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## **IR-4 Environmental Horticulture Program Spurge Efficacy**

***Chamaesyce maculata (=Euphorbia maculata)***

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## Abstract

Nursery growers have had a longstanding battle to control weeds in environmental horticulture crops. Spurge (*Chamaesyce maculata*), is one of the most difficult weeds to control in container grown ornamentals. It grows aggressively in containers and can outcompete ornamental crops for water, nutrients, and light. Several chemical tools are available for preemergent control. However, there remains a need for effective control of emerged weed seedlings. At the 2007 Environmental Horticulture Workshop, IR-4 initiated a study to determine whether preemergent herbicides could provide efficacy for spurge, and other weeds, up to the 2-4 leaf stage. Research was conducted from 2008 through 2019. This report is a brief summary of available data from 18 experiments received through the IR-4 Environmental Horticulture Program. Early postemergence applications of Casoron, Certainty, Gallery, Marengo/Indaziflam, Pendulum, SP 1770, Tower and V-10142 provided significant control of emerged spurge. 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 environmental horticulture crops. Spurge (*Chamaesyce maculata*) is one of the most difficult weeds to control in container grown ornamentals. It grows aggressively in containers and can outcompete ornamental crops for water, nutrients, and light. Several chemical tools are available for preemergent control. However, there remains a need for effective control of emerged weed seedlings. At the 2007 Environmental Horticulture Workshop, IR-4 initiated a study to determine whether preemergent herbicides could provide efficacy for spurge, and other weeds, up to the 2-4 leaf stage. Research was conducted from 2008 through 2019.

## Materials and Methods

Between 2008 and 2019, several products were tested as preemergence or over-the-top foliar applications against spurge. In many experiments, researchers also included other important weeds although this report is a summary of spurge data. A minimum of 4 plants (replicate treatments) were required with many researchers exceeding this minimum. Evaluations of percent cover and percent control were estimated at various intervals after treatment. For more detailed materials and methods, please see Appendix 1: Protocols and Appendix 3: Research Reports. For IR-4 2018 and 2019 testing, the following protocols were used: 18-019 and 19-019. Please visit <https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-researcher-resources/#Protocols> to view and download these protocols.

Products were supplied to researchers (See list of researchers in Appendix 1) by their respective manufacturers.

For all research data tables, product names have been updated where manufacturers have established trade names and tables have been rearranged by product alphanumeric order.

**Table 1. List of Products and Rates Tested from 2008 to 2019.**

Product <sup>1</sup>	Active Ingredient(s)	Manufacturer	Rate(s) Tested/Acre	
			Pounds Active Ingredient	Product
Basagran	bentazon	BASF	0.75	24 fl oz
			1.0	32 fl oz
Broadstar 0.25G original formulation	flumioxazin	Valent	0.19	75 lb
			0.375	150 lb
			0.75	300 lb
Broadstar VC1604 0.25G	flumioxazin	Valent	0.19	75 lb
			0.38	150 lb
Casoron 4G	dichlobenil	Chemtura Corp.	1.0	25 lb
			2.0	50 lb
Certainty	sulfosulfuron	Valent	0.035	0.75 oz
			0.094	2.0 oz
Dimension	dithiopyr	Dow	0.5	32 fl oz
			1.0	64 fl oz
			2.0	128 fl oz
Dismiss 4F	sulfentrazone	FMC	0.25	8 fl oz
			0.375	12 fl oz
EXC3898 2.1G	mesotrione + prodiamine + s-metolachlor	Syngenta	2.10	100 lb
			3.15	150 lb
Fiesta	iron HEDTA	Neudorff		25/1 ksf
				50/1 ksf
FreeHand 1.75G	pendimethalin + dimethenamid-p	BASF	3.5	200 lb
			7.0	400 lb
Gallery 75DF	isoxaben	Dow AgroSciences	1.0	1.33 lb
HGH-63 2G	oxyfluorfen	Harrold's	1.0	50 lb
			2.0	100 lb
Indaziflam	indaziflam	Bayer	50 g/ha	150 lb
			100 g/ha	300 lb
Marengo 0.622SC	indaziflam	Bayer	0.04	9 fl oz
Pendulum 3.3EC	pendimethalin	BASF	2.0	77.58 fl oz
			4.0	155 fl oz
Pendulum 2G	pendimethalin	BASF	3	150 lb
			6	300 lb
			12	600 lb
Sedgehammer 75	halosulfuron-methyl	Gowan	0.04	9 fl oz
SP1770	SP1770	SePro		9.6 fl oz
				19.2 fl oz
				38.4 fl oz
SureGuard 51WDG	flumioxazin	Valent	0.383	0.75 oz
			0.5625	8.2 oz
Tower 6.0EC (BAS 656h EC)	dimethenamid-p	BASF	0.97	21 fl oz
			1.5	32 fl oz
			1.94	42 fl oz
			3.0	64 fl oz

