Phytotoxicity of SureGuard, SedgeHammer, Dismiss, and V-10142 on Selected Nursery Crops

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Significance to the Industry: IR-4 is an important federally funded program that enables the EPA to register pesticides for minor use crops, which ornamentals are a part of. In the weed control sector of IR-4, SureGuard, SedgeHammer, Dismiss, and V-10142 were chosen in 2006 for their possible use as sedge and/or broadleaf control agents.

Materials and Methods: All of the crops chosen were based on availability and protocol of each herbicide (not all herbicide protocols had the same crops). Crops selected were: Rose (*Rosa* 'Oranges & Lemons'), Orange Coneflower (*Rudbeckia fulgida speciosa* 'Viettas Little Suzie'), Daylily (*Hemerocallis* 'Stella d'Oro'), Hosta (*Hosta* 'Golden Tiara'), Rhododendron (*Rhododendron* x 'Roseum Elegans'), Boxwood (*Buxus* 'Green mountain'), Spireae (*Spireae ×bumalda* 'Goldmound'), Viburnum (*Viburnum dentatum* 'Chicago lustre'), Holly (*Ilex xmerserveaea* 'Blue Prince'), Red Maple (*Acer rubrum)*, Burning bush *(Euonymus alata* 'Compacta'), and Juniper (*Juniperus squamata* 'Blue carpet'). SureGuard (flumioxazin, Valent USA Corp., Walnut Creek, CA) was applied at 0.38, 0.75, and 1.50 lb ai/ac to Rose. SedgeHammer (halosulfuron, Gowan Co., Yuma, AZ) was applied at 0.047, 0.094, and 0.188 lb ai/ac to Rose, Hosta, and Spireae. Dismiss (sulfentrazone, FMC Corp., Philadelphia, PA) was applied at 0.125, 0.250, and 0.5 lb ai/ac to Rose, Orange Coneflower, Rhododendron, Spirea, Red Maple, Boxwood, Holly and Burning Bush. Rhododendron was evaluated in a container and in the field (all others were in containers only). V-10142 was applied at 0.5, 1.0, and 2.0 lb ai/ac to Rose, Orange Coneflower, Daylily, Spireae, Burning Bush, Boxwood, Holly, and Viburnum. SureGuard, SedgeHammer, and V-10142 were applied using a CO_2 backpack sprayer delivering 25 gal/ac. Dismiss was applied with a handheld shaker jar. Initial applications were made to #3 containers of Rose, Orange Coneflower, Hosta, and Daylily on April 5, 2006 at Smith's Gardens, Delaware, OH. Initial applications were made to #1 containers of Rhododendron, Boxwood, Spireae, Viburnum, Holly, Red Maple, Burning Bush, and Juniper on June 7, 2006 at The Ohio State University, Columbus, OH. Initial applications were made to the Rhododendrons in the field at Waterman Farm, The Ohio State University, Columbus, OH, on June 29, 2006. Phytotoxicity was evaluated using visual ratings based on a 1-10 scale (1 being no phytotoxicity and 10 death) at 1, 2, and 4 WA1T (weeks after first treatment). At 4 WA1T, herbicides were reapplied, and were then evaluated at 1, 2, and 4 WA2T (weeks after second treatment). At 1 WA1T and 4 WA2T, heights and widths were taken on all plants to determine growth.

Results and Discussion: Each of the herbicides tested was phytotoxic to at least one of the species tested (Table 1). SureGuard was phytotoxic at all rates when applied to Rose or Orange Coneflower. SedgeHammer was phytotoxic to Rose only after 2 applications at all rates tested and phytotoxic to Hosta only at the 4X rate after the second application. SedgeHammer was also phytotoxic to Spireae at the 4X rate 4WA1T, but at all rates tested after the second application. V-10142 produced similar injury as the

SedgeHammer. V-10142 was injurious to all species at some point during the evaluation period. Juniper, Boxwood, and Burning Bush all seemed to recover from injury by 4WA2T from the V-10142. Viburnum also recovered nicely from the V-10142, but the injury signs were still evident on old foliage which is why they had higher phytotoxicity ratings than the untreated Viburnum. Dismiss performed quite well on all species tested at the 1X rate. Dismiss caused Rose, Boxwood, Spireae, and Maple to often grow taller than the untreated plants, especially at the 2X rates. With Boxwood, it caused them to elongate too much, and sometimes the Boxwood broke off or became unsightly, which explains the phytotoxicity ratings at the 2X rate. Dismiss caused phytotoxicity at the 2X and 4X rates on Rhododendron in containers, especially at the evaluations after the first application. Out in the field, Dismiss caused injury to the Rhododendron only with the 4X rate, after the second application. Dismiss injured Orange Coneflower only at the 4X rate. Rhododendron and Orange Coneflower were the only species showing reduced growth from the 2X and 4X applications of Dismiss. Holly and Red Maple showed no injury from any of the treatments.

