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**IR-4 Ornamental Horticulture Program
Clethodim Crop Safety**

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Abstract

Clethodim, a grass herbicide, was first registered in the US as Select Herbicide for ornamental horticulture crops in 1983 with a limited crop list. From 1997 through 2007, the IR-4 Project completed 122 trials on 76 ornamental plant genera or species examining phytotoxicity related to foliar and/or drench applications of clethodim. In these trials, 7 species or genera exhibited minimal or no injury after foliar applications. Based on this information, it is suggested that all of these crops be added to the list of tolerant plants.

Introduction

Clethodim, a grass herbicide, was first registered in the US as Select Herbicide for ornamental horticulture crops in 1983 with a limited crop list. From 1997 through 2007, the IR-4 Project completed 122 trials on 76 ornamental plant genera or species examining phytotoxicity related to foliar and/or drench applications of acibenzolar.

Materials and Methods

Clethodim was tested as over the top applications, primarily as a single use, but some researchers did apply twice during their experiments. The application rates were 0.25, 0.5, and 1.0 lb ai per acre. All experiments had an untreated control. A minimum of 4 plants (replicate treatments) were required. Phytotoxicity was planned to be recorded on a scale of 0 to 10 (0 = No phytotoxicity; 10 = Complete kill).

Clethodim 1EC was supplied to 12 researchers (See list of researchers in Appendix 1) by Valent as either Envoy or Prism. For the purposes of this summary, the product tested will be referred to as Envoy.

Results and Summary

Based on the type and nature of injury seen with pesticide applications, tested plant species were placed into three categories: 1) no significant phytotoxicity or growth differences from the untreated check or any injury was transitory, 2) no or minimal transitory injury seen at the 1X rate, but the 2X and/or 4X rates did cause significant phytotoxicity, 3) Significant injury sufficient to recommend growers not utilize acibenzolar.

Phytotoxicity

Across all plant species tested, clethodim exhibited no or minimal negative impact (Table 1) on 7 plant genera or species; one crop exhibited primarily minimal injury with the exception of one trial where severe injury was observed (Table 2). Five crops exhibited significant injury (Table 3). There are 63 species or genera where less than 3 trials were conducted for either foliar or drench applications so there is not enough information available at this time (Table 4).

Please see Table 5 for a summary of the individual trial results.

Table 1. List of clethodim treated crops with no or minimal transitory injury.

<i>Brassica sp.</i>	<i>Nepeta sp.</i>
<i>Dryopteris erythrosora</i>	<i>Polystichum acrostichoides</i>
<i>Dryopteris x australis</i>	<i>Polystichum polyblepharum</i>
<i>Forsythia sp.</i>	

Table 2. List of clethodim treated crops with no injury at 1X but significant injury at 2X or 4X.

Echinacea sp. (see Senesac 1999)

Table 3. List of clethodim treated crops with significant injury at 1X.

Imperata cylindrica
Leymus arenarius
Matteuccia struthiopteris
Onoclea sensibilis
*Salvia splendens*¹

Table 4. List of clethodim treated crops where more information is needed.

<i>Achillea tomentosa</i>	<i>Cyrtomium fortunei</i>	<i>Limonium latifolium</i>
<i>Adiantum pedatum</i>	<i>Delphinium</i> sp.	<i>Linums perenne</i>
<i>Ageratum houstonianum</i> ¹	<i>Digitalis</i> sp.	<i>Lobelia</i> sp.
<i>Alchemilla mollis</i>	<i>Dryopteris marginalis</i>	<i>Lysimachia</i> sp.
<i>Amsonia hubrichtii</i>	<i>Dryopteris celsa</i>	<i>Mazus repans</i>
<i>Antennaria parvifolia</i>	<i>Dryopteris cycadina</i>	<i>Monarda didyma</i>
<i>Antirrhinum majus</i> ¹	<i>Eryngium maritimum</i>	<i>Oenothera</i> sp.
<i>Arenaria montana</i>	<i>Eryngium planum</i>	<i>Osmunda cinnamomea</i>
<i>Aster novi-belgii</i>	<i>Eupatorium purpureum</i>	<i>Osmunda regalis</i>
<i>Astilve</i> sp.	<i>Fragaria</i> sp. ¹	<i>Paeonia</i> sp.
<i>Athyrium filix-femina</i>	<i>Gaura lindeimeri</i>	<i>Perovskia</i> sp.
<i>Athyrium nipponicum</i>	<i>Helichrysum bracteatum</i>	<i>Polemonium caeruleum</i>
<i>Begonia semperflorens</i>	<i>Hemerocallis</i> sp. ¹	<i>Prunus maritima</i>
<i>Boltonia asteroides</i>	<i>Hosta fortunei</i> ¹	<i>Sedum</i> sp. ¹
<i>Buddleia davidii</i>	<i>Hydrangea</i> sp.	<i>Sempervivum</i>
<i>Callistephus chinensis</i>	<i>Iberis</i> sp. ¹	<i>arachnoideum</i>
<i>Carex morrowii</i>	<i>Impatiens</i> sp.	<i>Solidao sempervirens</i>
<i>Celosia</i> sp.	<i>Itea virginica</i>	<i>Thymus praecox</i>
<i>Chelone lyonii</i>	<i>Lamiastrum</i> sp.	<i>Vernonia noveboracensis</i>
<i>Clethra alnifolia</i>	<i>Lamium</i> sp.	<i>Veronica</i> sp.
<i>Cornus sericea</i>	<i>Lavandula</i> sp.	
<i>Cosmos bipinnatus</i>	<i>Liatris</i> sp.	

