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IR-4 Ornamental Horticulture Program Pendimethalin Crop Safety

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Abstract

Pendimethalin has been registered in the United States since 1994 for uses in and around ornamental plants in production nurseries and in landscapes. Between 1981 and 2008, the IR-4 Project has conducted over 469 trials using two granular formulations (Corral 2.68G and Pendulum 2G), two liquid formulations (Pendulum AquaCap and Prowl 4E) and a wettable dry granular formulation (Pendulum WDG). Between 2014 and 2016, 62 trials were conducted on ornamental grasses to determine crop safety of the Pendulum 2G formulation. This summary is an update of the first summary across all the available data generated through IR-4 since screenings began in 1981.

Eighty-two plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of Corral 2.68G and Pendulum 2G formulations. Of these, 19 species or genera are not on the current Pendulum 2G label. Thirty-seven plant species or genera exhibited no or minimal transitory phytotoxicity to applications of Pendulum AquaCap and Pendulum WDG formulations. All these ornamentals are currently listed on the Pendulum AquaCap label. One species (*Stachys byzantina*) exhibited phytotoxicity at 2 lb ai per acre and higher rates. Twenty plant species or genera exhibited no or minimal transitory phytotoxicity to applications of Prowl 4E. Of these, one (*Paeonia* sp.) is not currently listed on the label.

Introduction

Pendimethalin has been registered in the United States since 1994 for uses in and around ornamental plants in production nurseries and in landscapes. Between 1981 and 2008, the IR-4 Project has conducted over 469 trials using two granular formulation (Corral 2.68G and Pendulum 2G), two liquid formulations (Pendulum AquaCap and Prowl 4E) and a wettable dry granular formulation (Pendulum WDG). Between 2014 and 2016, 62 trials were conducted on ornamental grasses to determine crop safety of the Pendulum 2G formulation. This summary is an update of the first summary across all the available data generated through IR-4 since 1981. While pendimethalin labels in the United States are fairly broad with many listed crops, this document will lead to amendments placing new crops on these labels as well as provide supporting information for registration in Canada for ornamental horticulture plants.

Materials and Methods

Because this research was conducted over several years with different protocols, application rates and whether repeat applications were made varied. Rates ranged from 0.75 to 13.2 lb ai per acre and either 1 or more applications were made. Typically, treatment was applied over the top 1-2 times at 2.0, 4.0 and 8.0 lb ai per acre, plus an untreated Check. Trials between 2014 and 2016 with Pendulum 2G used 3, 6 and 12 lb ai per acre applied twice. A minimum of three plants (replicate treatments) were required with many researchers exceeding this minimum. Phytotoxicity was generally recorded on a scale of 0 to 10 (0 = No phytotoxicity; 10 = Complete kill) at various intervals from 1 week to 4 months after application. A researcher also took readings one year after application.

Pendulum formulations were supplied to researchers (See list of researchers in Appendix 1) by American Cyanamid, BASF, and Scotts.

For IR-4 testing, the following protocols were used: 05-001, 06-009, 14-010, 15-010 and 16-011. Please visit <http://ir4.rutgers.edu/ornamental/OrnamentalDrafts.cfm> to view and download these protocols.

Results and Summary

Based on the type and nature of injury seen with pendimethalin 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) significant injury sufficient to recommend growers not utilize this product, and 3) more data are needed to make informed recommendations.

Phytotoxicity of Corral 2.68G and Pendulum 2G

Eighty-two plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of Corral 2.68G and Pendulum 2G formulations (Table 1). For 92 genera/species, more information is needed either because only 1 or 2 trials were conducted or because consistent results were not achieved among the research sites (Table 2). The 68 crops with asterisks exhibited no or minimal transitory injury. *Perovskia atriplicifolia*, a crop that is already on the Pendulum 2G label, showed no significant phytotoxicity at 1.5, 3 and 6 lb ai per acre but

dry weight decreased significantly with increasing rate.

Please see Table 8 and Table 9 for a list of research and a summary of the individual trial results with Corral 2.68G and Pendulum 2G, respectively.

Phytotoxicity of Pendulum AquaCap and Pendulum WDG Formulations

Thirty seven plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of Pendulum AquaCap and Pendulum WDG formulations (Table 3). All these ornamentals are currently listed on the Pendulum AquaCap label. One species (*Stachys byzantina*) exhibited significant injury (Table 4). In Table 5, 31 ornamental genera or species are listed where only 1 or 2 trials were conducted through IR-4. The 14 crops with asterisks exhibited no or minimal transitory injury.