<b>Product</b> <sup>1</sup>	<b>Active Ingredient(s)</b>	<b>Manufacturer</b>	<b>Rate(s) Tested/Acre</b>	
			<b>Pounds Active Ingredient</b>	<b>Product</b>
V-10142	imazosulfuron	Valent	0.375	75 lb
			0.75	150 lb

<sup>1</sup> In some cases surfactant such as crop oil concentrate (COC) or non-ionic surfactant (NIS) were used and noted in individual experiments.

## Results and Summary

### Overview

Several experiments were conducted during 2008-2019 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, SP 170 and Tower. For this summary, commercial or acceptable weed control is defined as >70% efficacy. Products varied in efficacy depending on the stage treated (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:** All herbicides applied prior to germination had some appreciable effect with the exception of Casoron and HGH-63. Certainty was not 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 21). V-10142 at 0.75 lb ai/A reached commercial control in five out of nine experiments. 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 15). HGH-63 at 2.0 lb ai/A controlled spurge with an injury rating of 65% at 4 WAT in one study 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. 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 treatments that provided consistent control at this stage were Marengo and Pendulum at 4.0 lb ai/a. 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 15) while Casoron 1.4CS at 1.0 lb ai/A provided a 70% injury rating 4 WAT (Table 20). None of the other treatments provided consistent control of spurge at the two to four leaf stage.

**Mature Stage:** Postemergence activity was poor for mature stage of spurge (Table 25).



**Table 2. 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
Basagran (bentazon)	0.75	-	-	0 of 3
	1.0	-	-	1 of 3
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
Dimension (dithiopyr)	0.5	-	-	1 of 1
	1.0	-	-	1 of 1
	2.0	-	-	1 of 1
Dismiss 4F (sulfentrazone)	0.25	-	-	0 of 3
	0.375	-	-	0 of 3
EXC3898 (mesotrione + prodiamine + s-metolachlor)	2.1	4 of 4 <sup>1</sup>	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
Fiesta	25/1 ksf	-	-	0 of 3
	50/1 ksf	-	-	1 of 3
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	1 of 2
	2.0	-	-	1 of 1
	4.0	-	-	1 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
Marengo 0.622SC (indaziflam)	0.04	-	-	2 of 3
Pendulum (pendimethalin)	2.0	1 of 1	3 of 3	1 of 3
	3.0	-	-	1 of 1
	4.0	1 of 1	3 of 3	3 of 3
	6.0	-	-	1 of 1
	12.0	-	-	1 of 1
SP1770	9.6 fl oz/A	-	-	0 of 1
	19.2 fl oz/A	-	-	0 of 1
	38.4 fl oz/A	-	-	1 of 1
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

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
	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

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

## Individual Research Reports

### **Boydston, 2008**

In 2008, Boydston 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 (Table 3). 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 (Table 4). 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 3. Efficacy of Pre-emergent Herbicides for Spurge, Stage 0, Boydston, 2008.**

Product – Rate (lb ai/A)	Efficacy Rating		# Plants/pot <sup>1</sup>	
	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
LSD (P=.05)	9.995	13.756	3.701	3.889
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
LSD (P=.05)	68.155	63.899	11.37	12.755

<sup>1</sup> No significant difference in number of live plants per pot on Day of Application.

**Table 4. Efficacy of Pre-emergent Herbicides for Emerged Spurge, Stages 1 and 2, Boydston, 2008.**

Product – Rate (lb ai/A)	Efficacy Rating		# Plants/pot <sup>1</sup>
	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
LSD (P=.05)	13.086	14.385	6.068
<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
LSD (P=.05)	52.071	46.421	5.828
<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
LSD (P=.05)	9.253	9.437	9.995
<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
LSD (P=.05)	9.253	9.253	6.321

<sup>1</sup> No 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 5).

