



Ornamental Horticulture Program Research Project Sheet

<http://ir4.rutgers.edu/Ornamental/ornamentalProjectInformationSheets.cfm>

Project Name: Pre Emergent Herbicide Crop Safety - Flumioxazin

New	Ongoing	Completed	X	Duration if ongoing or completed:	2004-2013
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Project Description:

The Pre-Emergent Herbicide Crop Safety Project began in 2004 and has continued through 2015. While specific crops and herbicides have changed, the intent of this research has been to screen over-the-top applications of pre-emergent herbicides as plants are breaking dormancy, or beginning new growth, and then 4 to 6 weeks later once foliage is more mature.

This research project sheet covers flumioxazin based formulations (Broadstar 0.17G, Broadstar 0.25G, Broadstar 0.25 G VC1604, SureGuard 51.1WDG).

Research Project Abstract (if available):

Abstract from 2011 Flumioxazin Crop Safety Summary

Between 2008 and 2010, IR-4 completed 189 trials on Broadstar 0.25G VC1604 (flumioxazin). The data contained in this report was generated to confirm registered uses of flumioxazin on and around ornamental horticulture plants with over-the-top applications. The flumioxazin rates in the testing program were 0.375, 0.75, and 1.5 pounds active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. Broadstar 0.25G VC1604 was applied to 82 plant genera or species. Of these, 68 crops exhibited no or minimal transient injury after application at all three rates. Fourteen species or genera need additional information to clarify crop response.

Abstract from 2007 Flumioxazin Crop Safety Summary

Flumioxazin has been registered in the United States since 2003 for uses in and around ornamental plants in production nurseries and in landscapes. Between 2001 and 2006, the IR-4 Project has conducted over 400 trials using two granular formulations (BroadStar 0.17G, BroadStar 0.25G) and a wettable dry granular formulation (SureGuard 51.1WDG). This is the first summary across all the available data generated through IR-4. Thirteen plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of SureGuard 51.1WDG formulations. Of these, 10 species or genera are not currently on this label. Three species exhibited no phytotoxicity with over the top SureGuard 51.1WDG applications at 0.25 to 0.375 lb ai per acre, but at higher rates there was some damage. Twenty-seven species demonstrated significant phytotoxicity at all tested rates of SureGuard 51.1WDG. Several crops and cultivars are not currently listed as sensitive crops; it is recommended that these be added to this list on the SureGuard 51.1WDG label. Thirty-four plant species or genera exhibited no or minimal transitory phytotoxicity to applications of BroadStar G formulations. Of these, 12 are not currently listed on the label. It is recommended that these be placed on the labels. Eleven crops exhibited significant damage after over the top applications of BroadStar G.

Target Species (Phytotoxicity, or common and Latin name of arthropod, pathogen, weed):

Crop Safety

Target Crops (list tested crops if ongoing or completed project)

See "IR-4 Crop Safety to Date" below

Target Product(s) (list tested products or numbered compounds if ongoing or completed project)

Broadstar 0.17G
Broadstar 0.25G

Broadstar 0.25G VC1604
SureGuard 51.1WDG

Product Registration and Research Status		
		Registration Status
Labeled & Commercialized	Broadstar 0.25G	SureGuard 51.1WDG
Wide range of ornamental horticulture crops listed	Broadstar 0.25G VC1604	
Labeled & Commercialized		
Opportunity to add additional ornamental horticulture crops		
Labeled But NOT Commercialized		
Not yet registered or labeled		
No longer available for development	Broadstar 0.17G	
* IR-4 Data contributed to registration decision – either adding pest to label or not pursuing further research		
1 At least one crop species screened fully		
2 Product not available for production ornamentals		

Other:

Project Pros	Project Cons
1 Broadstar causes minimal injury to a wide range of crops	1 Wide range of crops already listed on the labels
2 Additional research could yield data favorable for further label expansion	

IR-4 Crop Safety Trials to Date

Average rating on a scale of 1 – 5 with 1 = 0 to about no injury and 5 = severe injury and mortality; minimum to maximum rating; number of trials. A rating of 3 or higher is considered commercially unacceptable (*red text*). A rating of 1 or 2 is considered commercially acceptable and those with more than 3 trials are complete (*green text*). ‘Labeled’ indicates that IR-4 generated data in at least one trial and that this crop is listed on the label. For crop/product combinations that are blank, IR-4 has not screened this combination.