¹ this crop is already on the Envoy label. No further testing is warranted.

Table 5 Detailed Summary of Crop Safety Testing with Envoy (clethodim).

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 9/10/2012 are listed below.

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results	EPA Reg ?	File Name
20721	Yarrow, Woolly (<i>Achillea tomentosa</i>) 'King Edward'	Field Container	Senesac	NY	2001	Over the top	Minor to moderate injury increasing with rate after single application of 1X, 2X, 4X ai per acre.	N	20120728d.pdf
25659	Fern, American Maidenhair (<i>Adiantum pedatum</i>)	Field Container	Senesac	NY	2006	Over the top	Limited data due to limited emergence but no injury observed	N	20061108a.pdf
13188	Ageratum (<i>Ageratum</i> sp.) <i>A. houstonianum</i> 'Blue Horizon'	Field In-Ground	Senesac	NY	1997	Over the top	No significant injury at 0.25, 0.5 and 1.0 lb ai per acre; poor to good control of grassy weeds, increasing with rate.	Y	20120727a.pdf
20722	Lady's-Mantle (<i>Alchemilla</i> sp.) <i>A. mollis</i> 'Thriller'	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728e.pdf
20722	Lady's-Mantle (<i>Alchemilla</i> sp.) <i>A. mollis</i> 'Thriller'	Field Container	Senesac	NY	2004	Over the top	No injury at 0.25 lb ai per acre, slight at 0.5 and 1.0 lb ai per acre.	N	19750101s.pdf
13274	Bluestar (<i>Amsonia</i> sp.) <i>Amsonia hubrichtii</i>	Field Container	Senesac	NY	2004	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	19750101s.pdf
23859	Pussy-Toes, Small-leaf (<i>Antennaria parvifolia</i>)	Field Container	Senesac	NY	2004	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	19750101s.pdf
13190	Snapdragon (<i>Antirrhinum majus</i>) 'Rocket Rose'	Field In-Ground	Senesac	NY	1997	Over the top	Very slight injury at all rates (0.25, 0.5, and 1.0 lb ai per acre).	Y	20120727b.pdf
20724	Sandwort (<i>Arenaria</i> sp.) <i>A. montana</i>	Field Container	Senesac	NY	2001	Over the top	No to minor transient injury after single application of 1X, 2X, and 4X per acre.	N	20120728f.pdf
18607	Aster, New York (<i>Aster novi-belgii</i>) 'Bonny Blue'	Field Container	Anderson	OH	2001	Over the top	Very slight, transient, injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120728g.pdf
18607	Aster, New York (<i>Aster novi-belgii</i>) 'Celeste'	Field Container	Senesac	NY	1998	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120727d.pdf
12184	False Spirea (<i>Astilbe</i> sp.) <i>A. x arendsii</i> 'Amethyst'	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728i.pdf
12184	False Spirea (<i>Astilbe</i> sp.) 'Purple Candles'	Field Container	Senesac	NY	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728h.pdf
25646	Fern, Lady (<i>Athyrium filix-femina</i>)	Field Container	Neal	NC	2006	Over the top	Very slight to moderate, but transient, injury increasing with rate (0.25, 0.5, 1.0 lb ai per acre).	N	20070308a.pdf
25647	Fern, Lady (<i>Athyrium nipponicum</i>) 'Pictum'	Field Container	Neal	NC	2006	Over the top	No significant injury at 0.25, 0.5 and 1 lb ai per acre + NIS	N	20070308a.pdf
17251	Fern, Uncrested Lady (<i>Athyrium</i> sp.) <i>A. filix-femina</i>	Field Container	Senesac	NY	1999	Over the top	No significant injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727e.pdf
23498	Begonia (<i>Begonia</i> sp.) <i>B. semperflorans</i> 'Gin'	Field Container	Knight	MS	2000	Over the top	Slight injury increasing with rate (0.25, 0.5 and 1.0 lb ai per acre).	N	20120730c.pdf