Table 1. Phytotoxicity Evaluations from SedgeHammer, SureGuard, V-10142, and Dismiss in 2006 on selected ornamentals

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Rosa 'Oranges & Lemons'		Phytotoxicity visual ratings[z]					
Treatment	Rate	1 WA1T[y]	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
SureGuard 1X	0.38 lb ai/ac	4.67 *[x]	2.89	2.44	5.67 *	6.22 *	5.22 *
SureGuard 2X	0.75 lb ai/ac	5.67 *	5.22 *	3.11	6.56 *	7.11 *	6.00 *
SureGuard 4X	1.50 lb ai/ac	6.44 *	5.00 *	2.00	6.89 *	7.00 *	6.89 *
SedgeHammer 1X	0.047 lb ai/ac	3.00	2.45	1.45	3.66 *	3.00 *	1.89
Sedgehammer 2X	0.094 lb ai/ac	3.00	1.11	1.00	3.89 *	3.78 *	1.22
SedgeHammer 4X	0.188 lb ai/ac	2.22	1.89	2.67	4.56 *	4.55 *	2.33 *
V-10142 1X	0.5 lb ai/ac	2.33	1.55	2.44	3.67 *	3.78 *	1.11
V-10142 2X	1.0 lb ai/ac	2.56	2.55	2.78	4.11 *	4.67 *	1.45
V-10142 4X	2.0 lb ai/ac	3.22	3.56 *	2.66	4.78 *	5.11 *	2.89 *
Dismiss 1X	0.125 lb ai/ac	2.44	1.44	1.33	1.11	1.00	1.00
Dismiss 2X	0.250 lb ai/ac	2.22	2.11	1.33	1.11	1.00	1.00
Dismiss 4X	0.500 lb ai/ac	3.44	2.00	1.22	1.00	1.00	1.00
Untreated	---	1.56	1.67	1.55	1.00	1.00	1.00

Viburnum denatum 'Chicago lustre'		Phytotoxicity visual ratings					
Treatment	Rate	1 WA1T	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
V-10142 1X	0.5 lb ai/ac	3.00 *	3.22 *	2.00 *	2.44 *	2.11 *	2.00 *
V-10142 2X	1.0 lb ai/ac	3.00 *	3.78 *	2.22 *	3.00 *	2.78 *	2.11 *
V-10142 4X	2.0 lb ai/ac	3.00 *	4.00 *	2.67 *	3.11 *	3.22 *	2.67 *
Untreated	---	1.00	1.00	1.00	1.00	1.00	1.00

Acer rubrum		Phytotoxicity visual ratings					
Treatment	Rate	1 WA1T	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
Dismiss 1X	0.125 lb ai/ac	1.00	1.44	1.44	1.22	1.22	1.33
Dismiss 2X	0.250 lb ai/ac	1.00	1.00	1.00	1.11	1.00	1.00
Dismiss 4X	0.500 lb ai/ac	1.33	1.22	1.22	1.00	1.00	1.00
Untreated	---	1.00	1.00	1.00	1.11	1.00	1.22

Juniperus squamata 'Blue carpet'		Phytotoxicity visual ratings					
Treatment	Rate	1 WA1T	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
V-10142 1X	0.5 lb ai/ac	1.95	1.83	2.06	1.22	1.72	1.11
V-10142 2X	1.0 lb ai/ac	2.45 *	2.56 *	2.11	1.45	1.45	1.11
V-10142 4X	2.0 lb ai/ac	2.67 *	3.22 *	3.33 *	2.89	2.22	2.11
Untreated	---	1.00	1.00	1.22	1.33	1.45	1.11

z = phytotoxicity visual ratings based on 1-10 scale with 1 representing no phytotoxicity and 10 representing death

y = WA1T--weeks after first application, WA2T--weeks after second application

x = Treatments marked with an * are significantly different from the untreated at the evaluation specified