Plant Group	Crop	BroadStar 0.17G (Flumioxazin)	BroadStar 0.25G (Flumioxazin)	BroadStar 0.25G VC1604 (Flumioxazin)	SureGuard 51WDG (Flumioxazin)
Broadleaf Evergreen Tree/Shrub					
	Boxwood, Japanese (Buxus microphylla)				3.5 (3 - 4) n2
	Boxwood (Buxus sp.)	Labeled		1.5 (1 - 2) n2	2.5 (2 - 3) n2
	Camellia (Camellia sp.)		Labeled	1.0 (1 - 1) n4	
	Cleyera (Cleyera japonica)	Labeled			MFG Hold
	Daphne (Daphne sp.)	MFG Hold			
	Russian Olive (Elaeagnus angustifolia)	Labeled			
	Jasmine, Cape, Common Gardenia (Gardenia sp.)		Labeled		
	Toyon, Christmas Berry (Heteromeles arbutifolia)			2.0 (2 - 2) n1	
	Holly (Ilex sp.)	Labeled	1.0 (1 - 1) n1	1.0 (1 - 1) n4	4.0 (4 - 4) n1
	Holly, Dwarf Yaupon (Ilex vomitoria ‘nana’)				3.0 (3 - 3) n1
	Holly, Blue (Ilex x meserveae)				4.0 (4 - 4) n1
	Fetterbush, Drooping Leucothoe (Leucothoe sp.)			1.0 (1 - 1) n1	
	Loropetalum (Loropetalum sp.)		MFG Hold	1.2 (1 - 2) n5	
	Oregon Grape (Mahonia aquifolium)	Labeled			

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	Wax Myrtle (<i>Myrica cerifera</i>)		Labeled		
	Bayberry (<i>Myrica pensylvanica</i>)	Labeled	Labeled		
	Heavenly Bamboo (<i>Nandina domestica</i>)	Labeled	Labeled	1.8 (1 - 4) n4	3.0 (3 - 3) n1
	Holly Olive;False (<i>Osmanthus heterophyllus</i>)			1.0 (1 - 1) n1	
	Photinia (<i>Photinia</i> sp.)			1.0 (1 - 1) n1	
	Andromeda (<i>Pieris</i> sp.)	Labeled	Labeled	1.0 (1 - 1) n2	4.0 (4 - 4) n1
	Indian Hawthorn (<i>Raphiolepis indica</i>)			1.0 (1 - 1) n3	
	Azalea (<i>Rhododendron</i> sp.)	Labeled	Labeled		3.3 (1 - 5) n6
	Azalea, & Rhododendron (<i>Rhododendron</i> sp.)	Labeled		1.0 (1 - 1) n5	
	Rhododendron (<i>Rhododendron</i> sp.)	Labeled			4.0 (4 - 4) n3
	Ternstroemia (<i>Ternstroemia</i> sp.)		2.0 (2 - 2) n1	1.0 (1 - 1) n1	
Broadleaf Evergreen/Deciduous Tree/Shrub					
	Abelia (<i>Abelia</i> sp.)	Labeled		1.0 (1 - 1) n4	
	Barberry (<i>Berberis</i> sp.)	Labeled	Labeled	1.0 (1 - 1) n4	4.0 (4 - 4) n2
	Cotoneaster (<i>Cotoneaster</i> sp.)	Labeled		1.0 (1 - 1) n2	4.0 (4 - 4) n1
	Mexican Heather, False Heather, Elfin Herb (<i>Cuphea hyssopifolia</i>)		4.0 (4 - 4) n1		
	Privet (<i>Ligustrum</i> sp.)		MFG Hold	3.0 (3 - 3) n1	
	Honeysuckle (<i>Lonicera</i> sp.)	Labeled			
	Magnolia (<i>Magnolia</i> sp.)			1.0 (1 - 1) n5	
Bulbs & Corms					
	Daylily (<i>Hemerocallis</i> sp.)	MFG Hold			3.3 (2 - 4) n3
	Lily, Easter (<i>Lilium longiflorum</i>)				MFG Hold
Cactus & Succulents	Stonecrop (<i>Sedum</i> sp.)			2.1 (1 - 4) n7	
Deciduous Tree/Shrub/Vine					
	Maple, Amur (<i>Acer ginnala</i>)	Labeled			
	Maple, Japanese (<i>Acer palmatum</i>)	Labeled	Labeled	1.0 (1 - 1) n4	
	Maple, Red (<i>Acer rubrum</i>)			1.3 (1 - 2) n3	Labeled
	Maple (<i>Acer</i> sp.)		Labeled	1.3 (1 - 2) n4	Labeled
	Horse Chestnut (<i>Aesculus</i> sp.)				
	Japanese Barberry (<i>Berberis thunbergii</i>)				3.5 (3 - 4) n2
	Birch, River (<i>Betula nigra</i>)				Labeled
	Birch (<i>Betula</i> sp.)				
	Butterfly Bush (<i>Buddleia davidii</i>)	Labeled		1.0 (1 - 1) n3	1.0 (1 - 1) n1
	Caryopteris (<i>Caryopteris x clandonensis</i>)			1.0 (1 - 1) n1	
	Ceanothus, maritime (<i>Ceanothus maritimus</i>)			1.7 (1 - 3) n3	
	Ceanothus sp. (<i>Ceanothus</i> sp.)			1.5 (1 - 2) n2	
	Ceanothus (<i>Ceanothus x pallida</i>)			1.0 (1 - 1) n2	
	Sand Heath, Rosemary (<i>Ceratiola ericoides</i>)				1.0 (1 - 1) n1
	Red Bud, Western (<i>Cercis reniformis</i>)				
	Clematis (<i>Clematis</i> sp.)			1.0 (1 - 1) n4	
	Summersweet (<i>Clethra alnifolia</i>)	Labeled	Labeled	2.0 (1 - 3) n2	3.0 (3 - 3) n1
	Dogwood, Flowering (<i>Cornus florida</i>)	Labeled		1.7 (1 - 3) n3	