**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 lbai/A and Tower at 3.0 lb ai/A 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 30 DAT 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 5. Efficacy of Pre-emergent Herbicides for Spurge (*Chamaesyce maculata*), Gilliam, 2008.**

Product – Rate (lb ai/A)	Weed Numbers <sup>7</sup>			Fresh Weights <sup>2</sup>
	10 DAT <sup>3</sup>	20 DAT	30 DAT--	30 DAT
<i>Preemergent</i>				
Broadstar VC1604 – 0.375	----- <sup>4</sup>	-----	-----	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 <sup>4</sup>	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

<sup>1</sup> Plant injury ratings on scale of 1 to 10. 1 = no injury, 10 = dead

<sup>2</sup> Fresh weights measured in grams.

<sup>3</sup> DAT = Days after treatment

<sup>4</sup> No ratings taken

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

### **Spurge – Neal, 2008**

In 2008, Neal 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 (Table 6). 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 (Table 7). 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 (Table 8). 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 6. Efficacy of Pre-emergent Herbicides for Spurge (*Chamaesyce maculata*), Stage 0, Neal, 2008.**

Product – Rate (lb ai/A)	Efficacy Rating <sup>1</sup>			
	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

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

**Table 7. Efficacy of Pre-emergent Herbicides for Emerged Spurge (*Chamaesyce maculata*), Stage 1, Neal, 2008.**

Product – Rate (lb ai/A)	Efficacy Rating <sup>1</sup>			
	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 VC1604 0.25G – 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

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

**Table 8. Efficacy of Pre-emergent Herbicides for Spurge (*Chamaesyce maculata*), Stage 2, Neal, 2008.**

Product – Rate (lb ai/A)	Efficacy Rating <sup>1</sup>		
	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

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

### **Regan, 2008**

In 2008, Regan 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 3 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 spurge.

**Table 9. Efficacy of Pre-emergent Herbicides for Spurge (*Chamaesyce maculata*), Regan 2008.**

Product – Rate (lb ai/A)	Percent Germination
	4 WAT <sup>1</sup>
<i>Preemergent Timing</i>	
Broadstar VC1604 0.25G – 0.19	14.0 b <sup>2</sup>
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

<sup>1</sup> Weeks After Treatment

<sup>2</sup> 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 10. 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 <sup>2</sup>
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

<sup>1</sup> Weeks After Treatment

<sup>2</sup> 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)



### 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 (Table 12, Table 13). In contrast, Broadstar VC1604 had poor to moderate efficacy ratings at this stage (Table 11).

**Stage 1:** V-10142 (all rates), EXC3898 (3.15 and 4.2 lb ai/A) and Broadstar VC1604 (0.75 lb ai/A) gave commercially acceptable control of spurge at this stage 3WAT (Table 11 - Table 13).

**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 11 - Table 13).

**Table 11. Efficacy of Broadstar VC1604 0.25G for Emerged Spurge (*Chamaesyce 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
Fisher’s LSD@ 0.05	38	43	38

**Table 12. Efficacy of V-10142 for emerged spurge (*Chamaesyce 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 13. Efficacy of EXC3898 for Spurge (*Chamaesyce 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

**Wilén, 2008**

During 2008, Wilén 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 (Table 14). 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 (Table 15). 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 14. 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 15. 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

### **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 provided a 70% injury rating at 14 DAT but wasn't commercially acceptable at other ratings (Table 16). 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 Certainty (0.094 lb ai/A) had statistically similar fresh weights to spurge treated with Pendulum (4.0 lb ai/A).

## **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  $\geq 80\%$  (Table 17). 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 2-4 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 no to little 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 2-4 leaf stage with only Pendulum 3.3EC at the high rate providing acceptable efficacy.

**Table 16. Efficacy of Pre-emergent Herbicides for Spurge (*Chamaesyce maculata*), Gilliam 2009 Experiment 1.**

Treatment	Rate	Injury Ratings <sup>Z</sup> and Fresh Weights <sup>Y</sup>									
		Cotyledon to One Leaf					2 to 4 Leaf				
		7 DAT <sup>X</sup>	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 <sup>V</sup>	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
	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
	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
	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
	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
	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
	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
	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
	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

<sup>Z</sup> Injury ratings on a scale of 1 to 10, 1 = no injury, 10 = dead plant.

<sup>Y</sup> Fresh weights taken at 28 days after treating and measured in grams.

<sup>X</sup> DAT = Days after treatment.

<sup>V</sup> Means separated using Duncan's Multiple Range Test (alpha = 0.05).

