.0 e	0.0 b	92.6 ab
Non-ionic Surfactant	0.25% v/v	0.0 c	0.0 d	0.0 e	0.0 b	108.4 a
Untreated		0.0 c	0.0 d	0.0 e	0.0 b	113.4 a

^zInjury ratings taken on a scale of 0 to 10, 0 = no injury, 10 = complete kill.

^yWAT = weeks after treatment. All pots treated on 6/18/11.

^xF.W. = Fresh weights taken on 8/11/11, presented in grams.

^wMeans separated using Duncan's Multiple Range Test (p = 0.05).

^v Preemergent control was made by taking weed counts in each pot at each evaluation date.

Table 42. Control of emerged oxalis (*Oxalis stricta*) with selected pre-emergent herbicides, Gilliam, 2011, Experiment 2.

Treatment	Rate	Weed Count ^v and Fresh Weights ^x				
		1 WAT ^y	2 WAT	4 WAT	8 WAT	Fresh Weight ^x
<i>Preemergent^v</i>						
Gallery	0.5 lb ai/A	0.3 c ^w	0.5 c	2.7 bc	8.3 b	4.2 b
Gallery	1.0 lb ai/A	0.0 c	0.0 c	2.0 bc	6.7 b	1.6 b
Indaziflam	50 g/ha	0.0 c	0.0 c	0.0 c	0.0 c	0.0 b
Indaziflam	100 g/ha	0.0 c	0.0 c	0.0 c	0.0 c	0.0 b
Tower	0.97 lb ai/A	2.5 b	4.5 b	5.5 b	8.5 b	0.5 b
Tower	1.5 lb ai/A	2.5 b	3.5 bc	4.9 b	6.5 b	0.3 b
Untreated		11.1 a	20.7 a	24.1 a	20.4 a	43.4 a
Treatment	Rate	Plant Injury ^z and Fresh Weights				
		1 WAT ^y	2 WAT	4 WAT	8 WAT	Fresh Weight ^x
<i>Cotyledon to one leaf^f</i>						
Gallery	0.5 lb ai/A	6.5 bc	8.3 bc	7.9 c	4.0 c	1.5 b
Gallery	1.0 lb ai/A	8.5 ab	9.6 ab	9.6 ab	6.9 b	0.4 b
Indaziflam	50 g/ha	10.0 a	10.0 a	10.0 a	10.0 a	0.0 b
Indaziflam	100 g/ha	10.0 a	10.0 a	10.0 a	10.0 a	0.0 b
Tower	0.97 lb ai/A	7.8 b	8.3 bc	8.6 bc	7.6 b	0.3 b
Tower	1.5 lb ai/A	5.5 c	7.3 c	7.6 c	7.4 b	0.6 b
Untreated		0.0 d	0.0 d	0.0 d	0.0 d	18.8 a
<i>Two to four leaf stage</i>						
Gallery	0.5 lb ai/A	4.2 bc	5.9 c	4.8 c	1.1 cd	12.0 b
Gallery	1.0 lb ai/A	5.4 b	8.2 b	7.8 b	3.5 b	3.9 bc
Indaziflam	50 g/ha	8.5 a	9.8 a	9.9 a	10.0 a	0.0 c
Indaziflam	100 g/ha	8.6 a	9.8 a	10.0 a	10.0 a	0.0 c
Tower	0.97 lb ai/A	3.5 c	3.3 d	3.5 cd	2.5 bc	14.1 b
Tower	1.5 lb ai/A	1.6 d	2.0 d	2.1 d	1.2 cd	16.9 b
Untreated		0.0 e	0.0 e	0.0 e	0.0 d	52.2 a

^zInjury ratings taken on a scale of 0 to 10, 0 = no injury, 10 = complete kill.

^yWAT = weeks after treatment. All pots treated on 6/18/11.

^xF.W. = Fresh weights taken on 8/11/11, presented in grams.

^wMeans separated using Duncan's Multiple Range Test (p = 0.05).

^v Preemergent control was made by taking weed counts in each pot at each evaluation date.

Oxalis - Senesac 2011

In 2011 Senesac (NY) tested Gallery, indaziflam and Tower for postemergent control of *Oxalis stricta* in the greenhouse under mist irrigation.

Stage 0: All treatments provided 100% preemergent control at 2 and 4 WAT (Table 43).

Stage 1: Indaziflam and Gallery provided very good to excellent control through 8 WAT. Tower at 1.94 lb ai/A provided acceptable control at 2 WAT decreased with time.

Stage 2: Indaziflam delivered excellent control of oxalis at 2, 4, and 8 WAT. Unacceptable control was observed with Gallery and Tower treatments at the two to four leaf stage.

Table 43. Postemergent control of oxalis (*Oxalis stricta*) with selected pre-emergent herbicides, Senesac, 2011.

Treatment	Rate	Percent Injury			
		1 WAT	2 WAT	4 WAT	8 WAT
<i>Preemergent</i>					
Gallery	0.5 lb ai/A	---	100	100	100
Gallery	1.0 lb ai/a	---	100	100	100
Indaziflam	50 g/ha	---	100	100	100
Indaziflam	100 g/ha	---	100	100	100
Tower	0.97 lb ai/A	---	100	100	93
Tower	1.94 lb ai/A	---	100	100	100
Untreated		---	0	0	0
<i>Newly Emerged</i>					
Gallery	0.5 lb ai/A	45	100	100	98
Gallery	1.0 lb ai/a	50	100	100	100
Indaziflam	50 g/ha	50	100	100	100
Indaziflam	100 g/ha	70	100	100	100
Tower	0.97 lb ai/A	30	90	50	45
Tower	1.94 lb ai/A	30	90	90	85
Untreated		0	0	0	0
<i>Cotyledon to one leaf</i>					
Gallery	0.5 lb ai/A	35	93	90	80
Gallery	1.0 lb ai/a	40	98	98	93
Indaziflam	50 g/ha	48	95	100	100
Indaziflam	100 g/ha	70	98	100	100
Tower	0.97 lb ai/A	0	13	20	13
Tower	1.94 lb ai/A	30	70	60	50
Untreated		0	0	0	0
<i>Two to four leaf stage</i>					
Gallery	0.5 lb ai/A	23	20	15	8
Gallery	1.0 lb ai/a	45	43	35	30
Indaziflam	50 g/ha	45	95	100	100
Indaziflam	100 g/ha	70	98	100	100
Tower	0.97 lb ai/A	33	33	30	30
Tower	1.94 lb ai/A	60	45	38	35
Untreated		0	0	0	0
<i>Fisher's LSD @ 0.05</i>		14	17	18	19

Phyllanthus

Senesac, 2010

Senesac (NY) tested five products in a single experiment on four growth stages including a 4+ leaf stage. All treatments were tested in field grown containers.

Stage 0: All treatments provided preemergent control except for Basagran (Table 44.)

Stage 1: Phyllanthus at the cotyledon to one leaf stage was effectively controlled by all treatments up to 4WAT with the exception of Basagran which was only effective at the 1WAT evaluation.

Stage 2: Certainty, Casoron, and Tower provided good to very good control while SureGuard gave excellent control of 2-4 leaf phyllanthus.

Stage 3: SureGuard completely controlled 4+ seedlings; Casoron at 4.0 lb ai/A gave acceptable control.

Summary: Phyllanthus at the 2-4+ leaf stage was best controlled by SureGuard at 0.383 lb ai/A, Casoron at 4.0 lb ai/A and by Certainty (0.035 and 0.094 lb ai/A). Smaller stages of emerged phyllanthus may also be effectively controlled by Tower at 0.97 and 1.94 lb ai/A.

Table 44. Efficacy of pre-emergent herbicides for Phyllanthus, Senesac, 2010.

Product (Active)	Rate lb ai/A	Percent Control		
		1 WAT	2 WAT	4 WAT
<i>Preemergent</i>				
Certainty 75WDG + NIS	0.035	-	0	90
Certainty 75 WDG + NIS	0.094	-	0	100
Casoron 4G	3.0	-	0	100
Casoron 4G	4.0	-	100	100
SureGuard 51 WDG + NIS	0.383	-	100	100
Tower 6EC	0.97	-	0	100
Tower 6EC	1.94	-	0	100
Basagran 4L + COC	1.0	-	0	0
Untreated	~	-	0	0
<i>Cotyledon to one leaf stage</i>				
Certainty 75WDG + NIS	0.035	80	90	93
Certainty 75 WDG + NIS	0.094	87	90	80
Casoron 4G	3.0	90	90	90
Casoron 4G	4.0	90	93	100
SureGuard 51 WDG + NIS	0.383	100	100	100
Tower 6EC	0.97	77	93	83
Tower 6EC	1.94	77	90	100
Basagran 4L + COC	1.0	70	57	0
Untreated	~	-	0	0
<i>Two to four leaf stage</i>				
Certainty 75WDG + NIS	0.035	30	80	70
Certainty 75 WDG + NIS	0.094	30	90	80
Casoron 4G	3.0	13	50	70
Casoron 4G	4.0	13	63	87
SureGuard 51 WDG + NIS	0.383	100	100	100
Tower 6EC	0.97	73	63	40
Tower 6EC	1.94	77	87	73
Basagran 4L + COC	1.0	27	20	0
Untreated	~	-	0	0
<i>Four + leaf stage</i>				
Certainty 75WDG + NIS	0.035	17	50	40
Certainty 75 WDG + NIS	0.094	17	57	60
Casoron 4G	3.0	10	20	27
Casoron 4G	4.0	10	30	70
SureGuard 51 WDG + NIS	0.383	100	100	100
Tower 6EC	0.97	47	23	0
Tower 6EC	1.94	30	27	0
Basagran 4L + COC	1.0	20	20	0
Untreated	~	-	0	0
<i>Fisher's LSD @ 0.05 14 17 14</i>				

Spurge

Several experiments were conducted during 2008-2011 looking primarily at postemergent applications of Broadstar VC1604, EXC3898 and V-10142 on spurge. A limited number of experiments included Broadstar 0.25G, Casoron 4G and 1.4 CS, Certainty, FreeHand, Gallery, HGH-63, indaziflam, Pendulum, and Tower. For this summary, commercial or acceptable weed control is defined as >70% efficacy as to be expected. Products varied in efficacy depending on the stage treated (Table 45). The summary table below lists the number of trials where commercial control was observed in at least one evaluation compared to the total number of trials

Stage 0: All herbicides applied prior to germination had some appreciable effect with the exception of Casoron and HGH-63. Certainty wasn't tested at Stage 0. Broadstar VC1604 at 0.375 lb ai/A, EXC3898 (2.1 and 3.15 lb ai/A), and V10142 (0.38 and 0.75 lb ai/A) were effective as preemergent applications for spurge control. In single trials Broadstar 0.25G, FreeHand, Gallery, indaziflam, pendulum, and Tower demonstrated acceptable preemergent spurge control.

Stage 1: Certainty (0.094 lb ai/A), FreeHand (3.5 and 7.0 lb ai/A), Pendulum (2 and 4.0 lb ai/A), and Tower (1.94 lb ai/A) showed good control at the cotyledon to one leaf stage. Indaziflam demonstrated commercial level control through 8 WAT in a single trial (Table 62). V-10142 at 0.75 lb ai/A reached commercial control in five out of nine experiments (Table 46, Table 49, Table 52, Table 56, Table 60). Similar results were observed with EXC3898 at 3.15 lb ai/A which gave acceptable control in three of five experiments. At 4.2 lb ai/A EXC3898 gave excellent spurge control in a single experiment (Table 57). HGH-63 at 2.0 lb ai/A controlled spurge with an injury rating of 65% 4WAT in one study (Table 60) out of three. Broadstar VC1604 (0.75 lb ai/a) provided some suppression but was not at a commercial level.

Stage 2: Postemergence activity declined at the 2 to 4 leaf stage for spurge. In several experiments, herbicide applications at 2X rate caused a significant effect but may be injurious to sensitive ornamental crops if applied over the top. The only treatment to give consistent control at this stage was Pendulum at 4.0 lb which provided excellent control in three of three experiments (Table 47, Table 58, Table 59). The high rate of V 10142 at 0.75 lb ai/A gave acceptable control in three of nine experiments. In single experiments the EXC3898 at 4.2 lb ai/A received a 93% injury rating 3 WAT (Table 57) while Casoron 1.4 CS 1.0 lb ai/a received a 70% injury rating 4 WAT (Table 60). None of the other treatments provided consistent control to spurge at the two to four leaf stage.