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results	EPA Reg ?	File Name
13275	Aster, Bolton (Boltonia sp.) B. asteroides	Field Container	Senesac	NY	1999	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727f.pdf
13272	Ornamental Cabbage, Ornamental Kale (Brassica sp.) 'Colorup' cabbage	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728j.pdf
13272	Ornamental Cabbage, Ornamental Kale (Brassica sp.) 'Nagoya Red' kale	Field Container	Senesac	NY	1998	Over the top	No reduction in dry weight at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727g.pdf
13272	Ornamental Cabbage, Ornamental Kale (Brassica sp.) 'Nagoya White' kale	Field Container	Senesac	NY	1998	Over the top	No reduction in dry weight at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727g.pdf
13272	Ornamental Cabbage, Ornamental Kale (Brassica sp.) 'Osaka Red' cabbage	Field Container	Senesac	NY	1998	Over the top	No reduction in dry weight at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120727h.pdf
13272	Ornamental Cabbage, Ornamental Kale (Brassica sp.) 'Osaka White' cabbage	Field Container	Senesac	NY	1998	Over the top	No reduction in dry weight at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727h.pdf
13272	Ornamental Cabbage, Ornamental Kale (Brassica sp.) 'Red Peacock' kale	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728k.pdf
20896	Butterfly Bush (Buddleia davidii) 'White Profusion'	Field Container	Senesac	NY	2000	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120729u.pdf
13108	China Aster (Callistephus chinensis)	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728l.pdf
13109	China Aster (Callistephus chinensis)	Field In-Ground	Senesac	NY	1997	Over the top	Slight to moderate injury increasing with rate (0.25, 0.5, 1.0 lb ai per acre)	N	20120727i.pdf
20725	Sedge (Carex sp.) C. morrowii 'Ice Dance'	Field Container	Senesac	NY	2001	Over the top	Moderate injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728m.pdf
13110	Cockscomb, Wool Flower (Celosia sp.) C. Cristata 'Amigo Mahogany Red'	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728n.pdf
13110	Cockscomb, Wool Flower (Celosia sp.) 'Cristata Dwarf'	Field Container	Anderson	OH	2001	Over the top	Moderate to severe injury increasing with rate (0.25, 0.5, 1.0 lb ai per acre).	N	20120728o.pdf
23863	Turtlehead, Snakehead (Chelone sp.) Chelone lyonii 'Hot Lips'	Field Container	Senesac	NY	2004	Over the top	Moderate injury at all rates (0.25, 0.5, 1.0 lb ai per acre) with almost complete recovery by 6 WAT	N	19750101s.pdf
20897	Summersweet (Clethra alnifolia) 'Rosea'	Field Container	Senesac	NY	2000	Over the top	Minor injury at all rates (0.25, 0.5, 1.0 lb ai per acre) with recovery.	N	20120729v.pdf
17248	Dogwood, Red Osier (Cornus sericea)	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728p.pdf
13189	Cosmos (Cosmos sp.) C. bipinnatus 'Qis Rose'	Field In-Ground	Senesac	NY	1997	Over the top	Slight to moderate injury increasing with rate (0.25, 0.5, 1.0 lb ai per acre).	N	20120727j.pdf