**Table 17. Efficacy of Pre-emergent Herbicides for Spurge (*Chamaesyce maculata*), Gilliam 2009 Experiment 2.**

Treatment	Rate	Injury Ratings <sup>Z</sup> and Fresh Weights <sup>Y</sup>									
		Cotyledon to One Leaf					2 to 4 Leaf				
		7 DAT <sup>X</sup>	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 <sup>W</sup>	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
	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
	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
	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
	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
	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
	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
	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
	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

<sup>Z</sup> Injury ratings on a scale of 1 to 10, 1 = no injury, 10 = dead plant.

<sup>Y</sup> Fresh weights taken at 28 days after treating and measured in grams.

<sup>X</sup> DAT = Days after treatment.

<sup>W</sup> Means separated using Duncan's Multiple Range Test (alpha = 0.05).

### **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 18).

**Stage 1:** Commercially acceptable control of spurge was achieved at 4 WAT 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 2-4 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.

### **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 8 WAT (Table 19).

**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 2-4 leaf stage.



**Table 18. 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 1.4CS	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
Fisher's LSD @ 0.05		26	26	29

**Table 19. 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
Fisher's LSD @ 0.05		9	8	12	10

**Derr 2015**

In 2015 Derr tested Dimension, Gallery and Pendulum for pre-emergence control of spotted spurge (*C. maculata*), in field containers. All products generally provided good control although the stand was erratic (Table 20).

**Table 20. Efficacy of Pre-emergent Herbicides for Spurge (*Chamaesyce maculata*), Derr, VA, 2015.**

Treatment	Rate (lb ai/a)	No. Per Plot 27 DAT	% Control 40 DAT
Dimension	0.5	7.8	81
	1.0	0.0	100
	2.0	0.0	100
Gallery SC	1.0	1.3	93
	2.0	0.8	93
	4.0	0.0	100
Gallery + Dimension	1.0 + 0.5	2.8	96
Pendulum 2G	3	2.8	93
	6	9.3	78
	12	5.0	99
Pendulum AquaCap + Gallery SC	3.0 + 1.0	2.0	90
Untreated	-	15.5	25
LSD P=.05	-	7.5	23

### **Derr 2017**

In 2018 Derr tested Barricade and SP1770 for postemergence control of spotted spurge (*C. maculata*), in field containers. Barricade provided excellent control, while SP 1770 gave poor to fair control (Table 21).

**Table 21. Efficacy of Herbicides for Spurge (*Chamaesyce maculata*), Derr, VA, 2017.**

Treatment	Rate	No. of Plants 30 DAT	% Control 38 DAT
Barricade	32 fl oz/A	0.3	100
SP 1770	9.6 fl oz/A	8.0	38
	19.2 fl oz/A	2.8	63
	38.4 fl oz/A	2.3	75
Untreated	-	19.3	0
LSD P=.05	-	5.0	39

### **Aulach 2018**

In 2018, Aulach tested Basagran, Dismiss, Fiesta and Marengo for postemergence control of spotted/prostate spurge (*C. maculata*), in field containers. Marengo provided only up to 64% control, while Basagran, Dismiss and Fiesta were ineffective (Table 22).

**Table 22. Efficacy of Herbicides for Spurge (*Chamaesyce maculata*), Aulach, CT, 2018.**

Product	Rate (fl oz/A)	Percent Control*			Fresh Biomass* 3 WAT
		7 DAT	14 DAT	21 DAT	
Basagran T&O 4F	24	0 d	0 d	0 c	33 bc
	32	0 d	0 d	0 c	51 ab
Dismiss 4F	8	22 b	0 b	0 b	36 bc
	12	25 b	0 b	0 b	47 ab
Fiesta	25	0 c	0 b	0 b	59 ab
	50	0 c	0 b	0 b	72 a
Marengo SC	9	41 a	64 a	55 a	14 c
Untreated	-	-	-	-	34 bc

\*Average weed control from 4 flats/replications. Weeds were 2 to 3-inch tall at the time of treatment.

\*\*Average weed fresh weight from 4 flats, each containing 25-30 plants/flat

### **Marble 2018**

In 2018, Marble tested Basagran, Dismiss, Fiesta and Marengo applied postemergence for mature spotted spurge (*C. maculata*), in field containers. Basagran and Fiesta provided no control, while Dismiss and Marengo provided poor control of mature weeds (Table 23).