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	Dogwood, Red Osier (Cornus sericea)	MFG Hold			
	Dogwood (Cornus sp.)				
	Smoke Tree, European (Cotinus coggygria)				MFG Hold
	Hawthorn (Crataegus sp.)			1.7 (1 - 2) n3	
	Pride-of-Rochester (Deutzia sp.)		Labeled		4.0 (4 - 4) n1
	Winged Burning Bush (Euonymus alatus)	Labeled		1.0 (1 - 1) n2	MFG Hold
	Golden Bells (Forsythia sp.)	Labeled		1.0 (1 - 1) n1	4.0 (4 - 4) n1
	Ash (Fraxinus sp.)	Labeled	Labeled		Labeled
	Maidenhair Tree (Ginkgo biloba)				
	Honey Locust (Gleditsia sp.)	1.0 (1 - 1) n1		1.0 (1 - 1) n3	
	Baby's Breath (Gypsophila elegans)	1.0 (1 - 1) n2			
	Hydrangea, French (Hydrangea macrophylla)				4.0 (4 - 4) n2
	Hydrangea (Hydrangea sp.)	Labeled	Labeled	1.5 (1 - 3) n4	3.7 (3 - 4) n3
	Candytuft (Iberis sp.)	1.0 (1 - 1) n2			4.0 (4 - 4) n1
	Jasmine, Jessamine (Jasminum sp.)	4.0 (4 - 4) n1			
	Walnut, Black (Non-Bearing) (Juglans nigra)				
	Crape Myrtle (Lagerstroemia indica)	Labeled	Labeled	1.0 (1 - 1) n4	Labeled
	Lavender (Lavandula sp.)			1.0 (1 - 1) n4	
	Apple & Crabapple (Non-Bearing) (Malus sp.)			1.0 (1 - 1) n2	
	Mock Orange (Philadelphus sp.)			3.0 (3 - 3) n1	
	Plane Tree, Sycamore (Platanus sp.)				
	Aspen, Poplar (Populus sp.)				
	Almond (Non-Bearing) (Prunus dulcis)	Labeled			
	Cherry (Non-Bearing) (Prunus sp.)	Labeled			
	Oak, Northern Red (Quercus rubra)	Labeled			Labeled
	Oak (Quercus sp.)			1.3 (1 - 2) n3	
	Sumac (Rhus sp.)	Labeled			
	Rose (Rosa sp.)		1.0 (1 - 1) n1	1.2 (1 - 2) n5	3.0 (2 - 4) n3
	Willow (Salix sp.)				
	Bridal-Wreath (Spiraea sp.)	Labeled	Labeled	2.0 (1 - 4) n4	3.3 (3 - 4) n3
	Camellia, Mountain (Stewartia sp.)			1.0 (1 - 1) n1	
	Lilac (Syringa sp.)		Labeled	1.0 (1 - 1) n4	3.0 (2 - 4) n3
	Dwarf germander (Teucrium chamaedrys)			2.0 (2 - 2) n1	
	Blueberry (Non-Bearing) (Vaccinium sp.)	Labeled			4.0 (4 - 4) n1
	Viburnum, arrowwood (Viburnum dentatum)				3.5 (3 - 4) n2
	Viburnum juddii (Viburnum juddii)				3.5 (3 - 4) n2
	Arrowwood (Viburnum sp.)	Labeled		1.0 (1 - 1) n6	4.0 (4 - 4) n3
	Craneberry-bush (Viburnum trilobum)				MFG Hold
	Weigela (Weigela sp.)	Labeled			
	Japanese Zelkova (Zelkova serrata)			1.0 (1 - 1) n2	
Fern	Fern, Japanese Painted (Athyrum goeringianum)		3.0 (3 - 3) n1		