Please see Table 10 and Table 11 for a list of research and a summary of the individual trial results with Pendulum AquaCap and Pendulum 60WDG formulations, respectively.

Phytotoxicity of Prowl 4E Formulations

Twenty plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of Prowl 4E (Table 6). Of these, one (*Paeonia* sp.) is not currently listed on the label. Although the treatment for the trials was applied to soil prior to shoot emergence, it is recommended that this ornamental be placed on the current Pendulum 3.3EC label since another species (*Paeonia lactiflora*) is already on the label. In Table 7, one plant (*Acer* sp.) is listed where only 1 trial was conducted through IR-4.

Please see Table 12 for a list of research and a summary of the individual trial results with Prowl 4E.

Table 1. List of Corral 2.68G and Pendulum 2G treated crops with no or minimal transitory injury.

<i>Acer griseum</i> ¹	<i>Digitalis thaspi</i>	<i>Nepeta x faasseni</i>
<i>Achillea millefolium</i> ¹	<i>Echinacea purpurea</i> ¹	<i>Origanum libanoticum</i> ¹
<i>Agastache aurantiaca</i> ¹	<i>Eupatorium purpureum</i> ¹	<i>Pennisetum alopecuroides</i>
<i>Agastache rupestris</i> ¹	<i>Gaura lindheimeri</i> ¹	<i>Pennisetum orientale</i>
<i>Alchemilla mollis</i> ¹	<i>Gazania linearis</i>	<i>Penstemon digitalis</i> ¹
<i>Ammophila breviligulata</i> ¹	<i>Gerbera jamesonii</i> ¹	<i>Penstemon x mexicali</i> ¹
<i>Amsonia hubrichtii</i> ¹	<i>Gomphrena globosa</i> ¹	<i>Penstemon</i> sp.
<i>Antennaria dioica</i> ¹	<i>Helenium autumnale</i> ¹	<i>Phlox subulata</i> ¹
<i>Antennaria parvifolia</i> ¹	<i>Helianthus salicifolius</i> ¹	<i>Physostegia virginiana</i> ¹
<i>Armeria maritima</i> ¹	<i>Helianthus</i> sp. ¹	<i>Polemonium boreale</i> ¹
<i>Artemisia lactiflora</i> ¹	<i>Heliopsis helianthoides</i> ¹	<i>Rumohra adiantiformis</i> ¹
<i>Asarum canadense</i> ¹	<i>Hemerocallis</i> sp. ¹	<i>Scabiosa</i> sp.
<i>Asparagus virgatus</i> ¹	<i>Heuchera sanguinea</i> ¹	<i>Schizachyrium scoparium</i>
<i>Aspidistra elatior</i> ¹	<i>Hibiscus syriacus</i> ¹	<i>Sedum</i> sp.
<i>Aster novi-belgii</i> ¹	<i>Hosta fortunei</i> ¹	<i>Sempervivum tectorum</i> ¹
<i>Athyrium nipponicum</i>	<i>Juncus effusus</i>	<i>Solidago rugosa</i> ¹
<i>Aubrieta</i> sp. ¹	<i>Kniphofia</i> sp.	<i>Solidago sempervirens</i> ¹
<i>Baptisia australis</i> ¹	<i>Kniphofia uvaria</i> ¹	<i>Solidago speciosa</i> ¹
<i>Bergenia cordifolia</i> ¹	<i>Lantana montevidensis</i> ¹	<i>Sorghastrum nutans</i>
<i>Buddleia davidii</i> ¹	<i>Lavandula angustifolia</i> ¹	<i>Sporobolus heterolepis</i> ¹
<i>Chasmanthium latifolium</i>	<i>Leymus arenarius</i>	<i>Tiarella cordifolia</i> ¹
<i>Chelone lyonii</i> ¹	<i>Ligularia stenocephala</i> ¹	<i>Tradescantia x</i>
<i>Chrysanthemum x</i>	<i>Linum perenne</i> L. ssp.	<i>andersoniana</i> ¹
<i>superbum</i> ¹	<i>Perenne</i> ¹	<i>Verbena canadensis</i> ¹
<i>Chrysogonum virginianum</i>	<i>Liriope muscari</i> ¹	<i>Vernonia noveboracensis</i> ¹
<i>Delosperma nubigenum</i> ¹	<i>Lysimachia punctata</i> ¹	<i>Viola tricolor</i> ¹
<i>Deschampsia caespitosa</i> ¹	<i>Monarda didyma</i> ¹	<i>Zauschneria californica</i> ¹
<i>Diascia barbaeae</i> ¹	<i>Muhlenbergia capillaris</i>	
<i>Digitalis purpurea</i> ¹	<i>Muhlenbergia dumosa</i>	

¹ Already registered for Pendulum 2G

Table 2. List of Corral 2.68G and Pendulum 2G treated crops where more information is needed.