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results	EPA Reg ?	File Name
25648	Fern, Japanese Holly (Cyrtomium fortunei)	Field Container	Gilliam	AL	2007	Over the top	No injury or growth reduction at 34, 68 and 124 oz per acre.	N	20071219i.pdf
25648	Fern, Japanese Holly (Cyrtomium fortunei)	Field Container	Neal	NC	2006	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre + NIS.	N	20070308a.pdf
13116	Larkspur (Delphinium sp.) D. x belladonna 'Cliven Beauty'	Field Container	Anderson	OH	2001	Over the top	Slight to moderate injury increasing with rate (0.25, 0.5, 1.0 lb ai per acre) with recovery.	N	20120728q.pdf
13116	Larkspur (Delphinium sp.) 'Dwarf Blue Butterfly'	Field Container	Linderman	OR	2001	Over the top	Severe injury and mortality after second application at all rates (0.25, 0.5, 1.0 lb ai per acre).	N	20120728r.pdf
12185	Foxglove (Digitalis sp.) D. x mertonensis	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728s.pdf
25586	Fern, Autumn (Dryopteris erythrosora)	Field Container	Gilliam	AL	2007	Over the top	No injury or growth reduction at 34, 68 and 124 oz per acre.	N	20071219i.pdf
25586	Fern, Autumn (Dryopteris erythrosora)	Field Container	Linderman	OR	2002	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120730d.pdf
25586	Fern, Autumn (Dryopteris erythrosora)	Field Container	Neal	NC	2006	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre + NIS.	N	20070308a.pdf
25661	Fern, Marginal Wood (Dryopteris marginalis)	Field Container	Gilliam	AL	2007	Over the top	No injury or growth reduction at 34, 68 and 124 oz per acre.	N	20071219i.pdf
25661	Fern, Marginal Wood (Dryopteris marginalis)	Field Container	Senesac	NY	2006	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre.	N	20061108a.pdf
17252	Fern, Autumn & Wood (Dryopteris sp.) D. celsa (Log Fern)	Field Container	Senesac	NY	1999	Over the top	Very slight injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727l.pdf
17252	Fern, Autumn & Wood (Dryopteris sp.) D. cycadina (Shaggy Wood Fern)	Field Container	Senesac	NY	1999	Over the top	Minor injury at 0.25, 0.5 and 1.0 lb ai per acre with significant decrease in fresh weights.	N	20120727m.pdf
25649	Fern, Dixie Wood (Dryopteris x australis)	Field Container	Gilliam	AL	2006	Over the top	No injury or growth reduction at 0.25, 0.5 and 1 lb ai per acre	N	20061212x.pdf
25649	Fern, Dixie Wood (Dryopteris x australis)	Field Container	Gilliam	AL	2007	Over the top	No injury or growth reduction at 34, 68 and 124 oz per acre.	N	20071219i.pdf
25649	Fern, Dixie Wood (Dryopteris x australis)	Field Container	Neal	NC	2006	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre + NIS	N	20070308a.pdf
17254	Purple Coneflower (Echinacea sp.)	Field Container	Anderson	OH	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728t.pdf
17254	Purple Coneflower (Echinacea sp.)	Field Container	Knight	MS	2000	Over the top	Very slight injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120730e.pdf
17254	Purple Coneflower (Echinacea sp.) E. purpurea	Field Container	Senesac	NY	1999	Over the top	Slight to severe injury increasing with rate (0.25, 0.5, and 1.0 lb ai per acre).	N	20120727n.pdf
17254	Purple Coneflower (Echinacea sp.) 'White Swan'	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728u.pdf