Table 45. General Summary of Early Postemergence Efficacy for Spurge

Product (active)	Rate (lb ai/A)	Number of Experiments with Acceptable Control (>70%)		
		Stage 0: Preemergence	Stage 1: Cotyledon to 1 Leaf	Stage 2: 2 to 4 Leaves
Broadstar 0.25G (flumioxazin)	0.19	1 of 1	0 of 2	0 of 2
	0.375	1 of 1	1 of 2	1 of 2
Broadstar VC1604 0.2G (flumioxazin)	0.19	2 of 5	1 of 8	0 of 8
	0.375	3 of 5	1 of 9	2 of 8
	0.75	0 of 1	2 of 4	1 of 4
Casoron 4 G (dichlobenil)	1.0	0 of 1	0 of 2	0 of 3
	2.0	0 of 1	0 of 2	0 of 3
Casoron 1.4 CS (dichlobenil)	1.0	0 of 1	----	1 of 1
Certainty (sulfosulfuron)	0.035	---	1 of 2	0 of 2
	0.094	---	2 of 2	1 of 2
EXC3898 (mesotrione + proflumicafene + s-metolachlor)	2.1	4 of 4 ¹	2 of 5	1 of 5
	3.15	4 of 4	3 of 5	1 of 5
	4.2	1 of 1	1 of 1	1 of 1
FreeHand (pendimethalin + dimethenamid-p)	3.5	1 of 1	2 of 3	0 of 3
	7.0	1 of 1	3 of 3	1 of 3
Gallery (isoxaben)	0.5	1 of 1	0 of 1	0 of 1
	1.0	1 of 1	0 of 1	0 of 1
HGH-63 2G (oxyfluorfen)	2.0	0 of 1	1 of 3	1 of 3
indaziflam	50 g/ha	1 of 1	1 of 1	0 of 1
	100 g/ha	1 of 1	1 of 1	0 of 1
Pendulum (pendimethalin)	2.0	1 of 1	3 of 3	1 of 3
	4.0	1 of 1	3 of 3	3 of 3
Tower EC (dimethenamid-p)	0.97	1 of 2	0 of 4	1 of 4
	1.5	1 of 1	3 of 3	0 of 3
	1.94	2 of 2	1 of 2	1 of 2
	3.0	1 of 1	1 of 1	1 of 1
V-10142 (imzasulfuron)	0.38	4 of 5	3 of 9	1 of 9
	0.75	5 of 5	5 of 9	3 of 9

¹ Highlighted numbers indicate efficacious treatments in the majority (≥ 66%) of the trials where at least two trials were conducted.

Spurge – Boydston, 2008

In 2008, Boydston (WA) examined efficacy on spurge grown in field containers under a shade house. Pots with spurge were watered using drip irrigation. Only low numbers of spurge emerged in each pot from planted seed, so it was somewhat difficult to evaluate control.

Stage 0: EXC3898 2.1G applied pre-emergence at 2.1 – 3.15 lb ai/A controlled spurge 57 and 87% 5-WAT, respectively. V-10142 provided somewhat better preemergent control of spurge with 0.375 – 0.75 lb ai/A of V-10142 0.5G having ratings of 80 and 83% 4 WAT, respectively.

Stage 1: EXC3898 2.1G applied to spurge between the cotyledon to 1 leaf stage at 3.15 lb ai/A controlled spurge 67% 4-WAT based on injury ratings. A treatment comparison based on weed count is confounded by the low number of plants in the untreated control. V-10142 demonstrated better spurge control than EXC3898 with V-10142 0.5G at 0.375 and 0.75 lb ai/A having efficacy ratings of 92 and 90% 4-WAT, respectively

Stage 2: EXC3898 2.1 G applied to spurge between the 2 to 4 leaf stage at 2.1 and 3.15 lb ai/A did not control spurge. V-10142 0.5G applied to spurge between the 2 to 4 leaf stage at 0.375 and 0.75 lb ai/A controlled spurge 88 and 87% 4 WAT, respectively.

Table 46. Efficacy of pre-emergent herbicides for Spurge, Stage 0, Boydston, 2008.

Product – Rate (lb ai/A)	Efficacy Rating		# Plants/pot ¹	
	3 WAT	5 WAT	3 WAT	5 WAT
<i>Preemergent</i>				
EXC3898 – 2.1	0.00 b	56.67 a	2.00 a	2.00 a
EXC3898 – 3.15	91.67 a	86.67 a	0.67 a	0.33 a
Untreated Check	0.00 b	0.00 a	2.33 a	2.33 a
<i>LSD (P=.05)</i>	<i>9.995</i>	<i>13.756</i>	<i>3.701</i>	<i>3.889</i>
V-10142 0.5 G - 0.375	61.67 ab	38.33 ab	8.33 a	6.67 a
V-10142 0.5G – 0.75	93.33 a	97.33 a	5.67 a	2.33 a
Untreated Control	0.00 b	0.00 b	10.00 a	10.00 a
<i>LSD (P=.05)</i>	<i>68.155</i>	<i>63.899</i>	<i>11.37</i>	<i>12.755</i>

¹No significant difference in number of live plants per pot on Day of Application.

Table 47. Efficacy of pre-emergent herbicides for emerged Spurge, Stages 1 and 2, Boydston, 2008.

Product – Rate (lb ai/A)	Efficacy Rating		# Plants/pot ¹
	2 WAT	4 WAT	4 WAT
<i>Cotyledon to one leaf stage</i>			
EXC3898 – 2.1	10.00 b	5.00 b	9.67 a
EXC3898 – 3.15	60.00 a	66.67 a	7.00 a
Untreated Check	0.00 b	0.00 b	2.33 a
<i>LSD (P=.05)</i>	<i>13.086</i>	<i>14.385</i>	<i>6.068</i>
<i>Two to Four leaf stage</i>			
V-10142 0.5 G – 0.375	70.00 a	78.33 a	7.67 a
V-10142 0.5G – 0.75	81.67 a	83.33 a	1.67 a
Untreated Control	0.00 b	0.00 b	6.33 a
<i>LSD (P=.05)</i>	<i>52.071</i>	<i>46.421</i>	<i>5.828</i>
<i>Two to Four leaf stage</i>			
EXC3898 – 2.1	3.33 a	5.67 a	7.67 a
EXC3898 – 3.15	6.67 a	3.33 a	6.33 a
Untreated Check	0.00 a	0.00 a	4.67 a
<i>LSD (P=.05)</i>	<i>9.253</i>	<i>9.437</i>	<i>9.995</i>
<i>Two to Four leaf stage</i>			
V-10142 0.5 G – 0.375	88.33 a	88.33 a	6.33 a
V-10142 0.5G – 0.75	86.67 a	86.67 a	1.67 a
Untreated Control	0.00 b	0.00 b	6.67 a
<i>LSD (P=.05)</i>	<i>9.253</i>	<i>9.253</i>	<i>6.321</i>

¹No significant difference in number of live plants per pot on Day of Application.

Spurge – Gilliam, 2008

In 2008, Gilliam (AL) tested whether Broadstar VC1604 0.25G, FreeHand G, Pendulum 2G and Tower EC could manage spurge after emergence. This experiment was conducted using spurge planted in field containers with overhead irrigation.

Stage 0: All herbicide treated pots were weed free through 30 DAT. Fresh weights of herbicide treated pots were significantly less than the untreated (Table 48)

Stage 1: Although Broadstar VC1604 at the 0.375 lb ai/A rate had little effect on the spurge the 0.75 lb ai/A rate had excellent activity at 10 and 20 DAT. However by 30 DAT, spurge began to recover. Spurge treated with FreeHand at 3.5 lb ai/A were injured at 10 and 20 DAT, but began to recover at 30 DAT. However, when FreeHand was applied at 7.0 lb ai/A, by 30 DAT, all pots were given an injury rating of 9 or higher. Tower at 1.5 lb/ ai/A had excellent activity throughout the study and at 3 lb ai/A had an injury rating of 10.0 on all dates. Pendulum (2 and 4 lb ai/A) provided similar results. Fresh weights for all treatments were statistically different from the control except for the low rate of Broadstar.

Stage 2: Pendulum at 4 lb/ ai per acre (7.2) and Tower at 3.0 lb/ ai per acre (8.8) provided the best control postemergence of spurge at all evaluation dates as seen in injury ratings and fresh weights. The low rate of Pendulum started off with low injury but increased by 30DAT to 80% control. FreeHand at 7.0 lb ai/A had activity at 20 DAT (68%) but was not commercially acceptable. Both rates of Broadstar VC1604 and the low rates of FreeHand and Tower had little effect on spurge in the 2 to 4 leaf stage in terms of injury ratings. All treated pots were found to have lower fresh weights than the untreated with Broadstar VC1604 having the least effect by comparison.

Table 48. Efficacy of pre-emergent herbicides for emerged spurge (*Chamaesyce maculata*), Gilliam, 2008.

Product – Rate (lb ai/A)	Weed Numbers ⁷			Fresh Weights ²
	10 DAT ³	20 DAT	30 DAT--	30 DAT
<i>Preemergent</i>				
Broadstar VC1604 – 0.375	----- ⁶	-----	-----	0.0 b
Broadstar VC1604 – 0.75	-----	-----	-----	0.0 b
FreeHand G – 3.5	-----	-----	-----	0.0 b
FreeHand G – 7.0	-----	-----	-----	0.0 b
Pendulum G – 2.0	-----	-----	-----	0.0 b
Pendulum G – 4.0	-----	-----	-----	0.0 b
Tower EC – 1.5	-----	-----	-----	0.0 b
Tower EC – 3.0	-----	-----	-----	0.0 b
Untreated Control	-----	-----	-----	0.8 a
<i>Cotyledon to one leaf stage</i>				
Broadstar VC1604 – 0.375	2.1 d ⁵	2.0 c	1.0 d	5.6 a
Broadstar VC1604 – 0.75	9.0 ab	9.1 a	6.7 b	0.8 bc
FreeHand G – 3.5	6.3 c	7.6 b	3.9 c	1.8 b
FreeHand G – 7.0	8.3 b	9.7 a	9.9 a	0.0 c
Pendulum G – 2.0	9.1 ab	9.9 a	10.0 a	0.0 c
Pendulum G – 4.0	9.7 a	10.0 a	10.0 a	0.0 c
Tower EC – 1.5	9.3 ab	9.6 a	10.0 a	0.0 c
Tower EC – 3.0	10.0 a	10.0 a	10.0 a	0.0 c
Untreated Control	1.0 e	1.3 c	1.0 d	6.6 a
<i>Two to four leaf stage</i>				
Broadstar VC1604 – 0.375	1.17 d	1.3 d	1.0 d	6.4 b
Broadstar VC1604 – 0.75	2.0 d	2.2 d	1.0 d	6.7 b
FreeHand G – 3.5	3.8 c	5.7 bc	5.0 bc	1.7 cd
FreeHand G – 7.0	5.2 c	6.8 ab	6.0 b	1.3 cd
Pendulum G – 2.0	4.7 c	7.7 a	8.0 a	0.6 cd
Pendulum G – 4.0	7.2 b	8.7 a	8.7 a	0.1 d
Tower EC – 1.5	4.7 c	4.7 c	4.0 c	2.5 c
Tower EC – 3.0	8.8 a	8.5 a	8.7 a	0.1 d
Untreated Control	1.0 d	1.2 d	1.0 d	12.0 a

¹Plant injury ratings on scale of 1 to 10. 1 = no injury, 10 = dead

²Fresh weights measured in grams.

³DAT = Days after treatment

⁵Means separated using Duncan's Multiple Range Test at $p = 0.05$. Means with the same letter are not significantly different ($P < .05$).

⁶No ratings taken

Spurge – Neal, 2008

In 2008, Neal (NC) tested whether newly emerged spurge grown in field containers with overhead irrigation could be managed with Broadstar 0.25G, Broadstar VC1604 0.25G, EXC3898, and V-10142 G.

Stage 0: In the summer experiment, both formulations of flumioxazin (Broadstar 0.25G original and VC1604), EXC3898 and V-10142 provided preemergence control of spotted spurge. Control was greater when applied at the higher (labeled) dose.

Stage 1: When applied early postemergence, significant differences between treatments were observed. In the summer experiment, only the high dose of Broadstar 0.25G provided greater than 70% spurge control at 1 week after treatment. However, in the second experiment, the high rates of Broadstar 0.25G, EXC3898, and V-10142 all provided greater than 70% control. Broadstar VC1604 did not provide acceptable efficacy in either the first or second experiment.

Stage 2: When applied to 4-leaf and branched plants, spurge control was poor with most treatments in both experiments. Only Broadstar 0.25G at 0.375 lb ai/A provided some suppression in the first experiment.

Summary: Emerged spurge was controlled by the high rates of Broadstar 0.25G and EXC3898 only; but spurge controlled decreased between the 1-leaf and 4 leaf stages of growth.