<i>Agastache</i> sp.	<i>Eragrostis curvula</i> *	<i>Pelargonium x hortorum</i>
<i>Agastache rugosa x foeniculum</i>	<i>Eragrostis spectabilis</i> *	<i>Penstemon hartwegii</i> *
<i>Alchemilla</i> sp.*	<i>Erianthus ravennae</i> *	<i>Pentas</i> sp.*
<i>Amsonia abernaemontana</i>	<i>Erianthus</i> sp.*	<i>Perovskia atriplicifolia</i> ¹
<i>Andropogon gerardii</i>	<i>Eupatorium maculatum</i> *	<i>Phlox paniculata</i>
<i>Arachniodes simplicior</i> *	<i>Eupatorium perfoliatum</i> *	<i>Phormium colinsoi</i> *
<i>Asarum chinensis</i> *	<i>Eupatorium rugosum</i> *	<i>Polemonium reptans</i>
<i>Aster dumosus x Aster</i>	<i>Eupatorium</i> sp.*	<i>Polemonium</i> sp.*
<i>novibelgii</i> *	<i>Fallugia paradoxa</i> *	<i>Polystichum polyblepharum</i>
<i>Aster ericoides</i> *	<i>Gazania</i> sp.*	<i>Primula malacoides</i>
<i>Astilbe</i> sp.	<i>Gerbera</i> sp.	<i>Rhamnus smithii</i> *
<i>Buddleia alternifolia</i> *	<i>Gomphrena</i> sp.*	<i>Ruellia brittoniana</i> *
<i>Calamagrostis acutiflora</i> *	<i>Hakonechloa macra</i> *	<i>Ruscus aculeatus</i> *
<i>Carex buchananii</i> *	<i>Helenium</i> sp.*	<i>Salvia daghestanica</i> *
<i>Carex cherokeensis</i> *	<i>Helianthemum</i> sp.*	<i>Salvia sylvestris</i> *
<i>Carex morrowii</i> *	<i>Helleborus niger</i> *	<i>Santolina chamaecyparissus</i> *
<i>Centranthus ruber</i> *	<i>Helleborus orientalis</i>	<i>Scabiosa columbaria</i> *
<i>Cimicifuga racemosa</i>	<i>Hierochloa odorata</i> *	<i>Scutellaria resinosa</i> *
<i>Clematis</i> sp.*	<i>Iberis</i> sp.*	<i>Sedum acre</i> *
<i>Coreopsis</i> sp.*	<i>Lantana hybrida</i> *	<i>Sedum hybridum</i>
<i>Cuphea hyssopifolia</i> *	<i>Leucanthemum maximum</i> *	<i>Sedum pachyclados</i>
<i>Cyrtomium falcatum</i> *	<i>Ligularia dentata</i> *	<i>Sedum reflexum</i> *
<i>Cytisus purgans</i> *	<i>Ligularia stenocephala</i> *	<i>Sedum sexangulare</i>
<i>Dianthus</i> sp.*	<i>Muhlenbergia dubia</i> *	<i>Sempervivum arachnoideum</i> *
<i>Diascia integerrima</i> *	<i>Nassella tenuissima</i>	<i>Solidago cabadensis</i> *
<i>Digitalis</i> sp.*	<i>Nepeta x nervosa</i>	<i>Stachys byzantina</i> *
<i>Dryopteris erythrosora</i> *	<i>Oenothera fruticosa</i> *	<i>Tiarella wherryi</i>
<i>Dryopteris ludoviciana</i> *	<i>Opuntia humifusa</i> *	<i>Tradescantiasp.</i> *
<i>Echinacea</i> sp.*	<i>Othonna capensis</i> *	<i>Tradescantia virginiana</i> *
<i>Epilobium fleischeri</i> *	<i>Paeonia</i> sp.*	<i>Veronica liwanensis</i>
<i>Epimedium x rubrum</i>	<i>Panicum virgatum</i> **	<i>Veronica repens</i>

* For these plants, the one or two trials presented here indicate no phytotoxicity or slight, transient injury, but these findings need to be confirmed.

** This plant showed no injury in 7 field container trials but high injury at 28 days in one greenhouse trial.

¹ Already registered for Pendulum 2G.