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	Fern, Royal (<i>Osmunda regalis</i>)				4.0 (4 - 4) n1
Hardy Ground Cover Foliage					
	Mugwort, White (<i>Artemisia lactiflora</i>)		MFG Hold		
	Snow-In-Summer (<i>Cerastium tomentosum</i>)	MFG Hold			
	Hardy Ice Plant, Yellow Ice Plant (<i>Delosperma nubigenum</i>)	1.0 (1 - 1) n1			
	English Ivy (<i>Hedera helix</i> L. ssp. <i>Helix</i>)	Labeled			MFG Hold
	Shrub Verbena (<i>Lantana</i> sp.)		Labeled		
	Lilyturf, Big Blue;Giant (<i>Liriope muscari</i>)	1.3 (1 - 2) n4			2.0 (2 - 2) n1
	Lilyturf, Creeping (<i>Liriope</i> sp.)	2.3 (1 - 4) n3	3.0 (3 - 3) n1		4.0 (4 - 4) n1
	Catnip (<i>Nepeta cataria</i>)			1.3 (1 - 2) n3	
	Catmint (<i>Nepeta x faasseni</i>)			2.3 (1 - 3) n3	
	Japanese Spurge (<i>Pachysandra terminalis</i>)	Labeled			
	Periwinkle (<i>Vinca</i> sp.)	2.0 (1 - 3) n2			MFG Hold
Herbaceous Flowering Plant					
	Lily-Of-The-Nile (<i>Agapanthus</i> sp.)			1.3 (1 - 2) n3	
	California fuschia (<i>Epilobium canum</i>)			1.0 (1 - 1) n1	
	Treasure Flower (<i>Gazania</i> sp.)	1.0 (1 - 1) n1			
	Carolinia Jessamine; Evening Trumpet Flower (<i>Gelsemium</i> sp.)	2.0 (2 - 2) n1			
	Mallow, Rose Mallow (<i>Hibiscus</i> sp.)				4.0 (4 - 4) n1
	Hopflower Oregano (<i>Origanum libanoticum</i>)	1.0 (1 - 1) n2			
	Cinquefoil (<i>Potentilla</i> sp.)	Labeled		1.4 (1 - 2) n5	3.5 (3 - 4) n2
	Mexican Petunia (<i>Ruellia carolinensis</i>)		MFG Hold		
	Sage (<i>Salvia daghestanica</i>)	1.0 (1 - 1) n2			
	Sage, Ramona (<i>Salvia sylvestris</i>)	2.0 (2 - 2) n1	1.0 (1 - 1) n1	1.8 (1 - 3) n4	5.0 (5 - 5) n1
	Skullcap (<i>Scutellaria racemosa</i>)	1.0 (1 - 1) n2			
	Speedwell, Brooklime (<i>Veronica</i> sp.)	1.0 (1 - 1) n1			
Herbaceous Flowering Plant - Annual					
	African Daisy (<i>Osteospermum</i> sp.)	1.0 (1 - 1) n1			
Herbaceous Flowering Plant - Perennial					
	Yarrow (<i>Achillea millefolium</i>)	4.0 (3 - 5) n2			2.0 (2 - 2) n1
	Chrysanthemum, Garden (<i>Chrysanthemum/Dendranthema</i> sp.)		1.0 (1 - 1) n1		
	Hellebore, Christmas rose, Lenten Rose (<i>Helleborus niger</i>)		2.0 (2 - 2) n1		4.0 (4 - 4) n2
	Hosta (<i>Hosta</i> sp.)	4.0 (4 - 4) n3			4.0 (4 - 4) n1
	Peony (<i>Paeonia</i> sp.)			1.0 (1 - 1) n2	
	Phlox (<i>Phlox</i> sp.)		4.0 (4 - 4) n1		
	Coneflower, Orange (<i>Rudbeckia fulgida speciosa</i>)				2.7 (1 - 5) n3
	Vervain (<i>Verbena</i> sp.)		2.0 (2 - 2) n1		1.0 (1 - 1) n1
	Adams-Needle (<i>Yucca filamentosa</i>)	1.0 (1 - 1) n1			
Narrowleaf Evergreen Tree/Shrub					
	Fir, Balsam (<i>Abies balsamea</i>)				3.0 (3 - 3) n1
	Fir, Fraser (<i>Abies fraseri</i>)				Labeled