**Table 23. Efficacy of Herbicides for Spurge (*Chamaesyce maculata*), Marble, FL, 2018.**

Product	Rate (fl oz/A)	Control Rating (0-10) <sup>x</sup>				Fresh Wt (g) 3 WAT
		3 DAT	7 DAT	14 DATy	21 DAT	
Basagran T&O 4F	24	0.0 b	0.0 c	0.0 b	0.0 b	31.6 a
	32	0.0 b	0.0 c	0.0 b	0.0 b	29.6 ab
Dismiss 4F	8	0.6 a	0.8 b	0.8 b	0.7 ab	29.6 ab
	12	0.8 a	1.6 a	1.8 a	1.9 a	22.4 d
Fiesta	25	0.0 b	0.0 c	0.0 b	0.0 b	27.7 ab
	50	0.0 b	0.0 c	0.0 b	0.0 b	28.2 ab
Marengo SC	9	0.0 b	0.9 b	1.8 a	1.9 a	22.9 ab
Untreated	-	0.0 b	0.0 c	0.0 b	0.0 b	26.6 ab

<sup>x</sup> Control ratings taken on a scale of 0-10, 0 = no control and 10 = dead plant. Means followed by the same letter within a column and within each species are not significantly different (Fisher's LSD 0.05).

### **Senesac 2018 & 2019**

In 2018 and 2019, Senesac tested Basagran, Dismiss, Fiesta and Marengo for postemergence control of spurge (*Chamaesyce maculata*) at the young seedling stage, in field containers. In 2018, Fiesta moderate control, Marengo provided good control, while both Basagran and Dismiss provided poor control (Table 24). In 2019, Fiesta provided excellent control at the high rate, Marengo provided good control, while both Basagran and Dismiss provided poor to fair control (Table 25).

**Table 24. Efficacy of Herbicides for Emerged Spurge (*Chamaesyce maculata*), Senesac, NY, 2018.**

Treatment	Rate	% Control				Fresh Wt (gm) 21 DAT
		3 DAT	7 DAT	14 DAT	21 DAT	
Basagran T&O 4F	24 fl oz/A	3	15	8	3	42
	32 fl oz/A	5	15	10	8	30
Dismiss 4F	8 fl oz/A	13	23	18	3	38
	12 fl oz/A	18	33	25	35	24
Fiesta 26.52%	25 oz/1000 sq ft	40	53	43	45	23
	50 oz/1000 sq ft	48	53	40	50	28
Marengo 0.622SC	9 fl oz/A	10	20	75	85	17
Untreated	-	0	0	0	0	31
Fisher's LSD P =.05		9	11	12	7	11

**Table 25. Efficacy of Herbicides for Emerged Spurge (*Chamaesyce maculata*), Senesac, NY, 2019.**

Treatment	Rate	% Control			Fresh Wt (g) 21 DAT
		3 DAT	7 DAT	14 DAT	
Basagran T&O 4F	24 fl oz/A	43	77	43	25
	32 fl oz/A	43	77	70	20
Dismiss 4F	8 fl oz/A	0	37	20	48
	12 fl oz/A	0	53	57	30
Fiesta 26.52%	25 oz/1000 sq ft	93	80	63	31
	50 oz/1000 sq ft	93	100	97	4
Marengo 0.622SC	9 fl oz/A	97	80	80	2
Untreated	-	0	0	0	55
Fisher's LSD P =.05		32	24	35	33

### ***Efficacy Summary by Product/Active Ingredient***

A brief efficacy summary for select products is given below.

**Basagran** generally provided poor control when applied postemergence in 3 experiments.

**Broadstar 0.25G** (original formulation) was tested by one researcher (Neal) and demonstrated effective control when applied preemergence, but not at the cotyledon to 1 leaf and 2-4 leaf stages.

**Broadstar VC1604** results were varied across experiments ranging from poor to very good.

Overall, Broadstar VC1604 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).

**Casoron 104CS** provided good control when applied at the 2 to 4 leaf stage in one experiment.

**Certainty** provided very good early postemergence control.

**Dimension** provided very good preemergence control in one experiment.

**Dismiss** provided poor postemergence control in 3 experiments.

**EXC3898** provided commercially acceptable control when applied preemergence, but not at the cotyledon to 1 leaf and 2-4 leaf stages. This product will not be registered.