Research should continue with EXC3898 and V-10142 to confirm efficacy on these and other weeds, and to evaluate crop safety. Additional products should be evaluated for postemergent spurge control.

Table 49. Efficacy of pre-emergent herbicides for spurge (*Chamaesyce maculata*), Stage 0, Neal, 2008.

Product – Rate (lb ai/A)	Efficacy Rating ¹			
	Preemergent			
	3 WAT	6 WAT	7 WAT	10 WAT
Broadstar 0.25G - 0.19	7.5 a	6.0 bc	2.5 cd	0.0 b
Broadstar 0.25G – 0.375	9.3 a	8.3 a	6.8 ab	0.8 b
Broadstar VC1604 0.25G – 0.19	6.5 a	7.5 ab	4.0 bc	1.0 b
Broadstar VC1604 0.25G – 0.375	8.8 a	9.2 a	8.3 a	4.0 a
EXC3898 G – 2.1	7.3 a	1.5 d	2.8 cd	0.5 b
EXC3898 G – 3.15	9.3 a	5.3 bc	4.5 bc	0.5 b
V-10142 0.5G – 0.375	6.3 a	4.8 c	2.8 cd	0.3 b
V-10142 0.5G – 0.75	8.5 a	5.8 bc	3.5 c	0.0 b
Untreated Control	0.0 b	0.0 d	0.0 d	0.0 b

¹ Efficacy was rated on a scale of 0 to 10 with 0 being no control and 10 being 100 percent.

Table 50. Efficacy of pre-emergent herbicides for emerged spurge (*Chamaesyce maculata*), Stage 1, Neal, 2008.

Product – Rate (lb ai/A)	Efficacy Rating ¹			
	Early Postemergence, one leaf			
	Experiment 1 Treated 7/15/08		Experiment 2 Treated 8/14/08	
	1 WAT	4 WAT	3 WAT	6 WAT
Broadstar 0.25G – 0.19	5.3 bc	1.5 b	6.0 ab	2.8 d
Broadstar 0.25G – 0.375	8.8 a	4.8 a	9.3 a	9.1 a
Broadstar VC16040.25G – 0.19	4.0 c	0.5 b	4.7 b	4.5 cd
Broadstar VC1604 0.25G – 0.375	4.8 bc	1.0 b	5.8 ab	4.5 cd
EXC3898 G – 2.1	4.3 c	0.5 b	6.5 ab	6.8 bc
EXC3898 G – 3.15	5.3 bc	2.3 b	8.2 ab	7.9 ab
V-10142 0.5G – 0.375	5.5 bc	1.9 b	6.3 ab	6.0 bc
V-10142 0.5G – 0.75	6.8 b	1.8 b	7.7 ab	7.0 b
Untreated Control	0.0 d	0.0 b	0.0 c	0.0 e

¹ Efficacy was rated on a scale of 0 to 10 with 0 being no control and 10 being 100 percent.

Table 51. Efficacy of pre-emergent herbicides for spurge (*Chamaesyce maculata*), Stage 2, Neal, 2008.

Product – Rate (lb ai/A)	Efficacy Rating ¹		
	Late Postemergence, Four leaf		
	Experiment 1 Treated 7/23/08	Experiment 2 Treated 8/14/08	
	4 WAT	3 WAT	6 WAT
Broadstar 0.25G – 0.19	4.0 b	3.3 b	0.0 b
Broadstar 0.25G – 0.375	8.9 a	6.7 a	3.3 a
EXC3898 – 2.1	1.0 cd	0.0 c	0.0 b
EXC3898 – 3.15	1.8 c	0.7 c	0.0 b
Broadstar VC1604 0.25G – 0.19	0.3 d	0.0 c	0.0 b
Broadstar VC1604 0.25G – 0.375	1.0 cd	0.3 c	0.0 b
V-10142 0.5G – 0.375	0.0 d	0.0 c	0.0 b
V-10142 0.5G – 0.75	0.8 cd	0.0 c	1.5 ab
Untreated Control	0.0 d	0.0 c	0.0 b

¹ Efficacy was rated on a scale of 0 to 10 with 0 being no control and 10 being 100 percent.

Spurge – Regan, 2008

In 2008, Regan (OR) tested Broadstar VC1604 0.25G, EXC3898, and V-10142 0.5G in a greenhouse with a retractable roof. Spurge seeds and seedlings were watered with overhead irrigation.

Stage 0: Both rates of Broadstar VC1604 delivered good control while EXC3898 and V-10142 G treatments completely prevented germination of spurge at both rates.

Stage 1: EXC3898 and V-10142 G caused significant damage to spurge 3 WAT for this stage. Broadstar VC1604 at both rates had no effect on spurge three weeks after treatment in the cotyledon to one leaf stage.

Stage 2: The 2 to 4 leaf stage of spurge had greater resistance to EXC3898 and V-10142 G herbicide treatments. It is interesting to note that the high rate on EXC3898 showed significantly lower effectiveness in controlling spurge than the lower rate. Broadstar VC1604 had no effect on spurge at the 2 to 4 leaf stage of development.

Summary: EXC3898 G and V-10142 provided excellent pre-emergent efficacy for spurge and greater than 70% control of this weed at Stage 1, but not at Stage 2. Broadstar VC1604 had little impact on prostrate spurge.

Table 52. Efficacy of pre-emergent herbicides for spurge (*Chamaesyce maculata*), Regan 2008.

Product – Rate (lb ai/A)	Percent Germination
	4 WAT ¹
<i>Preemergent Timing</i>	
Broadstar VC1604 0.25G – 0.19	14.0 b ²
Broadstar VC1604 0.25G – 0.375	9.0 b
EXC3898 – 2.1	0.1 a
EXC3898 – 3.15	0.0 a
V-10142 0.5G – 0.375	0.0 a
V-10142 0.5G – 0.75	0.0 a
Untreated Control	45.0 c

¹Weeks After Treatment

²Column mean numbers followed by the same letter are not significantly different (Alpha=0.05) as determined by Fishers LSD multiple-comparison test (NCSS, 2004)

Table 53. Efficacy of pre-emergent herbicides for spurge (*Chamaesyce maculata*), Regan 2008.

Product – Rate (lb ai/A)	Efficacy Rating 0-10 (0= no damage; 10= dead)		
	1 WAT	2 WAT	3 WAT
<i>One to two leaf stage</i>			
Broadstar VC1604 0.25G – 0.19	0.0	0.0	0.0 a ²
Broadstar VC1604 0.25G – 0.375	0.0	0.0	0.0 a
EXC3898– 2.1	0.0	0.0	7.5 bc
EXC3898 – 3.15	0.0	0.0	9.1 d
V-10142 – 0.375	0.0	0.0	7.1 b
V-10142 – 0.75	0.0	0.0	8.5 cd
Untreated Control	0.0	0.0	0.0 a
<i>Two to four leaf stage</i>			
Broadstar VC1604 0.25G – 0.19	0.0	0.0 a	0.0 a
Broadstar VC1604 0.25G– 0.375	0.0	0.0 a	0.0 a
EXC3898– 2.1	0.0	6.9 d	6.9 d
EXC3898 – 3.15	0.0	1.2 b	1.2 b
V-10142 – 0.375	0.0	1.8 bc	1.8 bc
V-10142 – 0.75	0.0	2.7 c	2.7 c
Untreated Control	0.0	0.0 a	0.0 a

¹Weeks After Treatment

²Column mean numbers followed by the same letter are not significantly different (Alpha=0.05) as determined by Fishers LSD multiple-comparison test (NCSS, 2004)

Spurge – Wilen, 2008

During 2008, Wilen (CA) examined the impact of Broadstar VC1604 0.25G, EXC3898, and V-10142 0.5G on spurge grown in field containers with overhead irrigation.

Stage 0: All herbicides provided good spurge control and reduced weed cover at 2 and 3 WAT. Broadstar VC1604 G was the only herbicide where the higher rate provided significantly greater control than the lower rate. This was noted at both evaluation dates and affected both percent control and percent cover.

Stage 1: While there was herbicidal activity, none of the herbicides at any rate provided adequate spurge control. The most effective treatments were EXC3898 at both rates and V-10142 at 0.75 lb ai/A. However, neither herbicide achieved weed control greater than 70%.

Stage 2: Broadstar VC1604 G did not control spurge, providing at most 43% control at the 0.375 lb ai/A rate. V-10142 provided even less control, providing only 34% control at 0.75 lb ai/A. EXC3898 provided moderate to good control at both rates (greater than 70% efficacy at 3 WAT). Activity shows a trend towards increasing control over time.

Table 54. Efficacy of pre-emergent herbicides for spurge (*Chamaesyce maculata*), Stage 0, Wilen, 2008.

Product – Rate (lb ai/A)	Percent Cover	Percent Control	Percent Cover	Percent Control
	2 WAT	2 WAT	3 WAT	3 WAT
<i>Preemergence</i>				
Broadstar VC1604 – 0.19	15.08 b	59.17 b	40.00 b	51.67 b
Broadstar VC1604 – 0.38	4.67 a	88.75 c	12.50 a	82.92 c
EXC3898 – 2.10	0.08 a	99.58 c	2.50 a	95.42 d
EXC3898 – 3.15	0.00 a	100.00 c	0.83 a	99.17 d
V-10142 – 0.375	4.58 a	89.17 c	11.25 a	87.92 cd
V-10142 – 0.75	0.00 a	100.00 c	2.08 a	97.08 d
Untreated Control	46.42 c	0.00 a	74.58 c	0.00 a
Level of Significance	***	**	***	***

Mean Separation done by LSD at P=0.05

** P < 0.01

*** P<0.001

Table 55. Efficacy of pre-emergent herbicides for spurge (*Chamaesyce maculata*), Stages 1 and 2, Wilen, 2008.

Product – Rate (lb ai/A)	Percent Cover	Percent Control	Percent Cover	Percent Control
	1 WAT	1 WAT	2 WAT	2 WAT
<i>Cotyledon to one leaf stage</i>				
Broadstar VC1604 – 0.19	33.33 cd	17.17 ab	73.50 de	14.17 ab
Broadstar VC1604 – 0.38	25.42 bc	31.25 bc	56.25 cd	27.75 bc
EXC3898 – 2.10	13.75 ab	55.42 d	32.50 ab	54.17 de
EXC3898 – 3.15	17.92 ab	45.83 cd	33.08 ab	53.75 de
V-10142 – 0.375	33.33 cd	27.50 bc	44.33 bc	40.42 cd
V-10142 – 0.75	12.08 a	64.58 d	21.67 a	65.00 e
Untreated Control	42.92 d	0.00 a	84.00 e	0.00 a
Level of Significance	***	**	***	***
<i>Two to four leaf stage</i>				
Broadstar VC1604– 0.19	38.75 c	12.50 ab	70.00 cd	17.92 ab
Broadstar VC1604 – 0.38	20.00 b	21.67 b	44.17 b	43.33 c
EXC3898 – 2.10	5.42 a	80.42 c	8.42 a	87.08 d
EXC3898 – 3.15	8.75 a	68.75 c	15.75 a	75.00 d
V-10142 – 0.375	23.33 b	12.08 ab	57.50 bc	30.00 bc
V-10142 – 0.75	27.50 b	22.08 b	54.83 bc	34.17 bc
Untreated Control	28.58 b	0.00 a	86.67 d	0.00 a
Level of Significance	***	**	***	***

Mean Separation done by LSD at P=0.05

** P < 0.01

*** P<0.001

Spurge – Senesac, 2008

Senesac, in 2008 studied control of spurge (*C. maculata*) grown in the greenhouse under hourly mist during daylight hours. No temperature controls were in place.

Stage 0: V-10142 and EXC3898 gave very good to excellent control of spurge when applied prior to emergence. In contrast Broadstar VC1604 had poor to moderate efficacy ratings at this stage.

Stage 1: V-10142 (all rates), EXC3898 (3.15 and 4.2 lb ai/A) and Broadstar VC1604 (0.75 lbai/A) gave commercially acceptable control of spurge at this stage 3WAT.

Stage 2: At the two to four leaf stage Broadstar VC1604 provided 93% control of spurge, V-10142 (1.50 lb ai/A) provided 73% control and EXC3898 (3.15 and 4.2 lb ai/A) provided 73% and 93%, respectively, when rated 3WAT.

Table 56. Efficacy of Broadstar VC1604 0.25G for spurge (*C. maculata*), Senesac, 2008.