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	Fir, Grand; Giant Fir (<i>Abies grandis</i>)				Labeled
	Fir, Alpine; Subalpine Fir (<i>Abies lasiocarpa</i>)				1.0 (1 - 1) n1
	Fir (<i>Abies</i> sp.)	Labeled		1.0 (1 - 1) n4	Labeled
	Heather (<i>Calluna</i> sp.)	MFG Hold			
	Cedar (<i>Cedrus deodara</i>)		Labeled		MFG Hold
	False cypress (<i>Chamaecyparis obtusa</i>)		Labeled		MFG Hold
	Japanese Cedar (<i>Cryptomeria japonica</i>)			1.0 (1 - 1) n3	
	Cypress (<i>Cupressus</i> sp.)	Labeled			
	Broom (<i>Cytisus</i> sp.)	MFG Hold			
	Heath (<i>Erica</i> sp.)	Labeled			
	Juniper, Creeping or Trailing (<i>Juniperus horizontalis</i>)				2.0 (2 - 2) n1
	Juniper (<i>Juniperus</i> sp.)	Labeled	Labeled	1.0 (1 - 1) n4	Labeled
	Cedar, Red (<i>Juniperus virginiana</i>)				2.0 (2 - 2) n1
	Spruce (<i>Picea</i> sp.)	Labeled	Labeled	1.0 (1 - 1) n3	Labeled
	Pine, Mugo & Mugho (<i>Pinus mugo</i> ssp. Mugo)	Labeled	Labeled		1.0 (1 - 1) n1
	Pine, Austrian (<i>Pinus nigra</i>)		2.0 (2 - 2) n1		Labeled
	Pine (<i>Pinus</i> sp.)	Labeled		1.0 (1 - 1) n4	Labeled
	Pine, Jap. Black (<i>Pinus thunbergiana</i>)				1.0 (1 - 1) n1
	Yew, Southern (<i>Podocarpus macrophyllus</i>)		Labeled		
	Fir, Douglas (<i>Pseudotsuga menziesii</i>)	Labeled			
	Evergreen currant (<i>Ribes viburnifolium</i>)			1.0 (1 - 1) n1	
	Rosemary (<i>Rosmarinus officinalis</i>)		MFG Hold		
	Giant Sequoia; Redwood (<i>Sequoiadendron giganteum</i>)				2.0 (2 - 2) n1
	Yew, Japanese (<i>Taxus cuspidata</i>)				
	Yew (<i>Taxus</i> sp.)	Labeled		1.0 (1 - 1) n3	Labeled
	Arborvitae (<i>Thuja</i> sp.)	Labeled		1.3 (1 - 2) n4	Labeled
	Hemlock (<i>Tsuga</i> sp.)	Labeled			
Ornamental Grass					
	Grassland Sedge (<i>Carex divulsa</i>)			2.0 (1 - 3) n2	
	Sedge (<i>Carex</i> sp.)		MFG Hold		
	Pampas Grass (<i>Cortaderia</i> sp.)		3.0 (3 - 3) n1		4.0 (4 - 4) n2
	Hair Grass (<i>Deschampsia</i> sp.)		MFG Hold		
	Blue Fescue (<i>Festuca glauca</i>)	MFG Hold	MFG Hold		1.5 (1 - 2) n2
	Hakone Grass, Japanese Forest Grass (<i>Hakonechloa</i> sp.)	MFG Hold			
	Mexican deergrass (<i>Muhlenbergia dubia</i>)			1.0 (1 - 1) n1	
	Mondo Grass, Lilyturf, Ker-Gawl (<i>Ophiopogon</i> sp.)	2.0 (2 - 2) n1	2.0 (2 - 2) n1	1.0 (1 - 1) n1	
	Fountain Grass (<i>Pennisetum setaceum</i>)	1.0 (1 - 1) n1			3.0 (3 - 3) n1
	Ribbon-Grass, Gardeners-Garters (<i>Phalaris arundinacea</i>)	3.0 (2 - 4) n2	4.0 (4 - 4) n1		4.0 (4 - 4) n1
Palm	Palmetto Palm (<i>Sabal minor</i>)			1.0 (1 - 1) n1	



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Tropical Foliage Plant	Pittosporum, Japanese (Pittosporum tobira)	Labeled			
	Jasmine, Asian (Trachelospermum asiaticum)		MFG Hold		1.0 (1 - 1) n1