**Fiesta** generally provided poor control when applied postemergence in 3 experiments.

**Gallery** generally provided good control when applied preemergence and at the cotyledon to 1 leaf stage.

**HGH-63** provided good control when applied postemergence in only 1 of 3 experiments.

**Marengo/Indaziflam** generally provided good preemergence and postemergence control.

**Pendulum** generally provided good preemergence control and postemergence control.

**SP 1770** controlled spurge effectively only at the highest rate applied postemergence in 1 experiment.

**Tower** generally provided good control when applied preemergence and early postemergence.

**V-10142** generally provided good control when applied preemergence and early postemergence.

Please see Table 26 for a list of all researchable studies and the summary of experiments conducted from 2008 to 2019.

**Table 26. Summary of Efficacy By Product**

Note: Table entries are sorted by crop Latin name. Only those experiments received by 3/10/2020 are included in the table below.

PR#	Product (Active Ingredient)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33524	Barricade 4FL (Prodiamine)	WSSA 3	Spurge, Spotted/ Prostrate (Chamaesyce maculata)	None (None)	Field Container	Derr	VA	2017	Over the top	Excellent control with 32 fl oz per acre.
33942	Basagran T&O Herbicide (Bentazon)	WSSA 6	Spurge, Spotted/ Prostrate (Chamaesyce maculata)	None (None)	Field Container	Aulakh	CT	2018	Over the top	24 and 32 fl oz per acre provided poor control of spotted spurge.
33942	Basagran T&O Herbicide (Bentazon)	WSSA 6	Spurge, Spotted/ Prostrate (Chamaesyce maculata)	None (None)	Field Container	Marble	CT	2018	Over the top	Poor control with 24 and 32 fl oz per acre applied twice.
33942	Basagran T&O Herbicide (Bentazon)	WSSA 6	Spurge, Spotted/ Prostrate (Chamaesyce maculata)	None (None)	Field Container	Senesac	NY	2019	Over the top	Poor to fair control with 24 and 32 fl oz + COC per acre.
33803	Basagran T&O Herbicide (Bentazon)	WSSA 6	Spurge (Chamaesyce sp.)	None (None)	Field Container	Senesac	NY	2018	Over the top	Poor control of spurge with 24 and 32 fl oz per acre.
33504	Biathlon (Oxyfluorfen + Prodiamine)	WSSA 14 + WSSA 3	Spurge, Spotted/ Prostrate (Chamaesyce maculata)	None (None)	Field Container	Derr	VA	2017	Over the top	Poor control with 2.75 lb ai per acre applied twice.
28911	BroadStar 0.25G (Flumioxazin)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata	Field Container	Neal	NC	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
27564	BroadStar 0.25G VC1604 (Flumioxazin)	WSSA 14	Spurge (Chamaesyce sp.)	None (None)	Field Container	Wilén	CA	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
27564	BroadStar 0.25G VC1604 (Flumioxazin)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata	Field Container	Neal	NC	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
27564	BroadStar 0.25G VC1604 (Flumioxazin)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce. Maculata	Field Container	Gilliam	AL	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

PR#	Product (Active Ingredient)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
27564	BroadStar 0.25G VC1604 (Flumioxazin)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce. Maculata	Field Container	Regan	OR	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.
27564	BroadStar 0.25G VC1604 (Flumioxazin)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Field Container	Senesac	NY	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
27564	BroadStar 0.25G VC1604 (Flumioxazin)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Field Container	Senesac	NY	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.
27564	BroadStar 0.25G VC1604 (Flumioxazin)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Field Container	Gilliam	AL	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
27564	BroadStar 0.25G VC1604 (Flumioxazin)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Field Container	Gilliam	AL	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
29516	Casoron 1.4CS (Dichlobenil)	WSSA 20	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Greenhouse	Senesac	NY	2009	Over the top	Poor pre, effective post at 2 to 4-leaf with 1 lb ai per acre.
28923	Casoron 4G (Dichlobenil)	WSSA20	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Greenhouse	Senesac	NY	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.
28923	Casoron 4G (Dichlobenil)	WSSA20	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
28923	Casoron 4G (Dichlobenil)	WSSA20	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
28924	Certainty Turf Herbicide (Monsanto) (Sulfosulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Greenhouse	Senesac	NY	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.