Table 1 cont. Phytotoxicity Evaluations from SedgeHammer, SureGuard, V-10142, and Dismiss in 2006 on selected ornamentals

Rhododendron x 'Roseum Elegans'		Phytotoxicity visual ratings[z]					
Treatment (container)	Rate	1 WA1T[y]	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
Dismiss 1X	0.125 lb ai/ac	1.00	1.11	1.44	1.00	1.00	1.00
Dismiss 2X	0.250 lb ai/ac	2.00 *[x]	2.45 *	2.33 *	1.67 *	1.67	1.67
Dismiss 4X	0.500 lb ai/ac	1.89 *	2.89 *	2.33 *	1.55	1.44	1.56
Untreated	---	1.00	1.00	1.00	1.00	1.00	1.00
Treatment (field)	Rate						
Dismiss 1X	0.125 lb ai/ac	1.11	1.56	1.17	.	1.17	1.17
Dismiss 2X	0.250 lb ai/ac	1.22	1.44	1.33	.	2.00	2.22
Dismiss 4X	0.500 lb ai/ac	1.55	1.44	1.44	.	2.78 *	3.00 *
Untreated	---	1.11	1.22	1.00	.	1.00	1.00
Hemerocallis 'Stella d'Oro'		Phytotoxicity visual ratings					
Treatment	Rate	1 WA1T	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
V-10142 1X	0.5 lb ai/ac	1.22	1.67 *	3.11 *	3.44 *	3.56 *	3.56 *
V-10142 2X	1.0 lb ai/ac	1.89 *	1.89 *	3.67 *	3.89 *	4.22 *	4.22 *
V-10142 4X	2.0 lb ai/ac	2.11 *	3.22 *	4.00 *	4.89 *	4.78 *	5.33 *
Untreated	---	1.00	1.00	1.00	1.00	1.00	1.00
Hosta 'Golden Tiara'		Phytotoxicity visual ratings					
Treatment	Rate	1 WA1T	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
SedgeHammer 1X	0.047 lb ai/ac	1.00	1.00	1.00	1.00	1.00	1.00
SedgeHammer 2X	0.094 lb ai/ac	1.00	1.00	1.00	1.00	1.00	1.00
SedgeHammer 4X	0.188 lb ai/ac	1.00	1.00	1.00	1.44 *	2.11 *	2.33 *
Untreated	---	1.00	1.00	1.00	1.00	1.00	1.00
Rudbeckia fulgida speciosa 'Viettas Little Suzie'		Phytotoxicity visual ratings					
Treatment	Rate	1 WA1T	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
V-10142 1X	0.5 lb ai/ac	1.78	4.22 *	5.33 *	7.00 *	8.33 *	8.56 *
V-10142 2X	1.0 lb ai/ac	3.00	5.00 *	7.67 *	8.89 *	9.44 *	9.67 *
V-10142 4X	2.0 lb ai/ac	2.89	5.00 *	7.78 *	8.78 *	9.33 *	9.89 *
Dismiss 1X	0.125 lb ai/ac	1.44	1.67	1.11	1.11	1.11	1.22
Dismiss 2X	0.250 lb ai/ac	3.00	3.44	2.11	2.56	2.11	1.78
Dismiss 4X	0.500 lb ai/ac	5.11 *	5.45 *	4.78 *	4.33 *	4.44 *	3.44 *
SureGuard 1X	0.38 lb ai/ac	6.78 *	4.44 *	4.67 *	8.89 *	9.00 *	9.00 *
SureGuard 2X	0.75 lb ai/ac	7.11 *	7.55 *	7.22 *	9.22 *	9.56 *	9.67 *
SureGuard 4X	1.50 lb ai/ac	7.78 *	8.22 *	8.78 *	9.89 *	10.00 *	10.00 *
Untreated	---	1.22	1.44	1.56	1.00	1.22	1.11

z = phytotoxicity visual ratings based on 1-10 scale with 1 representing no phytotoxicity and 10 representing death

y = WA1T--weeks after first application, WA2T--weeks after second application

x = Treatments marked with an * are significantly different from the untreated at the evaluation specified

Table 1 cont. Phytotoxicity Evaluations from SedgeHammer, SureGuard, V-10142, and Dismiss in 2006 on selected ornamentals