Product – Rate (lb ai/A)	Efficacy Rating		
	1 WAT	2 WAT	3 WAT
<i>Preemergent</i>			
Broadstar VC1604 0.25G– 0.190	--	23	0
Broadstar VC1604 0.25G– 0.375	--	40	10
Broadstar VC1604 0.25G– 0.75	--	50	33
Untreated	0	0	0
<i>Cotyledon to one leaf stage</i>			
Broadstar VC1604 0.25G– 0.190	17	27	40
Broadstar VC1604 0.25G – 0.375	23	50	47
Broadstar VC1604 0.25G – 0.75	73	80	83
Untreated	0	0	0
<i>Two to four leaf stage</i>			
Broadstar VC1604 0.25G–0.190	10	50	50
Broadstar VC1604 0.25G 0.375	47	80	73
Broadstar VC1604 0.25G – 0.75	57	90	93
Untreated	0	0	0
<i>Fisher's LSD@ 0.05</i>	38	43	38

Table 57. Efficacy of V-10142 for spurge (*C. maculata*), Senesac, 2008.

Product – Rate (lb ai/A)	Efficacy Rating		
	1 WAT	2 WAT	3 WAT
<i>Preemergent</i>			
V-10142 – 0.38	--	73	23
V-10142 – 0.75	--	83	27
V-10142 – 1.50	--	93	30
Untreated	--	0	0
<i>Cotyledon to one leaf stage</i>			
V-10142 – 0.38	57	72	77
V-10142 – 0.75	57	70	77
V-10142 – 1.50	63	73	77
Untreated	0	0	0
<i>Two to four leaf stage</i>			
V-10142 – 0.38	43	47	57
V-10142 – 0.75	37	60	57
V-10142 – 1.50	43	60	73
Untreated	0	0	0
Fisher’s LSD @0.05	19	10	40

Table 58. Efficacy of EXC3898 for spurge (*C. maculata*), Senesac, 2008.

Product – Rate (lb ai/A)	Efficacy Rating		
	1 WAT	2 WAT	3 WAT
<i>Preemergent</i>			
EXC3898 – 2.10	--	73	30
EXC3898 – 3.15	--	77	30
EXC3898 – 4.20	--	87	30
Untreated	--	0	0
<i>Cotyledon to one leaf stage</i>			
EXC3898 – 2.10	17	63	60
EXC3898 – 3.15	40	67	83
EXC3898 – 4.20	40	77	93
Untreated	0	0	0
<i>Two to four leaf stage</i>			
EXC3898 – 2.10	33	50	63
EXC3898 – 3.15	43	53	73
EXC3898 – 4.20	40	63	93
Untreated	0	0	0
Fisher’s LSD@ 0.05	42	27	48

Spurge – Gilliam, 2009, Experiment 1

In 2009, Gilliam (AL) tested the impact of 8 herbicides for post emergent efficacy on spurge (*C. maculata*). This experiment was conducted in a greenhouse with overhead irrigation. Unlike previous experiments, treatments were not evaluated for preemergent control.

Stage 1: Both rates of Certainty, Pendulum, and Tower at 1.5 lb ai/A, caused the greatest injury at 14 and 21 DAT. FreeHand at 7.0 lb ai/A reached 76% injury at 21 DAT but was unacceptable at all other timings. Casoron at 0.035 lb ai/A received a 70% injury rating at 14 DAT but wasn't commercially acceptable at other ratings. Broadstar VC1604 (0.19 lb ai/A), Casoron (2.0 lb ai/A) HGH-63, Tower (0.97 lb ai/A) and V-10142 (both rates) provided little to no control as evidenced by injury ratings. All herbicide-treated spurge had lower fresh weights than nontreated plants with the greatest reduction occurring in pots treated with Certainty, FreeHand, Pendulum 3.3EC, and Tower. . HGH-63 had the highest fresh weights of any herbicide treatment and was similar to the nontreated spurge.

Stage 2: The only treatments to achieve commercial levels of control at 14 and 21 DAT were Certainty at 0.094 lb ai/A and Pendulum 4.0 lb ai/A. Pendulum maintained control of spurge through 28 DAT while injury from Certainty applications dropped appreciably. Fresh weights indicate Pendulum (4.0 lb ai/A) had the lowest mean fresh weight, however Pendulum (2.0 lb ai/A), FreeHand (7.0 lb ai/A) and Sulfosulfuron (0.094 lb ai/A) had statistically similar fresh weights to spurge treated with Pendulum (4.0 lb ai/A).

Table 59. Efficacy of pre-emergent herbicides for spurge (*Chamaesyce maculata*), Gilliam 2009a.

Treatment	Rate	Injury Ratings ^z and Fresh Weights ^y									
		Cotyledon to One Leaf					2 to 4 Leaf				
		7 DAT ^x	14 DAT	21 DAT	28 DAT	Fresh Weight	7 DAT	14 DAT	21 DAT	28 DAT	Fresh Weight
Broadstar VC1604	0.19 lb ai/A	1.0 i ^v	1.0 h	1.1 e	1.0 f	7.0 ef	1.0 e	1.0 e	1.0 d	1.2 e	18.1 ab
Broadstar VC1604	0.375 lb ai/A	1.0 i	1.1 gh	1.4 e	1.7 ef	8.3 de	1.0 e	1.0 e	1.0 d	1.5 e	20.8 ab
Broadstar VC1604	0.75 lb ai/A	1.0 i	1.0 h	1.0 e	1.1 f	12.4 bc	1.0 e	1.0 e	1.2 d	1.5 e	14.4 bcd
Casoron 4G	1.0 lb ai/A	1.1 hi	7.0 bc	1.0 e	1.3 ef	7.9 def	1.0 e	1.0 e	1.0 d	1.2 e	15.4 bc
Casoron 4G	2.0 lb ai/A	1.3 hi	2.0 fgh	1.6 e	1.0 f	5.0 fgh	1.5 de	1.2 e	1.2 d	1.0 e	11.2 cde
Certainty	0.035 lb ai/A	3.9 e	8.3 a	7.9 ab	3.7 c	0.1 i	2.0 d	4.7 bc	3.8 c	2.8 d	3.1 fgh
Certainty	0.094 lb ai/A	8.1 a	9.3 a	8.4 ab	6.0 b	0.0 i	4.8 b	7.3 a	7.7 ab	5.2 b	1.8 gh
FreeHand1.75G	3.5 lb ai/A	1.3 hi	3.1 f	4.4 c	2.4 de	3.0 ghi	1.0 e	1.8 de	3.8 c	4.8 bc	5.4 efgh
FreeHand1.75G	7.0 lb ai/A	2.0 g	4.4 e	7.6 b	6.6 b	0.4 i	1.0 e	1.0 e	1.8 d	4.0 c	10.8 cde
HGH-63	2.0 lb ai/A	1.7 gh	1.1 gh	1.1 e	1.0 f	15.0 ab	1.0 e	1.2 e	1.0 d	1.2 e	22.0 a
Pendulum 3.3 EC	2.0 lb ai/A	6.7 b	8.1 ab	8.9 a	8.7 a	0.0 i	4.0 c	5.7 b	6.8 b	5.3 b	1.6 gh
Pendulum 3.3 EC	4.0 lb ai/A	4.9 d	6.6 cd	9.0 a	8.6 a	0.0 i	6.2 a	8.3 a	8.3 a	7.7 a	0.1 h
Tower 6.0 EC	0.97 lb ai/A	3.0 f	5.6 de	3.6 cd	1.3 ef	2.3 hi	4.0 c	2.0 de	1.0 d	1.0 e	14.4 bcd
Tower 6.0 EC	1.5 lb ai/A	5.9 c	7.0 bc	7.3 b	3.4 cd	0.4 i	4.5 bc	4.5 c	1.5 d	1.2 e	8.8 def
V-10142	0.375 lb ai/A	1.0 i	1.0 h	1.0 e	1.0 f	10.2 cd	1.0 e	2.5 d	2.2 d	1.2 e	6.6 efg
V-10142	0.75 lb ai/A	2.0 g	2.4 fg	2.8 d	1.1 f	5.3 fg	1.2 e	2.2 de	2.3 d	1.5 e	6.7 efg
Control	*****	1.0 i	1.0 h	1.0 e	1.0 f	15.4 a	1.0 e	1.0 e	1.0 d	1.0 e	18.5 ab

^z Injury ratings on a scale of 1 to 10, 1 = no injury, 10 = dead plant.

^y Fresh weights taken at 28 days after treating and measured in grams.

^x DAT = Days after treatment.

^v Means separated using Duncan's Multiple Range Test (alpha = 0.05).

Spurge – Gilliam, 2009, Experiment 2

In 2009, Gilliam tested the impact of 8 herbicides for post emergent efficacy on spurge (*C. maculata*). This experiment was also conducted in field containers with overhead irrigation. Unlike previous experiments, treatments were not evaluated for preemergent control.

Stage 1: Similar to experiment 1, the results from the repeated experiment showed the highest injury ratings at 14 and 21 DAT came from Certainty at 0.094 lb ai/A and Pendulum applications with ratings $\geq 80\%$. Control with FreeHand was not at a commercial level initially but by 21 and 28 DAT control reached acceptable levels. Both rates of Tower demonstrated good control of spurge at 14 DAT but dropped with time. Even though spurge had begun to recover the fresh weights were reduced significantly with Certainty, FreeHand, Pendulum and Tower. The remaining treatments had fresh weights lower than the nontreated plants but only provided marginal control.

Stage 2: Pendulum at 4.0 lb ai/A was the only treatment to demonstrate acceptable control of spurge at the two to four leaf stage. Moderate injury was observed at 7 DAT with Tower (both rates) and the low rate of Pendulum but controlled decreased significantly by 28 DAT. All other herbicides had little to no effect. Fresh weight data supported these findings.

Summary: Certainty, FreeHand, Pendulum 3.3EC, and Tower have postemergence activity on immature spurge, especially if applied in the cotyledon to one leaf stage. Postemergence activity declined once spurge reached the two to four leaf stage with only Pendulum 3.3EC at the high rate providing acceptable efficacy.

Table 60. Efficacy of pre-emergent herbicides for spurge (*Chamaesyce maculata*), Gilliam 2009b.

Treatment	Rate	Injury Ratings ^z and Fresh Weights ^y									
		Cotyledon to One Leaf					2 to 4 Leaf				
		7 DAT ^x	14 DAT	21 DAT	28 DAT	Fresh Weight	7 DAT	14 DAT	21 DAT	28 DAT	Fresh Weight
Broadstar VC1604	0.19 lb ai/A	2.3 ef ^v	1.9 de	1.9 ef	1.7 hi	9.4 de	1.1 g	1.1 d	1.3 f	1.3 f	16.0 ab
Broadstar VC1604	0.375 lb ai/A	2.0 f	2.4 d	3.0 e	3.0 gh	5.0 fg	1.1 g	1.1 d	1.4 f	1.3 f	14.9 ab
Broadstar VC1604	0.75 lb ai/A	2.4 e	5.1 c	4.9 d	4.1 fg	1.7 gh	2.0 f	1.1 d	1.7 ef	1.5 ef	14.1 ab
Casoron 4G	1.0 lb ai/A	2.0 f	1.0 e	1.0 f	1.0 i	13.6 bc	1.3 g	1.4 d	1.9 ef	1.4 f	11.1 bc
Casoron4G	2.0 lb ai/A	2.0 f	1.8 de	1.6 f	1.4 i	7.5 ef	1.0 g	1.4 d	1.5 f	1.0 f	14.1 ab
Certainty	0.035 lb ai/A	4.1 d	6.4 c	5.3 d	4.3 fg	1.1 h	3.0 e	2.5 bc	2.9 d	2.4 cde	6.7 cd
Certainty	0.094 lb ai/A	5.0 c	8.0 ab	8.3 ab	6.7 cd	0.1 h	4.0 d	2.9 b	4.1 c	3.1 c	4.2 def
FreeHand1.75 G	3.5 lb ai/A	1.3 g	5.4 c	7.1 bc	7.6 bc	0.2 h	1.0 g	1.0 d	2.5 de	2.6 cd	5.5 de
FreeHand1.75G	7.0 lb ai/A	2.0 f	6.1 c	7.9 b	8.9 ab	0.0 h	1.0 g	1.9 cd	3.1 d	2.8 c	4.4 def
HGH-63	2.0 lb ai/A	2.6 e	1.0 e	1.0 f	1.0 i	17.2 b	1.0 g	1.0 d	1.3 f	1.0 f	13.8 ab
Pendulum 3.3 EC	2.0 lb ai/A	7.0 b	8.1 ab	8.3 ab	8.6 ab	0.0 h	6.0 b	6.1 a	6.5 b	5.4 b	1.3 ef
Pendulum 3.3 EC	4.0 lb ai/A	8.0 a	9.3 a	9.4 a	9.6 a	0.0 h	7.4 a	6.6 a	7.8 a	7.1 a	0.4 f
Tower 6.0EC	0.97 lb ai/A	6.9 b	7.9 b	6.3 cd	5.9 de	0.3 h	5.6 bc	3.1 b	1.6 ef	1.8 def	7.7 cd
Tower 6.0EC	1.5 lb ai/A	7.0 b	7.7 b	5.9 cd	4.7 ef	0.2 h	5.5 c	2.9 b	1.8 ef	1.1 f	7.1 cd
V-10142	0.375 lb ai/A	1.0 g	1.0 e	1.0 f	1.0 i	13.9 bc	1.1 g	1.3 d	1.5 f	1.0 f	11.4 bc
V-10142	0.75 lb ai/A	1.0 g	1.3 de	1.1 f	1.1 i	11.4 cd	1.0 g	1.0 d	1.3 f	1.1 f	12.7 ab
Control	*****	1.0 g	1.0 e	1.0 f	1.0 i	21.4 a	1.0 g	1.0 d	1.1 f	1.0 f	17.3 a

^z Injury ratings on a scale of 1 to 10, 1 = no injury, 10 = dead plant.