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results	EPA Reg ?	File Name
13277	Sea Holly (<i>Eryngium maritimum</i>)	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728v.pdf
13277	Sea Holly (<i>Eryngium maritimum</i>) <i>E. planum</i>	Field Container	Senesac	NY	1999	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727o.pdf
23869	Joepywe weed, Sweetscented (<i>Eupatorium purpureum</i>)	Field Container	Senesac	NY	2004	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	19750101s.pdf
12186	Golden Bells (<i>Forsythia</i> sp.)	Field Container	Fraelich	GA	1997	Over the top	No significant injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727p.pdf
12186	Golden Bells (<i>Forsythia</i> sp.)	Field Container	Fraelich	GA	1999	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120729w.pdf
12186	Golden Bells (<i>Forsythia</i> sp.) <i>F. suspensa</i>	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728w.pdf
28016	Strawberry (Non-Bearing) (<i>Fragaria</i> sp.) 'Pink Panda'	Field Container	Senesac	NY	2001	Over the top	No injury with single application of 1X, 2X, or 4X on actively growing plants.	Y	20080616d.pdf
17255	Gaura (<i>Gaura lindheimeri</i>)	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728x.pdf
17255	Gaura (<i>Gaura lindheimeri</i>) 'Siskiyou Pink'	Field Container	Senesac	NY	1999	Over the top	No significant injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727q.pdf
13115	Strawflower (<i>Helichrysum bracteatum</i>) 'Bright Ball'	Field In-Ground	Senesac	NY	1997	Over the top	No to slight injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727r.pdf
13114	Strawflower (<i>Helichrysum bracteatum</i>) 'Bright Bikinis'	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120728y.pdf
19599	Daylily (<i>Hemerocallis</i> sp.)	Field Container	Knight	MS	2000	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120730f.pdf
12194	Daylily (<i>Hemerocallis</i> sp.) 'Raspberry Pixie'	Field In-Ground	Birch	WA	1997	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	Y	20120727s.pdf
12188	Lily, Plantain (<i>Hosta fortunei</i>)	Field Container	Fraelich	GA	1999	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	Y	20120729x.pdf
12182	Lily, Plantain (<i>Hosta fortunei</i>) 'Royal Standard'	Field In-Ground	Birch	WA	1997	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	Y	20120727t.pdf
12189	Hydrangea (<i>Hydrangea</i> sp.)	Field Container	Fraelich	GA	1999	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120729y.pdf
12189	Hydrangea (<i>Hydrangea</i> sp.) 'Nikko Blue'	Field Container	Birch	WA	1997	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120727u.pdf
17256	Candytuft (<i>Iberis</i> sp.)	Field Container	Anderson	OH	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	Y	20120728z.pdf
17256	Candytuft (<i>Iberis</i> sp.) 'Brilliant Rose'	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	Y	20120729a.pdf
23499	New Guinea Impatiens (<i>Impatiens walleriana</i>) 'Accent White'	Field Container	Knight	MS	2000	Over the top	Moderate injury at 0.25 and 1.0 lb ai per acre; virtually no injury at 0.5 lb ai per acre.	N	20120730g.pdf

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results	EPA Reg ?	File Name
28017	Cogongrass; Japanese Bloodgrass (Imperata cylindrica) 'Red Baron'	Field Container	Senesac	NY	2001	Over the top	Significant injury increasing with rate after single application on actively growing plants.	N	20120729b.pdf
20898	Virginia Sweetspire (Itea virginica)	Field Container	Senesac	NY	2000	Over the top	No injury at 0.25, 0.5 and 1.0 lb ai per acre.	N	20120729z.pdf
20733	Yellow Archangel (Lamiastrum galeobdolon) 'Herman's Pride'	Field Container	Senesac	NY	2001	Over the top	No injury after single application of 1X, 2X, and 4X on actively growing plants.	N	20120729c.pdf
20919	Dead Nettle (Lamium sp.) L. maculatum 'White Nancy'	Field Container	Senesac	NY	2000	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120730a.pdf
23876	Lavender, English (Lavandula angustifolia) 'Munstead'	Field Container	Senesac	NY	2004	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	19750101s.pdf
20855	Blue Lyme Grass (Leymus arenarius) 'Blue Dune'	Field Container	Senesac	NY	2001	Over the top	Moderate injury increasing with rate (1X, 2X, 4X) with single application on actively growing plants.	N	20120729d.pdf
13278	Blazing-Star, Gayfeather (Liatris sp.) L. kobold	Field Container	Anderson	OH	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120729e.pdf
13112	Statice (Limonium sp.) L. latifolium	Field Container	Anderson	OH	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120729g.pdf
13112	Statice (Limonium sp.) L. latifolium	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120729f.pdf
23878	Blue flax (Linum perenne L. ssp. Perenne)	Field Container	Senesac	NY	2004	Over the top	No to very slight injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	19750101s.pdf
13279	Cardinal Flower, Indian Pink (Lobelia cardinalis) L. cardinalis x speciosa 'Fan Scarlet'	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120729i.pdf
13279	Cardinal Flower, Indian Pink (Lobelia cardinalis) 'Ruby Slippers'	Field Container	Anderson	OH	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120729h.pdf
13280	Loosestrife, Circle Flower (Lysimachia sp.) L. punctata	Field Container	Senesac	NY	1999	Over the top	No to very slight injury at 0.25, 0.5, and 1.0 lb ai per acre.	Y	20120727w.pdf
25650	Fern, Ostrich (Matteuccia struthiopteris)	Field Container	Neal	NC	2006	Over the top	No significant injury at 0.25, 0.5 and 1 lb ai per acre + NIS	N	20070308a.pdf
25650	Fern, Ostrich (Matteuccia struthiopteris)	Field Container	Senesac	NY	2006	Over the top	Moderate to severe injury at 0.25, 0.5 and 1 lb ai per acre; plants not saleable	N	20061108a.pdf
20735	Mazus (Mazus reptans)	Field Container	Senesac	NY	2001	Over the top	Very slight transient injury at single application of 1X, 2X, and 4X on actively growing plants.	N	20120729j.pdf
20910	Bee Balm (Monarda didyma) 'Gardenview Scarlet'	Field Container	Senesac	NY	2000	Over the top	Slight, but transient, injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120730b.pdf
20737	Catnip (Nepeta cataria)	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120729k.pdf