Buxus 'Green mountain'		Phytotoxicity visual ratings[z]					
Treatment	Rate	1 WA1T[y]	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
Dismiss 1X	0.125 lb ai/ac	1.11	1.00	1.00	1.11	1.11	1.00
Dismiss 2X	0.250 lb ai/ac	1.22	1.56	3.33 *[x]	3.55 *	3.22 *	2.11 *
Dismiss 4X	0.500 lb ai/ac	1.33	1.45	1.89 *	1.78	1.56	1.11
V-10142 1X	0.5 lb ai/ac	1.11	1.56	2.22 *	2.22 *	1.33	1.00
V-10142 2X	1.0 lb ai/ac	1.22	1.89	2.33 *	2.00 *	1.89 *	1.44
V-10142 4X	2.0 lb ai/ac	1.44	1.56	2.22 *	1.78	1.89 *	1.33
Untreated	---	1.11	1.22	1.22	1.11	1.00	1.00

Spireae xbumalda 'Goldmound'		Phytotoxicity visual ratings					
Treatment	Rate	1 WA1T	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
Dismiss 1X	0.125 lb ai/ac	1.33	1.33	1.22	1.00	1.00	1.00
Dismiss 2X	0.250 lb ai/ac	1.22	1.67	1.44	1.11	1.00	1.00
Dismiss 4X	0.500 lb ai/ac	1.33	1.33	2.00	1.67	1.00	1.17
V-10142 1X	0.5 lb ai/ac	1.78	1.67	3.56 *	4.44 *	3.67 *	5.22 *
V-10142 2X	1.0 lb ai/ac	1.11	1.33	3.00	4.11 *	3.67 *	5.11 *
V-10142 4X	2.0 lb ai/ac	1.67	1.22	4.00 *	4.56 *	4.33 *	5.78 *
SedgeHammer 1X	0.047 lb ai/ac	1.11	1.00	2.55	3.67 *	2.67 *	2.89 *
SedgeHammer 2X	0.094 lb ai/ac	1.56	1.33	2.78	3.44 *	2.44 *	2.55 *
SedgeHammer 4X	0.188 lb ai/ac	1.89	1.45	3.78 *	4.11 *	3.56 *	3.78 *
Untreated	---	1.11	1.11	1.44	1.22	1.11	1.00

Ilex xmerserveaea 'Blue Prince'		Phytotoxicity visual ratings					
Treatment	Rate	1 WA1T	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
Dismiss 1X	0.125 lb ai/ac	1.00	1.00	1.00	1.00	1.00	1.00
Dismiss 2X	0.250 lb ai/ac	1.11	1.00	1.00	1.00	1.00	1.00
Dismiss 4X	0.500 lb ai/ac	1.00	1.00	1.00	1.00	1.11	1.00
V-10142 1X	0.5 lb ai/ac	1.00	1.00	1.00	1.00	1.00	1.00
V-10142 2X	1.0 lb ai/ac	1.00	1.00	1.00	1.00	1.00	1.00
V-10142 4X	2.0 lb ai/ac	1.00	1.00	1.00	1.00	1.00	1.00
Untreated	---	1.00	1.00	1.00	1.00	1.00	1.00

Eunoymus alata 'Compacta'		Phytotoxicity visual ratings					
Treatment	Rate	1 WA1T	2 WA1T	4 WA1T	1 WA2T	2 WA2T	4 WA2T
Dismiss 1X	0.125 lb ai/ac	1.22	1.00	1.22	1.00	1.00	1.11
Dismiss 2X	0.250 lb ai/ac	1.56	1.33	1.33	1.22	1.22	1.00
Dismiss 4X	0.500 lb ai/ac	1.33	1.22	1.00	1.00	1.00	1.00
V-10142 1X	0.5 lb ai/ac	1.55	1.56	1.00	1.00	1.00	1.00
V-10142 2X	1.0 lb ai/ac	1.56	2.22 *	1.67 *	1.11	1.11	1.00
V-10142 4X	2.0 lb ai/ac	1.67	2.33 *	2.00 *	1.00	1.11	1.00
Untreated	---	1.11	1.00	1.00	1.00	1.00	1.00

z = phytotoxicity visual ratings based on 1-10 scale with 1 representing no phytotoxicity and 10 representing death

y = WA1T--weeks after first application, WA2T--weeks after second application

x = Treatments marked with an * are significantly different from the untreated at the evaluation specified