^y Fresh weights taken at 28 days after treating and measured in grams.

^x DAT = Days after treatment.

^w Means separated using Duncan's Multiple Range Test (alpha = 0.05).

Spurge – Senesac, 2009

In 2009, Senesac tested 7 products for the post emergent control of spurge grown in a greenhouse with hourly mist for irrigation.

Stage 0: At 4 WAT, Tower at 1.94 lb ai/A had the highest efficacy ratings for preemergent applications followed by Broadstar VC1604 at 0.19 lb ai/A, and V-10142 at 0.75 lb ai/A (Table 61).

Stage 1: Commercially acceptable control of spurge was achieved 4WAT with Broadstar VC1604 (0.375 lb ai/A) Certainty (0.035 and 0.094 lb ai/A), Tower (1.94 lb ai/A) and V-10142 (0.75 lb ai/A) at the one to two leaf stage.

Stage 2: Greatest control of spurge at the two to four leaf stage was achieved with applications of Tower at 1.94 lb ai/A. Very good to excellent control was also found with these applications in descending order of control: Tower at 0.97 lb ai/A, Certainty at 0.094 lb ai/A and HGH-63 at 1.0 lb ai/A, V-10142 (80%) at 0.75 lb ai/A, and Casoron 1.4CS (70%) at 1.0 lb ai/A and V-10142 (70%) at 0.75 lb ai/A. All other treatments demonstrated moderate control.

Spurge – Senesac 2011

In 2011, Senesac tested Gallery, indaziflam and Tower for the post emergent control of spurge grown in a greenhouse with hourly mist for irrigation.

Stage 0: All treatments were 100% effective in controlling emergence, as well as, the newly emerged stage, through 8WAT (Table 62).

Stage 1: Very good to excellent control was observed with indaziflam and the high rate (1.94 lb ai/A) of Tower. Gallery did not injury oxalis at the cotyledon to one leaf stage.

Stage 2: None of the products tested significantly impacted oxalis at the two to four leaf stage.

Table 61. Efficacy of pre-emergent herbicides for Spurge, Senesac, 2009.

Product	Rate lb ai/A	Percent Control		
		1 WAT	2 WAT	4 WAT
<i>Preemergence</i>				
Broadstar VC1604 0.25G	0.19	28	53	83
Broadstar VC1604 0.25G	0.375	13	28	58
Certainty	0.035	0	23	63
Certainty	0.094	0	23	58
Casoron 4G	1.0	0	0	0
Casoron 4G	2.0	0	0	10
Casoron 1.4CS	1.0	0	3	25
HGH-63	2.0	18	25	55
Tower	0.97	5	18	53
Tower	1.94	70	73	88
V-10142	0.38	0	40	63
V-10142	0.75	43	58	73
Untreated	~	0	0	0
<i>One to two leaf stage</i>				
Broadstar VC1604 0.25G	0.19	5	15	48
Broadstar VC1604 0.25G	0.375	33	43	80
Certainty	0.035	13	33	78
Certainty	0.094	8	18	68
Casoron 4G	1.0	0	0	3
Casoron 4G	2.0	0	15	5
HGH-63	2.0	18	15	65
Tower	0.97	13	13	60
Tower	1.94	38	40	93
V-10142	0.38	13	28	48
V-10142	0.75	38	40	73
Untreated	~	0	0	0
<i>Two to four leaf stage</i>				
Broadstar VC1604 0.25G	0.19	~	~	50
Broadstar VC1604 0.25G	0.375	~	~	65
Certainty	0.035	~	~	68
Certainty	0.094	~	~	83
Casoron 4G	1.0	~	~	48
Casoron 4G	2.0	~	~	43
Casoron	1.0	~	~	70
HGH-63	2.0	~	~	83
Tower	0.97	~	~	85
Tower	1.94	~	~	95
V-10142	0.38	~	~	70
V-10142	0.75	~	~	80
Untreated	~	~	~	0
<i>Fisher's LSD @ 0.05</i>		26	26	29

Table 62. Efficacy of pre-emergent herbicides for Spurge (*Chamaesyce maculata*), Senesac, 2011.

Treatment	Rate	Percent Injury			
		1 WAT	2 WAT	4 WAT	8 WAT
<i>Preemergent</i>					
Gallery	0.5 lb ai/A	~	100	100	73
Gallery	1.0 lb ai/a	~	100	100	75
Indaziflam	50 g/ha	~	100	100	100
Indaziflam	100 g/ha	~	100	100	100
Tower	0.97 lb ai/A	~	100	100	100
Tower	1.94 lb ai/A	~	100	100	100
Untreated		~	0	0	0
<i>Newly Emerged</i>					
Gallery	0.5 lb ai/A	98	100	100	90
Gallery	1.0 lb ai/a	100	100	100	90
Indaziflam	50 g/ha	93	100	98	90
Indaziflam	100 g/ha	100	100	100	98
Tower	0.97 lb ai/A	48	65	83	73
Tower	1.94 lb ai/A	53	65	93	80
Untreated		0	0	0	0
<i>Cotyledon to one leaf</i>					
Gallery	0.5 lb ai/A	5	5	0	0
Gallery	1.0 lb ai/a	5	20	0	0
Indaziflam	50 g/ha	25	70	73	73
Indaziflam	100 g/ha	50	90	95	95
Tower	0.97 lb ai/A	30	38	38	33
Tower	1.94 lb ai/A	50	85	85	85
Untreated		0	0	0	0
<i>Two to four leaf stage</i>					
Gallery	0.5 lb ai/A	5	3	0	0
Gallery	1.0 lb ai/a	5	10	0	0
Indaziflam	50 g/ha	3	18	5	5
Indaziflam	100 g/ha	18	28	35	35
Tower	0.97 lb ai/A	13	15	15	13
Tower	1.94 lb ai/A	15	30	20	15
Untreated		0	0	0	0
<i>Fisher's LSD @ 0.05</i>		9	8	12	10

Efficacy Summary by Product/Active Ingredient

A brief efficacy summary for select products is given below.

Basagran 4L at 1.0 lb ai/A provided very good to excellent control of eclipta at the cotyledon to 1 leaf stage and 2 to 4 leaf stage.

Broadstar VC1604 results were varied across experiments ranging from poor to very good for all three weed species. Overall, Broadstar VC1604 (0.19 and 0.375 lb ai/A) provided some degree of injury compared to the nontreated and to a greater degree with the higher rate particularly in experiments that conducted evaluations beyond 3 WAT. Further studies with higher rates and longer evaluation periods would be useful (6-12 WAT).

Broadstar 0.25G (original formulation) at 0.19 and 0.375 lb ai/A was tested by one researcher (Neal) and demonstrated effective control of oxalis and spurge as a preemergence application. This formulation caused some injury at the second and third timing but not at a commercial level.

Casoron 4G at 4.0 lb ai/A controlled oxalis and spurge at Stage 0 and 1 in limited trials. The 1.4CS formulation at 1.0 lb ai/A controlled bittercress and spurge at Stage 3 in a single experiment (Senesac). Casoron 4G (3.0 and 4.0 lb ai/A) provided good control of eclipta and phyllanthus as an early postemergence application in a single trial (Senesac).

Certainty at rates of 0.035 and 0.094 lb ai/A provide very good early postemergence control of bittercress, eclipta, oxalis, and phyllanthus. Applications at 0.094 lb ai/A controlled spurge at Stage 1.

EXC3898 (mesotrione+prodiamine+s-metolachlor) applied at 2.10 to 4.20 lb ai/A delivered commercially acceptable control at the preemergence for all three weed species. Good to excellent control was observed on bittercress at Stage 1 and 2 but not for oxalis or spurge. This product will not be registered.

Gallery 75 DF at 1.0 lb ai/A provided excellent bittercress control when applied in the cotyledon to one leaf stage or two to four leaf stage. Both the 0.5 and 1.0 lb ai/A rates controlled oxalis at the cotyledon to one leaf stage.

FreeHand G (evaluated in 3 trials at 1 location) at 7.0 lb ai/A gave excellent control of spurge at the cotyledon to one leaf stage while the 3.5 lb ai/A treatment provided inconsistent injury at similar stages of growth.

HGH-63 at 1.0 and 2.0 lb ai/A was ineffective as a preemergent treatment for controlling bittercress, oxalis and spurge. At 2.0 lb ai/A results were inconsistent for controlling bittercress, oxalis, and spurge.

Indaziflam at rates of 50 and 100 g/ha provided excellent preemergence and early postemergence control of oxalis. In a single experiment these rates also controlled bittercress and spurge prior to emergence and at the cotyledon to one leaf stage.

Pendulum 2G at 2 and 4 lb ai/A exhibited excellent spurge control at both the cotyledon to one leaf stage, The 2 to 4 leaf stage was effectively controlled with the 4.0 lb ai/A rate.

SureGuard 51WDG at 0.383 lb ai/A controlled eclipta, and phyllanthus in limited trials. In two trials the 0.562 rate controlled oxalis effectively.

Tower EC at (0.97 lb ai/A) exhibited significant injury on oxalis at the cotyledon to one leaf stage while the 1.94 lb ai/A rate provided control at all stages tested. At 1.5 lb ai/A Tower demonstrated very good to excellent spurge control at Stage 1. Tower exhibited control of eclipta and phyllanthus but not bittercress.

V-10142 0.5G at 0.375 to 0.75 lb ai/A evaluated in numerous experiments showed effective postemergence bittercress, oxalis and spurge control when applied in the early stages of growth.

Table 63. Summary of product efficacy by weed and product.

Note: Table entries are sorted by weed common name and Latin name, and then by product. Only those IR-4 trials received by 11/10/2011 are included in the table below.