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results	EPA Reg ?	File Name
20737	Catnip (<i>Nepeta cataria</i>) N x faassenii 'Walker's Low'	Field Container	Senesac	NY	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre on actively growing plants.	N	20120729l.pdf
20737	Catnip (<i>Nepeta cataria</i>) 'Walker's Low'	Field Container	Senesac	NY	2004	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre.	N	19750101s.pdf
12190	Evening Primrose, Sundrops (<i>Oenothera</i> sp.) 'Missouri Sundrops'	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120729m.pdf
25651	Fern, Sensitive (<i>Onoclea sensibilis</i>)	Field Container	Neal	NC	2006	Over the top	Slight to severe injury increasing with rate (0.25, 0.5 and 1 lb ai per acre + NIS); plants recovered by end of trial.	N	20070308a.pdf
25652	Fern, Cinnamon (<i>Osmunda cinnamomea</i>)	Field Container	Gilliam	AL	2006	Over the top	No injury at all rates (0.25, 0.5 and 1 lb ai per acre); growth reduction at 2X and 4X	N	20061212x.pdf
25652	Fern, Cinnamon (<i>Osmunda cinnamomea</i>)	Field Container	Senesac	NY	2006	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre.	N	20061108a.pdf
25653	Fern, Royal (<i>Osmunda regalis</i>)	Field Container	Neal	NC	2006	Over the top	Slight transient injury at 0.5 and 1 lb ai per acre + NIS; plants recovered at end of trial.	N	20070308a.pdf
17253	Fern, Royal, Flowering Fern (<i>Osmunda</i> sp.) <i>O. regalis</i>	Field Container	Senesac	NY	1999	Over the top	Slight injury at 0.25, 0.5, and 1.0 lb ai per acre; decrease in fresh weight at 0.25 lb ai per acre.	N	20120727x.pdf
20736	Peony (<i>Paeonia</i> sp.) 'Festiva Maxima'	Field Container	Senesac	NY	2001	Over the top	No injury at 0.25, 0.5, 1.0 lb ai per acre.	N	20020426a.pdf
13281	Sage, Russian; Blue Spire (<i>Perovskia</i> sp.) <i>P. abrotanoides</i>	Field Container	Anderson	OH	2001	Over the top	No injury at 0.25, 0.5, 1.0 lb ai per acre.	N	20120729n.pdf
17257	Jacob's Ladder (<i>Polemonium</i> sp.) <i>P. caeruleum</i>	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5, 1.0 lb ai per acre.	N	20120729o.pdf
17257	Jacob's Ladder (<i>Polemonium</i> sp.) <i>P. caeruleum</i>	Field Container	Senesac	NY	1999	Over the top	No to minor injury increasing with rate (0.25, 0.5, 1.0 lb ai per acre).	N	20120727y.pdf
25655	Fern, Christmas (<i>Polystichum acrostichoides</i>)	Field Container	Gilliam	AL	2006	Over the top	No injury or growth reduction at 0.25, 0.5 and 1 lb ai per acre.	N	20061212x.pdf
25655	Fern, Christmas (<i>Polystichum acrostichoides</i>)	Field Container	Neal	NC	2006	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre + NIS.	N	20070308a.pdf
25655	Fern, Christmas (<i>Polystichum acrostichoides</i>)	Field Container	Senesac	NY	2006	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre.	N	20061108a.pdf
25654	Fern, Tassel (<i>Polystichum polyblepharum</i>)	Field Container	Gilliam	AL	2006	Over the top	No injury or growth reduction at 0.25, 0.5 and 1 lb ai per acre	N	20061212x.pdf
25654	Fern, Tassel (<i>Polystichum polyblepharum</i>)	Field Container	Neal	NC	2006	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre + NIS.	N	20070308a.pdf
25654	Fern, Tassel (<i>Polystichum polyblepharum</i>)	Field Container	Senesac	NY	2006	Over the top	No injury at 0.25, 0.5 and 1 lb ai per acre.	N	20061108a.pdf
19735	Beach Plum (<i>Prunus maritima</i>)	Field Container	Senesac	NY	1999	Over the top	Very slight injury at 0.25, 0.5, 1.0 lb ai per acre.	N	20120727z.pdf