PR#	Product (Active Ingredient)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
28924	Certainty Turf Herbicide (Monsanto) (Sulfosulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
28924	Certainty Turf Herbicide (Monsanto) (Sulfosulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
32615	Dimension 2EW (Dithiopyr)	WSSA 3	Spurge (Chamaesyce sp.)	None (None) E. maculata	Field Container	Derr	VA	2015	Over the top	Poor control with 0.5, excellent with 1 and 2 lb ai per acre.
33946	Dismiss 4F (Sulfentrazone)	WSSA 14	Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Aulakh	CT	2018	Over the top	8 and 12 fl oz per acre provided poor control of spotted spurge.
33946	Dismiss 4F (Sulfentrazone)	WSSA 14	Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Marble	FL	2018	Over the top	Poor control with 8 and 12 fl oz per acre applied twice.
33946	Dismiss 4F (Sulfentrazone)	WSSA 14	Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Senesac	NY	2019	Over the top	Poor to fair control with 8 and 12 fl oz per acre.
33804	Dismiss 4F (Sulfentrazone)	WSSA 14	Spurge (Chamaesyce sp.)	None (None)	Field Container	Senesac	NY	2018	Over the top	Poor control of spurge with 8 and 12 fl oz per acre.
27291	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	WSSA 27 + WSSA 3 + WSSA 15	Spurge (Chamaesyce sp.)	None (None)	Field Container	Wilén	CA	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
27291	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	WSSA 27 + WSSA 3 + WSSA 15	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata	Field Container	Neal	NC	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
27291	EXC3898 (Mesotrione + prodiamine & S-metolachlor)	WSSA 27 + WSSA 3 + WSSA 15	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Field Container	Senesac	NY	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

PR#	Product (Active Ingredient)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
27291	EXC3898 (Mesotrione + proflumicetone & S-metolachlor)	WSSA 27 + WSSA 3 + WSSA 15	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata 'Spotted'	Field Container	Boydston	WA	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
27291	EXC3898 (Mesotrione + proflumicetone & S-metolachlor)	WSSA 27 + WSSA 3 + WSSA 15	Spurge (Chamaesyce sp.)	None (None) E. maculata	Field Container	Regan	OR	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.
33950	Fiesta Herbicide (Iron HEDTA)		Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Aulakh	CT	2018	Over the top	25 and 50 oz per acre provided no control spotted spurge.
33950	Fiesta Herbicide (Iron HEDTA)		Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Marble	FL	2018	Over the top	Poor control with 25 and 50 fl oz per acre applied twice.
33950	Fiesta Herbicide (Iron HEDTA)		Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Senesac	NY	2019	Over the top	Fair control with 25, excellent 50 oz per 1000 sq ft.
33805	Fiesta Herbicide (Iron HEDTA)		Spurge (Chamaesyce sp.)	None (None)	Field Container	Senesac	NY	2018	Over the top	Moderate control of spurge with 25 and 50 oz per 1000 sq ft.
33505	Freehand G (Dimethenamid-p + pendimethalin)	WSSA 15 + WSSA 3	Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Derr	VA	2017	Over the top	Mediocre control with 150 lb per acre applied twice.
28866	Freehand G (Dimethenamid-p + pendimethalin)	WSSA 15 + WSSA 3	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
28866	Freehand G (Dimethenamid-p + pendimethalin)	WSSA 15 + WSSA 3	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
28866	Freehand G (Dimethenamid-p + pendimethalin)	WSSA 15 + WSSA 3	Spurge (Chamaesyce sp.)	None (None) E. maculata	Greenhouse	Gilliam	AL	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

PR#	Product (Active Ingredient)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
30986	Gallery 75DF (Isoxaben)	WSSA 21	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata	Field Container	Senesac	NY	2011	Over the top	Poor control with 0.5 and 1.0 lb ai per acre at all stages except for preemergent stage.
32616	Gallery SC (Isoxaben)	WSSA 21	Spurge (Chamaesyce sp.)	None (None) E. maculata	Field Container	Derr	VA	2015	Over the top	Great control with 1, excellent with 2 and 4 lb ai per acre.
33517	Gemini Granular (Prodiamine + isoxaben)		Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Derr	VA	2017	Over the top	Good control with 200 lb per acre applied twice;comparable to Snapshot.
28925	HGH-63 2G (Oxyfluorfen)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Greenhouse	Senesac	NY	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.
28925	HGH-63 2G (Oxyfluorfen)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	2009	Over the top	Trial 1. No control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 100 lb per acre
28925	HGH-63 2G (Oxyfluorfen)	WSSA 14	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	2009	Over the top	Trial 2. No control applied at cotyledon to 1-leaf and 2 - 4 leaf stages at 100 lb per acre
33954	Marengo 74SC (Indaziflam)	WSSA 29	Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Aulakh	CT	2018	Over the top	9 fl oz per acre provided effective control of spotted spurge.
33954	Marengo 74SC (Indaziflam)	WSSA 29	Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Marble	FL	2018	Over the top	Poor control with 9 fl oz per acre applied twice.
33954	Marengo 74SC (Indaziflam)	WSSA 29	Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Senesac	NY	2019	Over the top	Good control with 9 fl oz per acre.
33806	Marengo 74SC (Indaziflam)	WSSA 29	Spurge (Chamaesyce sp.)	None (None)	Field Container	Senesac	NY	2018	Over the top	Good control of spurge with 9 fl oz per acre.
30660	Marengo 74SC (Indaziflam)	WSSA 29	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata	Greenhouse	Senesac	NY	2011	Over the top	Very good to excellent control with 0.045 and 0.089 lb aia at preemergent and cotlydon to 1 leaf stage but poor control at 2 to 4 leaf stage.
28865	Pendulum 2G (Pendimethalin)	WSSA 17	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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