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
28911	Bittercress (Cardamine hirsuta)	BroadStar 0.25G (Flumioxazin)	Field Container	Neal	2008	Over the top	Good control pre at 0.19 and 0.38 lb ai per acre; poor to fair control at 1X, good at 2X applied at 1-leaf stage; poor control at 1X, fair at 2X applied at 4-leaf stage	20090319j.pdf
27563	Bittercress (Cardamine hirsuta)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Gilliam	2008	Over the top	Excellent control pre at 75 and 150 lb per acre, no control post applied at cotyledon - one leaf or at 2-4 leaf stages at 75, poor at 150 lb	20090218f.pdf
27563	Bittercress (Cardamine hirsuta)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Regan	2008	Over the top	Fair and good control pre, no control post at cotyledon to 1-leaf, no and poor control post at 2 to 4-leaf with 0.19 and 0.375 lb ai per acre.	20091125a.pdf
27563	Bittercress (Cardamine hirsuta)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Senesac	2008	Over the top	Good control pre, poor post at cotyledon to 1-leaf stage, over 70 % control post at 2-4 leaf stage, at 0.375 and 0.75 lb ai per acre; poor at 0.19 lb	20081219b.pdf
27604	Bittercress (Cardamine hirsuta)	BroadStar 0.25G VC1604 (Flumioxazin)	Greenhouse	Wilen	2008	Over the top	80 and 93 % control pre at 75 and 150 lb per acre; 74 and 87 % control at 1X and 2X applied at cotyledon-1 leaf stage; 61 and 92 % control at 1X and 2X applied at 2-4 leaf stage	20090819a.pdf
27563	Bittercress (Cardamine hirsuta)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Neal	2008	Over the top	Good control pre at 0.19 and 0.38 lb ai per acre; poor control at both rates applied at 1-leaf or 4-leaf stage	20090319j.pdf
27604	Bittercress (Cardamine hirsuta)	BroadStar 0.25G VC1604 (Flumioxazin)	Greenhouse	Gilliam	2009	Over the top	Trial 2: Virtually no control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 75 and 150 lb per acre	20090923b.pdf
27604	Bittercress (Cardamine hirsuta)	BroadStar 0.25G VC1604 (Flumioxazin)	Greenhouse	Gilliam	2009	Over the top	Trial 1. Virtually no control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 75 and 150 lb per acre	20090923b.pdf
27604	Bittercress (Cardamine hirsuta)	BroadStar 0.25G VC1604 (Flumioxazin)	Greenhouse	Senesac	2009	Over the top	Poor control pre at 0.19 and 0.375 lb ai per acre; good post at cotyledon to 1-leaf stage at 2X, fair post at 2-4 leaf stage at both rates	20091130a.pdf
28920	Bittercress (Cardamine hirsuta)	Casoron 4G (Dichlobenil)	Greenhouse	Gilliam	2009	Over the top	Virtually no control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 25 and 50 lb per acre	20090923b.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
28920	Bittercress (Cardamine hirsuta)	Casoron 4G (Dichlobenil)	Greenhouse	Senesac	2009	Over the top	Poor control pre and post cotyledon to 1-leaf, good control post at 2 to 4-leaf stage with 1 and 2 lb ai per acre.	20091130b.pdf
28921	Bittercress (Cardamine hirsuta)	Certainty (Sulfosulfuron)	Greenhouse	Gilliam	2009	Over the top	Trial 1: Excellent control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 0.035 and 0.094 lb ai per acre; equal to Gallery.	20090923b.pdf
28921	Bittercress (Cardamine hirsuta)	Certainty (Sulfosulfuron)	Greenhouse	Gilliam	2009	Over the top	Trial 2: Excellent control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 0.035 and 0.094 lb ai per acre; equal to Gallery.	20090923b.pdf
28921	Bittercress (Cardamine hirsuta)	Certainty (Sulfosulfuron)	Greenhouse	Senesac	2009	Over the top	Effective control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.035 and 0.094 lb ai per acre.	20091130c.pdf
27290	Bittercress (Cardamine hirsuta)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Gilliam	2008	Over the top	Excellent control pre, fair to good control post applied at cotyledon - one leaf or at 2-4 leaf stages at 100 and 150 lb per acre.	20090218f.pdf
27290	Bittercress (Cardamine hirsuta)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Regan	2008	Over the top	Excellent control pre, good post at cotyledon to 1-leaf and 2 to 4-leaf stages with 2.1 and 3.15 lb ai per acre.	20091125a.pdf
27290	Bittercress (Cardamine hirsuta)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Senesac	2008	Over the top	Generally 70 % or higher control pre and post at cotyledon to 1-leaf stage, less effective post at 2-4 leaf stage, at 2.1, 3.15 and 4.2 lb ai per acre	20081219c.pdf
27602	Bittercress (Cardamine hirsuta)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Greenhouse	Wilen	2008	Over the top	47 and 63 % control pre at 100 and 150 lb per acre; 62 and 73 % control at 1X and 2X applied at cotyledon to 1-leaf stage; 42 and 56 % control at 1X and 2X applied at 2 to 4-leaf stage	20090819a.pdf
27290	Bittercress (Cardamine hirsuta)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Neal	2008	Over the top	Poor to fair control pre at 2.1, fair to good at 3.15 lb ai per acre; good control at both rates applied at 1-leaf stage; fair to good at 1X, good at 2X applied at 4-leaf stage	20090319j.pdf
27290	Bittercress (Cardamine hirsuta)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Boydston	2008	Over the top	97 and 98 % control pre at 2.1 and 3.15 lb ai per acre; 76 and 97 % control at 1X and 2X applied at cotyledon-1 leaf stage; 88 and 99 % control at 1X and 2X applied at 2-4 leaf stage	20090129i.pdf
28864	Bittercress (Cardamine hirsuta)	Gallery 75DF (Isoxaben)	Greenhouse	Gilliam	2008	Over the top	Excellent control pre at 1 lb ai per acre; excellent control post applied at cotyledon - one leaf and 2-4 leaf stages	20090218f.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
28864	Bittercress (Cardamine hirsuta)	Gallery 75DF (Isoxaben)	Greenhouse	Senesac	2011	Over the top	Excellent control at preemergent and cotyledon to 1 leaf stages but unacceptable at 2 to 4 leaf stage with 0.5 and 1.0 lb ai/A.	20111107h.pdf
28922	Bittercress (Cardamine hirsuta)	HGH-63 2G (Oxyfluorfen)	Greenhouse	Gilliam	2009	Over the top	Trial 2. Poor control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 50 and 100 lb per acre	20090923b.pdf
28922	Bittercress (Cardamine hirsuta)	HGH-63 2G (Oxyfluorfen)	Greenhouse	Gilliam	2009	Over the top	Trial 1. Poor control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 50 and 100 lb per acre	20090923b.pdf
28922	Bittercress (Cardamine hirsuta)	HGH-63 2G (Oxyfluorfen)	Greenhouse	Senesac	2009	Over the top	Fair control pre, good post at cotyledon to 1-leaf, poor post at 2 to 4-leaf stage with 2 lb ai per acre.	20091130g.pdf
30466	Bittercress (Cardamine hirsuta)	Indaziflam SC (Indaziflam)	Greenhouse	Senesac	2011	Broadcast	Excellent control with 0.045 and 0.089 lb aia at premergence and cotyledon to 1 leaf stages but poor control at 2 to 4 leaf stage.	20111107h.pdf
27760	Bittercress (Cardamine hirsuta)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Gilliam	2009	Over the top	Trial 1: Poor control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 21 and 32 fl oz per acre	20090923b.pdf
27760	Bittercress (Cardamine hirsuta)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Gilliam	2009	Over the top	Trial 2: Poor control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 21 and 32 fl oz per acre	20090923b.pdf
27760	Bittercress (Cardamine hirsuta)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Senesac	2009	Over the top	Poor control pre at 0.97 and 1.94 lb ai per acre; good post at cotyledon to 1-leaf stage with 2X, good post at 2-4 leaf stage with both rates	20100106a.pdf
27760	Bittercress (Cardamine hirsuta)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Senesac	2011	Over the top	Good control with 0.97 and 1.94 lb aia at cotyledon to one leaf stage but poor at all other stages.	20111107h.pdf
27293	Bittercress (Cardamine hirsuta)	V-10142 0.5G (Imzasulfuron)	Field Container	Gilliam	2008	Over the top	Excellent control pre, excellent control post applied at cotyledon - one leaf or at 2-4 leaf stages at 75 and 150 lb per acre; best post treatment.	20090218f.pdf
27293	Bittercress (Cardamine hirsuta)	V-10142 0.5G (Imzasulfuron)	Field Container	Regan	2008	Over the top	Excellent control pre, fair and excellent control post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.375 and 0.75 lb ai per acre.	20091125a.pdf
27293	Bittercress (Cardamine hirsuta)	V-10142 0.5G (Imzasulfuron)	Field Container	Senesac	2008	Over the top	Generally 70 % or higher control pre, post at cotyledon to 1-leaf stage and post at 2-4 leaf stage, at 0.38, 0.75 and 1.5 lb ai per acre	20081219e.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
27603	Bittercress (Cardamine hirsuta)	V-10142 0.5G (Imazasulfuron)	Greenhouse	Wilén	2008	Over the top	78 and 71 % control pre at 75 and 150 lb per acre; 36 and 16 % control at 1X and 2X applied at cotyledon-1 leaf stage; 42 and 38 % control at 1X and 2X applied at 2-4 leaf stage	20090819a.pdf
27293	Bittercress (Cardamine hirsuta)	V-10142 0.5G (Imazasulfuron)	Field Container	Neal	2008	Over the top	Poor to good control pre at 0.375, good at 0.75 lb ai per acre; fair to good control at 1X, good control at 2X applied at 1-leaf stage; good control at both rates applied at 4-leaf stage	20090319j.pdf
27293	Bittercress (Cardamine hirsuta)	V-10142 0.5G (Imazasulfuron)	Field Container	Boydston	2008	Over the top	80 and 83 % control pre at 0.375 and 0.75 lb ai per acre; 92 and 90 % control at 1X and 2X applied at cotyledon-1 leaf stage; 95 and 98 % control at 1X and 2X applied at 2-4 leaf stage	20090319k.pdf
27603	Bittercress (Cardamine hirsuta)	V-10142 0.5G (Imazasulfuron)	Greenhouse	Gilliam	2009	Over the top	Trial 2. Excellent control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 75 and 150 lb per acre; equal to Gallery.	20090923b.pdf
27603	Bittercress (Cardamine hirsuta)	V-10142 0.5G (Imazasulfuron)	Greenhouse	Gilliam	2009	Over the top	Trial 1. Excellent control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 75 and 150 lb per acre; equal to Gallery.	20090923b.pdf
27603	Bittercress (Cardamine hirsuta)	V-10142 0.5G (Imazasulfuron)	Greenhouse	Senesac	2009	Over the top	Effective control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.38 and 0.75 lb ai per acre; higher rate better.	20091130k.pdf
29591	Eclipta sp. (Eclipta sp)	Basagran SG (Bentazon)	Field Container	Senesac	2010	Over the top	Very good to excellent control of cotyledon to 2 leaf and 2 to 4 leaf stages with 1.0 lb ai/A.	20101129h.pdf
29593	Eclipta sp. (Eclipta sp)	Casoron 4G (Dichlobenil)	Field Container	Senesac	2010	Over the top	By 4WAT 4 lb ai/A provide good to excellent control on 2-4 leaf and 4+ leaf stage while the 3 lb/A rate gave unacceptable control at all stages except preemergence.	20101129h.pdf
29592	Eclipta sp. (Eclipta sp)	Certainty (Sulfosulfuron)	Field Container	Senesac	2010	Over the top	By 4WAT both 0.035 and 0.094 lb ai/A provided excellent control at all stages except for the low rate at the 4+ leaf stage which was unacceptable.	20101129h.pdf
29594	Eclipta sp. (Eclipta sp)	SureGuard 51WDG (Flumioxazin)	Field Container	Senesac	2010	Broadcast	Complete control up to 4 leaf stage with 0.383 lb ai/A	20101129h.pdf
29595	Eclipta sp. (Eclipta sp)	Tower (BAS 656h EC) (Dimethenamid-p)	Field Container	Senesac	2010	Over the top	By 2WAT 0.97 and 1.94 lb ai/A provided good to excellent control of cotyledon-1 leaf and 2-4 leaf stage.	20101129h.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
29601	Oxalis (Oxalis sp.)	Basagran SG (Bentazon)	Field Container	Peachey	2010	Over the top	Moderate to good oxalis control at cotyledon to 1 leaf stage and excellent control at 2-4 leaf stage with 1 lb ai per acre plus 1% COC.	20110302b.pdf
29601	Oxalis (Oxalis sp.)	Basagran SG (Bentazon)	Field Container	Senesac	2010	Over the top	Poor control of emerged oxalis with 1.0 lbs ai/A.	20101129h.pdf
28911	Oxalis (Oxalis sp.)	BroadStar 0.25G (Flumioxazin)	Field Container	Neal	2008	Over the top	Good control pre at 0.19 and 0.38 lb ai per acre; poor control at both rates applied at 1-leaf stage; poor control at 1X, fair at 2X applied at 4-leaf stage	20090319j.pdf
27565	Oxalis (Oxalis sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Gilliam	2008	Over the top	Good control pre, virtually no control post applied at cotyledon or at 2-4 leaf stages at 75 and 150 lb per acre.	20080910b.pdf
27565	Oxalis (Oxalis sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Wilen	2008	Over the top	94 and 90 % control pre at 75 and 150 lb per acre; 13 and 21 % control at 1X and 2X applied at cotyledon to 1-leaf stage; 42 and 66 % control at 1X and 2X applied at 2 to 4-leaf stage	20090618a.pdf
27565	Oxalis (Oxalis sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Regan	2008	Over the top	No control pre, fair control post at cotyledon to 1-leaf, and poor control post at 2 to 4-leaf with 0.19 and 0.375 lb ai per acre.	20091125a.pdf
27565	Oxalis (Oxalis sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Neal	2008	Over the top	Fair control pre at 0.19, good at 0.38 lb ai per acre; poor control at both rates applied at 1-leaf or 4-leaf stage	20090319j.pdf
27565	Oxalis (Oxalis sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Senesac	2008	Over the top	Poor to fair control pre, poor post at cotyledon to 1-leaf stage, 70 % control or higher post at 2-4 leaf stage, at 0.19, 0.375 and 0.75 lb ai per acre	20081219b.pdf
28930	Oxalis (Oxalis sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Greenhouse	Senesac	2009	Over the top	Poor control pre, fair post at cotyledon to 1-leaf stage, good post at 2-4 leaf stage with 0.19 and 0.375 lb ai per acre.	20091130a.pdf
28927	Oxalis (Oxalis sp.)	Casoron 4G (Dichlobenil)	Greenhouse	Senesac	2009	Over the top	Poor control pre and post cotyledon to 1-leaf, good control post at 2 to 4-leaf stage with 1 and 2 lb ai per acre.	20091130b.pdf
28927	Oxalis (Oxalis sp.)	Casoron 4G (Dichlobenil)	Greenhouse	Peachey	2010	Broadcast	Excellent oxalis control with 3 and 4 lb ai/A at the cotyledon to 1 leaf stage and 2-4 leaf stage.	20110302b.pdf
28927	Oxalis (Oxalis sp.)	Casoron 4G (Dichlobenil)	Greenhouse	Senesac	2010	Over the top	4.0 lb/A provided very good control at cotyledon-1 leaf stage from 1WAT-4WAT while other rates and growth stages were unremarkable.	20101129h.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
28928	Oxalis (Oxalis sp.)	Certainty (Sulfosulfuron)	Greenhouse	Senesac	2009	Over the top	Effective control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.035 and 0.094 lb ai per acre.	20091130c.pdf
29602	Oxalis (Oxalis sp.)	Certainty (Sulfosulfuron)	Field Container	Peachey	2010	Over the top	Excellent oxalis control at .035 and .094 lb ai per acre at the cotyledon to 1 leaf stage and 2-4 leaf stage	20110302b.pdf
29602	Oxalis (Oxalis sp.)	Certainty (Sulfosulfuron)	Field Container	Senesac	2010	Over the top	4.0 lb/A was effective on all growth stages while 3.0 lb was effective at the cotyledon-1 leaf and 2-4 leaf stages.	20101129h.pdf
27292	Oxalis (Oxalis sp.)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Gilliam	2008	Over the top	Poor control pre, good control post applied at cotyledon - one leaf or at 2-4 leaf stages at 100 and 150 lb per acre.	20080910b.pdf
27292	Oxalis (Oxalis sp.)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Wilén	2008	Over the top	71 and 91 % control pre at 100 and 150 lb per acre; 43 and 83 % control at 1X and 2X applied at cotyledon to 1-leaf stage; 32 and 14 % control at 1X and 2X applied at 2 to 4-leaf stage	20090618a.pdf
27292	Oxalis (Oxalis sp.)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Regan	2008	Over the top	Excellent control pre and post at cotyledon to 1-leaf, fair and good control at 2 to 4-leaf stages with 2.1 and 3.15 lb ai per acre.	20091125a.pdf
27292	Oxalis (Oxalis sp.)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Neal	2008	Over the top	Good control pre at 2.1 and 3.15 lb ai per acre; poor control at 2.1, fair at 3.15 lb applied at 1-leaf stage; poor control at both rates applied at 4-leaf stage	20090319j.pdf
27292	Oxalis (Oxalis sp.)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Senesac	2008	Over the top	Fair control pre, good post at cotyledon to 1-leaf stage, poor post at 2-4 leaf stage, at 4.2 lb ai per acre; poor at lower rates	20081219c.pdf
27292	Oxalis (Oxalis sp.)	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	Field Container	Boydston	2008	Over the top	90 and 94 % control pre at 2.1 and 3.15 lb ai per acre; 27 and 80 % control at 1X and 2X applied at cotyledon-1 leaf stage; 30 and 92 % control at 1X and 2X applied at 2-4 leaf stage	20090129i.pdf