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results	EPA Reg ?	File Name
17246	Cherry (Non-Bearing) (<i>Prunus</i> sp.) <i>P. pensylvanicum</i>	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5, 1.0 lb ai per acre.	Y	20120729q.pdf
17246	Cherry (Non-Bearing) (<i>Prunus</i> sp.) <i>P. x cistena</i> (Sand Cherry)	Field Container	Anderson	OH	2001	Over the top	No injury at 0.25, 0.5, 1.0 lb ai per acre.	Y	20120729p.pdf
23497	Sage, Scarlet (<i>Salvia splendens</i>)	Field Container	Knight	MS	2000	Over the top	Severe injury at 0.25, 0.5, 1.0 lb ai per acre.	Y	20120730h.pdf
11632	Stonecrop (<i>Sedum spectabile</i>) <i>S. spectabile</i> 'Autom Joy'	Field In-Ground	Birch	WA	1997	Over the top	No injury at 0.25, 0.5, 1.0 lb ai per acre; great control of smooth brome.	Y	20120728a.pdf
11876	Stonecrop (<i>Sedum spurium</i>) <i>S. spurium</i> 'Dragon's Blood'	Field In-Ground	Birch	WA	1997	Over the top	No injury at 0.25, 0.5, 1.0 lb ai per acre; great control of smooth brome.	Y	20120728b.pdf
23885	Hen and chicks (<i>Sempervivum tectorum</i>) <i>Sempervivum arachnoideum</i>	Field Container	Senesac	NY	2004	Over the top	No injury at 0.25, 0.5, 1.0 lb ai per acre.	N	19750101s.pdf
23889	Goldenrod, Seaside (<i>Solidago sempervirens</i>)	Field Container	Senesac	NY	2004	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	19750101s.pdf
20740	Thyme, Creeping (<i>Thymus praecox</i>)	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120729s.pdf
20740	Thyme, Creeping (<i>Thymus praecox</i>) 'Albiflorus'	Field Container	Senesac	NY	2001	Over the top	No injury with a single application of 0.25, 0.5, and 1.0 lb ai per acre on actively growing plants.	N	20120729r.pdf
23892	Ironweed, New York (<i>Vernonia noveboracensis</i>)	Field Container	Senesac	NY	2004	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	19750101s.pdf.
17258	Speedwell, Brooklime (<i>Veronica</i> sp.) <i>V. longiflora</i> 'Pink Shades'	Field Container	Linderman	OR	2001	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120729t.pdf
17258	Speedwell, Brooklime (<i>Veronica</i> sp.) <i>V. prostrata</i> 'Georgia Blue'	Field Container	Senesac	NY	1999	Over the top	No injury at 0.25, 0.5, and 1.0 lb ai per acre.	N	20120728c.pdf

Label Suggestions

In this report, 7 species or genera exhibited minimal or no injury after foliar and/or drench treatments of acibenzolar. All of these can be added to the EPA label:

Brassica sp.

Dryopteris erythrosora

Dryopteris x australis

Forsythia sp.

Nepeta sp.

Polystichum acrostichoides

Polystichum polyblepharum

In addition, a section where injury after application has been observed may assist growers. It is recommended that *Imperata cylindrical*, *Leymus arenarius*, *Matteuccia struthiopteris*, *Onoclea sensibilis*, and *Salvia splendens* be added to that new section of the label.

Appendix 1: Contributing Researchers

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Appendix 2: Submitted Data

Researcher reports included in the printed copy of this report are only those received prior to 9/10/2012. Reports on following pages are in order by the last name of the researchers for grouped reports and then by PRNumber for those reported on individually.