PR#	Product (Active Ingredient)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
28865	Pendulum 2G (Pendimethalin)	WSSA 17	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
32617	Pendulum 2G (Pendimethalin)	WSSA 17	Spurge (Chamaesyce sp.)	None (None) E. maculata	Field Container	Derr	VA	2015	Over the top	Mediocre control with 3, 6 and 12 lb ai per acre.
28865	Pendulum 2G (Pendimethalin)	WSSA 17	Spurge (Chamaesyce sp.)	None (None) E. maculata	Greenhouse	Gilliam	AL	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
33506	Rout (Oxyfluorfen + Oryzalin)	WSSA 14 + WSSA 3	Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Derr	VA	2017	Over the top	Mediocre control with 100 lb per acre applied twice.
33520	Snapshot 2.5TG (Trifluralin + Isoxaben)	WSSA 3 + WSSA 21	Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Derr	VA	2017	Over the top	Good control with 200 lb per acre applied twice.
33523	SP1770 Liquid (SP1770)		Spurge, Spotted/Prostrate (Chamaesyce maculata)	None (None)	Field Container	Derr	VA	2016	Over the top	Poor to fair control with 9.6, 19.2 and 38.4 fl oz per acre.
28867	Tower (Dimethenamid-p)	WSSA 15	Spurge (Chamaesyce sp.)	None (None) Chamaesyce hirsuta	Greenhouse	Senesac	NY	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.
28867	Tower (Dimethenamid-p)	WSSA 15	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Greenhouse	Senesac	NY	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.
28867	Tower (Dimethenamid-p)	WSSA 15	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
28867	Tower (Dimethenamid-p)	WSSA 15	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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

PR#	Product (Active Ingredient)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
28867	Tower (Dimethenamid-p)	WSSA 15	Spurge (Chamaesyce sp.)	None (None) E. maculata	Greenhouse	Gilliam	AL	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
27294	V-10142 0.5G (Imazasulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None)	Field Container	Wilén	CA	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
27294	V-10142 0.5G (Imazasulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata	Field Container	Neal	NC	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
27294	V-10142 0.5G (Imazasulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Field Container	Senesac	NY	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
28926	V-10142 0.5G (Imazasulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) Chamaesyce humistrata	Greenhouse	Senesac	NY	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.
28926	V-10142 0.5G (Imazasulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
28926	V-10142 0.5G (Imazasulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata (spotted spurge)	Greenhouse	Gilliam	AL	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
27294	V-10142 0.5G (Imazasulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) Chamaesyce maculata 'Spotted'	Field Container	Boydston	WA	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

<b>PR#</b>	<b>Product (Active Ingredient)</b>	<b>MOA Class</b>	<b>Target</b>	<b>Crop</b>	<b>Production Site</b>	<b>Researcher</b>	<b>State</b>	<b>Year</b>	<b>Application Type</b>	<b>Results</b>
27294	V-10142 0.5G (Imzasulfuron)	WSSA 2	Spurge (Chamaesyce sp.)	None (None) E. maculata	Field Container	Regan	OR	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.
33113	V-10233 76WG (Flumioxazin + pyroxasulfone)	WSSA 14 + WSSA 15	Spurge, Spotted/Prostrate (Chamaesyce maculata)	Oak, Willow (Quercus phellos)	Seedbed	Beste	MD	2016	Soil applied broadcast	100% efficacy at 2.0, 2.5, and 3.0 oz per acre

### ***Label Suggestions***

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

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

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