30211	Oxalis (Oxalis sp.)	Gallery 75DF (Isoxaben)	Field Container	Gilliam	2011	Over the top	Trial 2: Good to very good control with 1 lb ai/a up to 4WAT at all stages; 0.5 lb ai/a provided good control at cotyledon to 1 leaf stage up to 4WAT.	20111101a.pdf
30211	Oxalis (Oxalis sp.)	Gallery 75DF (Isoxaben)	Field Container	Gilliam	2011	Over the top	Trial 1: Good to very good control up to 4WAT at cotyledon to 1 lf stage at 0.5 and 1.0 lb ai/A; 2-4 lf stage lacked acceptable control	20111101a.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
30211	Oxalis (Oxalis sp.)	Gallery 75DF (Isoxaben)	Field Container	Senesac	2011	Over the top	Very good to excellent control with 1 lb ai/a up to 8WAT at preemergent and cotyledon to one leaf stage but poor control at 2 to four leaf stage.	20111107h.pdf
28929	Oxalis (Oxalis sp.)	HGH-63 2G (Oxyfluorfen)	Greenhouse	Senesac	2009	Over the top	Fair control pre, good post at cotyledon to 1-leaf, fair post at 2 to 4-leaf stage with 2 lb ai per acre.	20091130g.pdf
30212	Oxalis (Oxalis sp.)	Indaziflam G (Indaziflam)	Field Container	Gilliam	2011	Broadcast	Trial 2: Excellent control and reduction in fresh weight at all growth stages throughout the evaluation with 50 and 100 g ai/ha.	20111101a.pdf
30212	Oxalis (Oxalis sp.)	Indaziflam G (Indaziflam)	Field Container	Gilliam	2011	Broadcast	Trial 1: Excellent control and reduction in fresh weight at all growth stages throughout the evaluation with 50 and 100 g ai/ha.	20111101a.pdf
30466	Oxalis (Oxalis sp.)	Indaziflam SC (Indaziflam)	Greenhouse	Senesac	2011	Over the top	Excellent control at all stages with 0.045 and 0.089 lb aia.	20111107h.pdf
29603	Oxalis (Oxalis sp.)	SureGuard 51WDG (Flumioxazin)	Field Container	Peachey	2010	Over the top	Excellent oxalis control with 0.56 lb ai per acre plus 0.25% NIS at the cotyledon to 1 leaf stage and 2-4 leaf stage.	20110302b.pdf
29603	Oxalis (Oxalis sp.)	SureGuard 51WDG (Flumioxazin)	Field Container	Senesac	2010	Broadcast	Excellent control of all growth stages with 0.383 lb ai/A.	20101129h.pdf
27761	Oxalis (Oxalis sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Senesac	2009	Over the top	Good control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 1.94 lb ai per acre; 0.97 lb good only at 2 to 4-leaf stage.	20100106a.pdf
27761	Oxalis (Oxalis sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Peachey	2010	Over the top	Good to very good control of oxalis with 0.97 and 1.94 lb ai per acre.	20110302b.pdf
27761	Oxalis (Oxalis sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Senesac	2010	Over the top	Ineffective all rates and timings except for 0.97 and 1.97 lb ai/A at cotyledon to 1 leaf stage.	20101129h.pdf
27761	Oxalis (Oxalis sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Gilliam	2011	Over the top	Trial 1: Good control of cotyledon to 1 leaf stage at 2-4WAT decreasing over time with 0.97 and 1.94 lb ai/A; significantly decreased fresh weights.	20111101a.pdf
27761	Oxalis (Oxalis sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Gilliam	2011	Over the top	Trial 2: Good control at cotyledon to 1 leaf stage up to 8WAT and reduction in fresh weight with 0.97 and 1.94 lb ai/A.	20111101a.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
27761	Oxalis (Oxalis sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Senesac	2011	Over the top	Very good control pre and post at cotyledon to 1-leaf with 1.94 lb ai per acre but unacceptable at 2 to 4 leaf stage. Very good control with 1.94 lb ai per acre at pre and cotyledon to one leaf stage but unacceptable at 2 to 4 leaf stage.	20111107h.pdf
27295	Oxalis (Oxalis sp.)	V-10142 0.5G (Imazasulfuron)	Field Container	Gilliam	2008	Over the top	Good control pre, excellent control post applied at cotyledon - one leaf or at 2-4 leaf stages at 75 and 150 lb per acre; best post treatment.	20080910b.pdf
27295	Oxalis (Oxalis sp.)	V-10142 0.5G (Imazasulfuron)	Field Container	Wilén	2008	Over the top	98 and 99 % control pre at 75 and 150 lb per acre; 78 and 81 % control at 1X and 2X applied at cotyledon to 1-leaf stage; 10 and 4 % control at 1X and 2X applied at 2 to 4-leaf stage	20090618a.pdf
27295	Oxalis (Oxalis sp.)	V-10142 0.5G (Imazasulfuron)	Field Container	Regan	2008	Over the top	Excellent control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.375 and 0.75 lb ai per acre.	20091125a.pdf
27295	Oxalis (Oxalis sp.)	V-10142 0.5G (Imazasulfuron)	Field Container	Neal	2008	Over the top	Good control pre at 0.375 and 0.75 lb ai per acre; poor control at 1X, fair at 2X applied at 1-leaf and 4-leaf stages	20090319j.pdf
27295	Oxalis (Oxalis sp.)	V-10142 0.5G (Imazasulfuron)	Field Container	Senesac	2008	Over the top	Generally 70 % or higher control pre and post at cotyledon to 1-leaf stage, less effective post at 2-4 leaf stage, at 0.38, 0.75 and 1.5 lb ai per acre	20081219e.pdf
27295	Oxalis (Oxalis sp.)	V-10142 0.5G (Imazasulfuron)	Field Container	Boydston	2008	Over the top	93 and 95 % control pre at 0.375 and 0.75 lb ai per acre; 92 and 97 % control at 1X and 2X applied at cotyledon-1 leaf stage; 62 and 70 % control at 1X and 2X applied at 2-4 leaf stage	20090319k.pdf
28931	Oxalis (Oxalis sp.)	V-10142 0.5G (Imazasulfuron)	Greenhouse	Senesac	2009	Over the top	Effective control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.38 and 0.75 lb ai per acre; higher rate better.	20091130k.pdf
29596	Phyllanthus sp (Phyllanthus sp.)	Basagran SG (Bentazon)	Field Container	Senesac	2010	Over the top	Little to no control with 1.0 lb ai/A.	20101129h.pdf
29598	Phyllanthus sp (Phyllanthus sp.)	Casoron 4G (Dichlobenil)	Field Container	Senesac	2010	Over the top	3.0 and 4.0 lb gave excellent control at cotyledon-1 leaf stage throughout the trial. By 4WAT 4 lb rate controlled stages 2-4 lf and 4+ leaf and 3 lb controlled 2-4 lf stage.	20101129h.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
29597	Phyllanthus sp (Phyllanthus sp.)	Certainty (Sulfosulfuron)	Field Container	Senesac	2010	Over the top	By 4WAT 0.035 and 0.094 lb ai/a provided v. good control at cotyledon and 2-4 leaf stage and 0.094 lb/A gave fair to good at 4+ leaf stage.	20101129h.pdf
29599	Phyllanthus sp (Phyllanthus sp.)	SureGuard 51WDG (Flumioxazin)	Field Container	Senesac	2010	Broadcast	Excellent control of emerged seedlings up to 4+ leaf stage with 0.383 lb ai/A.	20101129h.pdf
29600	Phyllanthus sp (Phyllanthus sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Field Container	Senesac	2010	Over the top	0.97 and 1.94 lb ai/A controlled cotyledon-1 lf stage from 1WAT-4WAT while the high rate also controlled the 2-4 leaf stage.	20101129h.pdf
28911	Spurge (Euphorbia sp.)	BroadStar 0.25G (Flumioxazin)	Field Container	Neal	2008	Over the top	Fair control pre at 0.19, good at 0.38 lb ai per acre; poor control at 1X, good at 2X applied at 1-leaf stage; poor control at 1X, poor to fair at 2X applied at 4-leaf stage	20090319j.pdf
27564	Spurge (Euphorbia sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Wilen	2008	Over the top	59 and 89 % control pre at 75 and 150 lb per acre; 14 and 28 % control at 1X and 2X applied at cotyledon-1 leaf stage; 18 and 43 % control at 1X and 2X applied at 4-leaf stage	20090319l.pdf
27564	Spurge (Euphorbia sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Neal	2008	Over the top	Fair control pre at 0.19, good at 0.38 lb ai per acre; poor control at both rates applied at 1-leaf or 4-leaf stage	20090319j.pdf
27564	Spurge (Euphorbia sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Gilliam	2008	Over the top	Excellent control pre at 150 and 300 lb per acre; no control post applied at cotyledon - one leaf at 150, good at 300 lb; virtually no control from both rates applied at 2-4 leaf stage	20090218f.pdf
27564	Spurge (Euphorbia sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Regan	2008	Over the top	Fair and good control pre, no control post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.19 and 0.375 lb ai per acre.	20091125a.pdf
27564	Spurge (Euphorbia sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Senesac	2008	Over the top	Poor control pre, poor to good post at cotyledon to 1-leaf stage, highest control post at 2-4 leaf stage, at 0.19, 0.375 and 0.75 lb ai per acre	20081219b.pdf
27564	Spurge (Euphorbia sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Senesac	2009	Over the top	Generally good control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.19 and 0.375 lb ai per acre.	20091130a.pdf
27564	Spurge (Euphorbia sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Gilliam	2009	Over the top	Trial 1. No to poor control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 75, 150 and 300 lb per acre	20091013a.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
27564	Spurge (Euphorbia sp.)	BroadStar 0.25G VC1604 (Flumioxazin)	Field Container	Gilliam	2009	Over the top	Trial 2. No to poor control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 75, 150 and 300 lb per acre	20091013a.pdf
29516	Spurge (Euphorbia sp.)	Casoron 1.4CS (Dichlobenil)	Greenhouse	Senesac	2009	Over the top	Poor pre, effective post at 2 to 4-leaf with 1 lb ai per acre.	20091130j.pdf
28923	Spurge (Euphorbia sp.)	Casoron 4G (Dichlobenil)	Greenhouse	Senesac	2009	Over the top	Poor control pre and post cotyledon to 1-leaf, fair control post at 2 to 4-leaf stage with 1 and 2 lb ai per acre.	20091130b.pdf
28923	Spurge (Euphorbia sp.)	Casoron 4G (Dichlobenil)	Greenhouse	Gilliam	2009	Over the top	Trial 2. No control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 25 and 50 lb per acre	20091013a.pdf
28923	Spurge (Euphorbia sp.)	Casoron 4G (Dichlobenil)	Greenhouse	Gilliam	2009	Over the top	Trial 1. No control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 25 and 50 lb per acre	20091013a.pdf
28924	Spurge (Euphorbia sp.)	Certainty (Sulfosulfuron)	Greenhouse	Senesac	2009	Over the top	Effective control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.035 and 0.094 lb ai per acre.	20091130c.pdf
28924	Spurge (Euphorbia sp.)	Certainty (Sulfosulfuron)	Greenhouse	Gilliam	2009	Over the top	Trial 1. Fair to good control applied at cotyledon to 1-leaf, less effective applied at 2 - 4 leaf stage with 0.035 and 0.094 lb ai per acre	20091013a.pdf
28924	Spurge (Euphorbia sp.)	Certainty (Sulfosulfuron)	Greenhouse	Gilliam	2009	Over the top	Trial 2. Fair to good control applied at cotyledon to 1-leaf, less effective applied at 2 - 4 leaf stage with 0.035 and 0.094 lb ai per acre	20091013a.pdf
27291	Spurge (Euphorbia sp.)	EXC3898 (Mesotrione + proflumiclor + S-metolachlor)	Field Container	Wilens	2008	Over the top	100 % control pre at 100 and 150 lb per acre; 54 % control at 1X and 2X applied at cotyledon-1 leaf stage; 87 and 75 % control at 1X and 2X applied at 4-leaf stage	20090319l.pdf
27291	Spurge (Euphorbia sp.)	EXC3898 (Mesotrione + proflumiclor + S-metolachlor)	Field Container	Neal	2008	Over the top	Poor control pre at 2.1, fair at 3.15 lb ai per acre; fair control at 1X, good at 2X applied at 1-leaf stage; poor control at both rates applied at 4-leaf stage	20090319j.pdf
27291	Spurge (Euphorbia sp.)	EXC3898 (Mesotrione + proflumiclor + S-metolachlor)	Field Container	Senesac	2008	Over the top	Generally 70 % or higher control pre and post at cotyledon to 1-leaf stage, less effective post at 2-4 leaf stage, at 2.1, 3.15 and 4.2 lb ai per acre	20081219c.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
27291	Spurge (Euphorbia sp.)	EXC3898 (Mesotrione + proflumicetone & S-metolachlor)	Field Container	Boydston	2008	Over the top	57 and 87 % control pre at 2.1 and 3.15 lb ai per acre; 5 and 67 % control at 1X and 2X applied at cotyledon-1 leaf stage; no control at 1X and 2X applied at 2-4 leaf stage	20090129i.pdf
27291	Spurge (Euphorbia sp.)	EXC3898 (Mesotrione + proflumicetone & S-metolachlor)	Field Container	Regan	2008	Over the top	Excellent control pre, good post at cotyledon to 1-leaf, and poor at 2 to 4-leaf stages with 2.1 and 3.15 lb ai per acre.	20091125a.pdf
28866	Spurge (Euphorbia sp.)	FreeHand G (BAS 659H G) (Dimethenamid-p + pendimethalin)	Greenhouse	Gilliam	2008	Over the top	Excellent control pre at 200 and 400 lb per acre; good control at 1X, excellent at 2X applied at cotyledon - one leaf; good control at both rates applied at 2-4 leaf stage	20090218f.pdf
28866	Spurge (Euphorbia sp.)	FreeHand G (BAS 659H G) (Dimethenamid-p + pendimethalin)	Greenhouse	Gilliam	2009	Over the top	Trial 1. Fair to good control applied at cotyledon to 1-leaf, poor control applied at 2 - 4 leaf stage with 200 and 400 lb per acre	20091013a.pdf
28866	Spurge (Euphorbia sp.)	FreeHand G (BAS 659H G) (Dimethenamid-p + pendimethalin)	Greenhouse	Gilliam	2009	Over the top	Trial 2. Fair to good control applied at cotyledon to 1-leaf, poor control applied at 2 - 4 leaf stage with 200 and 400 lb per acre	20091013a.pdf
30986	Spurge (Euphorbia sp.)	Gallery 75DF (Isoxaben)	Field Container	Senesac	2011	Over the top	Poor control with 0.5 and 1.0 lb ai per acre at all stages except for preemergent stage.	20111107h.pdf
28925	Spurge (Euphorbia sp.)	HGH-63 2G (Oxyfluorfen)	Greenhouse	Senesac	2009	Over the top	Good control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 2 lb ai per acre.	20091130g.pdf
28925	Spurge (Euphorbia sp.)	HGH-63 2G (Oxyfluorfen)	Greenhouse	Gilliam	2009	Over the top	Trial 2. No control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 100 lb per acre	20091013a.pdf
28925	Spurge (Euphorbia sp.)	HGH-63 2G (Oxyfluorfen)	Greenhouse	Gilliam	2009	Over the top	Trial 1. No control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 100 lb per acre	20091013a.pdf
30660	Spurge (Euphorbia sp.)	Indaziflam SC (Indaziflam)	Greenhouse	Senesac	2011	Over the top	Very good to excellent control with 0.045 and 0.089 lb ai at preemergent and cotyledon to 1 leaf stage but poor control at 2 to 4 leaf stage.	20111107h.pdf
28865	Spurge (Euphorbia sp.)	Pendulum 2G (Pendimethalin)	Greenhouse	Gilliam	2008	Over the top	Excellent control pre at 1.5 and 3 lb ai per acre; excellent control at both rates applied at cotyledon - one leaf and 2-4 leaf stages	20090218f.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
28865	Spurge (Euphorbia sp.)	Pendulum 2G (Pendimethalin)	Greenhouse	Gilliam	2009	Over the top	Trial 1. Good to excellent control applied at cotyledon to 1-leaf, fair to good control applied at 2 - 4 leaf stages with 2 and 4 lb ai per acre	20091013a.pdf
28865	Spurge (Euphorbia sp.)	Pendulum 2G (Pendimethalin)	Greenhouse	Gilliam	2009	Over the top	Trial 2. Good to excellent control applied at cotyledon to 1-leaf, fair to good control applied at 2 - 4 leaf stages with 2 and 4 lb ai per acre	20091013a.pdf
28867	Spurge (Euphorbia sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Gilliam	2008	Over the top	Excellent control pre at 1.5 and 3 lb ai per acre; excellent control at both rates applied at cotyledon - one leaf; good at 1X, excellent at 2X applied at 2-4 leaf stage	20090218f.pdf
28867	Spurge (Euphorbia sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Senesac	2009	Over the top	Effective control pre, post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.97 and 1.94 lb ai per acre; higher rate better.	20100106a.pdf
28867	Spurge (Euphorbia sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Gilliam	2009	Over the top	Trial 2. Fair to good control applied at cotyledon to 1-leaf, less effective applied at 2 - 4 leaf stage with 21 and 32 fl oz per acre	20091013a.pdf
28867	Spurge (Euphorbia sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Gilliam	2009	Over the top	Trial 1. Fair to good control applied at cotyledon to 1-leaf, less effective applied at 2 - 4 leaf stage with 21 and 32 fl oz per acre	20091013a.pdf
28867	Spurge (Euphorbia sp.)	Tower (BAS 656h EC) (Dimethenamid-p)	Greenhouse	Senesac	2011	Over the top	Good to very good control with 0.97 and 1.94 lb ai per acre at pre and cotyledon to 1-leaf stages but unacceptable control at 2 to 4 leaf stage.	20111107h.pdf
27294	Spurge (Euphorbia sp.)	V-10142 0.5G (Imazasulfuron)	Field Container	Wilen	2008	Over the top	89 and 100 % control pre at 75 and 150 lb per acre; 40 and 65 % control at 1X and 2X applied at cotyledon-1 leaf stage; 30 and 34 % control at 1X and 2X applied at 4-leaf stage	20090319l.pdf
27294	Spurge (Euphorbia sp.)	V-10142 0.5G (Imazasulfuron)	Field Container	Neal	2008	Over the top	Poor control pre at 0.375, fair at 0.75 lb ai per acre; fair control at both rates applied at 1-leaf stage; poor control at both rates applied at 4-leaf stage	20090319j.pdf
27294	Spurge (Euphorbia sp.)	V-10142 0.5G (Imazasulfuron)	Field Container	Senesac	2008	Over the top	Generally 70 % or higher control pre and post at cotyledon to 1-leaf stage, less effective post at 2-4 leaf stage, at 0.38, 0.75 and 1.5 lb ai per acre	20081219e.pdf

PR#	Target	Product	Production Site	Researcher	Trial Year	Application Type	Results	Data Link
27294	Spurge (Euphorbia sp.)	V-10142 0.5G (Imzasulfuron)	Field Container	Boydston	2008	Over the top	38 and 97 % control pre at 0.375 and 0.75 lb ai per acre; 78 and 83 % control at 1X and 2X applied at cotyledon-1 leaf stage; 88 and 87 % control at 1X and 2X applied at 2-4 leaf stage	20090319k.pdf
27294	Spurge (Euphorbia sp.)	V-10142 0.5G (Imzasulfuron)	Field Container	Regan	2008	Over the top	Excellent control pre, good post at cotyledon to 1-leaf and poor at 2 to 4-leaf with 0.375 and 0.75 lb ai per acre.	20091125.pdf
28926	Spurge (Euphorbia sp.)	V-10142 0.5G (Imzasulfuron)	Greenhouse	Senesac	2009	Over the top	Generally effective control pre and post at cotyledon to 1-leaf and 2 to 4-leaf stages with 0.38 and 0.75 lb ai per acre; higher rate better.	20091130k.pdf
28926	Spurge (Euphorbia sp.)	V-10142 0.5G (Imzasulfuron)	Greenhouse	Gilliam	2009	Over the top	Trial 1. No control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 75 and 150 lb per acre	20091013a.pdf
28926	Spurge (Euphorbia sp.)	V-10142 0.5G (Imzasulfuron)	Greenhouse	Gilliam	2009	Over the top	Trial 2. No control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 75 and 150 lb per acre	20091013a.pdf

Label Suggestions

The following label suggestions are for use in container grown ornamentals provided an acceptable level of crop safety exists.

Certainty at 0.035 and 0.094 lb ai/A for preemergent and early postemergent control of bittercress and oxalis.

EXC3898 at 2.1 to 3.15 lb ai/A for preemergent and early postemergent control of bittercress.

Gallery 75 DF at 1 lb ai/A for early postemergent control of bittercress.

Indaziflam at 50 and 100 g/ha for preemergent and early postemergent control of oxalis.

Pendulum at 4 lb ai/A for early postemergent control of spurge.

V-10142 at 0.38 to 0.75 lb ai/A for preemergent and early postemergent control of bittercress and oxalis.

Appendix 1: Contributing Researchers

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Appendix 2: Submitted Data Reports

The IR-4 reports in this Appendix cover multiple PR numbers and are arranged alphabetically by the researchers' last names. Only those reports received by 11/10/2011 are included.

These reports can also be found at www.rutgers.ir4.edu by searching under the Efficacy for Broadleaved Weeds project.