Table 3. List of Pendulum AquaCap and Pendulum WDG treated crops with no or minimal transitory injury.

<i>Abies fraseri</i> ¹	<i>Gaillardia aristata</i> ¹
<i>Achillea millefolium</i> ¹	<i>Gaillardia grandiflora</i> ¹
<i>Aquilegia hybrida</i> ¹	<i>Gaillardia pulchella</i> ¹
<i>Aquilegia</i> sp. ‘McKana’ ¹	<i>Geum quellyon</i> ¹
<i>Artemisia ludoviciana</i> ¹	<i>Geum</i> sp. ¹
<i>Astilbe chinensis</i> ¹	<i>Goniolimon tataricum</i> ¹
<i>Campanula persicifolia</i> ¹	<i>Gypsophila paniculata</i> ¹
<i>Chrysalidocarpus lutescens</i> ¹	<i>Hemerocallis</i> sp. ¹
<i>Chrysanthemum maximum</i> ¹	<i>Iris kaempfei</i> ¹
<i>Chrysanthemum maximum</i> x <i>superbum</i> ¹	<i>Liatris pycnostachys</i> ¹
<i>Coreopsis lanceolata</i> ¹	<i>Limonium latifolia</i> ¹
<i>Cupressocyparis leylandii</i> ¹	<i>Limonium sinuatum</i> ¹
<i>Dennstaedtia punctilobula</i> ¹	<i>Limonium</i> sp. ¹
<i>Digitalis purpurea</i> ¹	<i>Phoenix roebelinii</i> ¹
<i>Doronicum cordatum</i> ¹	<i>Rodgersia henricii</i> ¹
<i>Echinacea purpurea</i> ¹	<i>Sedum spurium</i> ¹
<i>Eucalyptus cinerea</i> ¹	<i>Stokesia laevis</i> ¹
<i>Forsythia intemedia</i> ¹	<i>Ulmus alata</i> ¹
<i>Fothergilla gardenii</i> ¹	

¹Already registered for Pendulum Aquacap.

Table 4. List of Pendulum AquaCap and Pendulum WDG treated crops exhibiting significant injury.

Stachys byzantina

Table 5. List of Pendulum AquaCap and Pendulum WDG treated crops where more information is needed.

<i>Alyssum</i> sp.*	<i>Impatiens</i> sp.
<i>Amsonia ciliata</i> *	<i>Lantana camara</i> *
<i>Arachniodes simplicor</i>	<i>Myrica pensylvanica</i> *
<i>Athyrium nipponicum</i> *	<i>Petuniasp.</i> ¹
<i>Aurinia saxatilis</i>	<i>Petunia x hybrida</i> ¹
<i>Begonia</i> sp.	<i>Physostegia virginiana</i>
<i>Campanula carpatica</i>	<i>Polystichum acrostichoides</i>
<i>Chionanthus retusus</i> *	<i>Polystichum polyblepharum</i> *
<i>Coreopsis verticillata</i> *	<i>Rudbeckia hirta</i> ¹
<i>Cyrtomium falcatum</i> *	<i>Stachys lanata</i> *
<i>Digitalis grandiflora</i> *	<i>Stokesia</i> sp.*
<i>Digitalis x mertonensis</i> *	<i>Tagetes</i> sp.
<i>Dryopteris ludoviciana</i> *	<i>Vinca</i> sp.
<i>Gazania</i> sp.	<i>Viola tricolor</i>
<i>Geum triflorum</i> ¹	<i>Washingtonia robusta</i> ¹
<i>Hydrangea quercifolia</i>	

* For these plants, the one or two trials presented here indicate no phytotoxicity or slight, transient injury, but these findings need to be confirmed.

¹ Already registered for Pendulum Aquacap.

Table 6. List of Prowl 4E treated crops with no or minimal transitory injury.

<i>Abies fraseri</i> ¹	<i>Lagerstroemia indica</i> ¹	<i>Pinus taeda</i> ¹
<i>Betula nigra</i> ¹	<i>Liriope muscari</i> ¹	<i>Quercus nigra</i> ¹
<i>Forsythia intermedia</i> ¹	<i>Liriope spicata</i> ¹	<i>Rhododendron x obtusum</i> ¹
<i>Fraxinus pennsylvanica</i> ¹	<i>Paeonia</i> sp.	<i>Taxus cuspidata</i> ¹
<i>Ilex cornuta</i> ¹	<i>Photinia fraseri</i> ¹	<i>Thuja occidentalis</i> ¹
<i>Ilex crenata</i> ¹	<i>Picea pungens</i> ¹	<i>Tsuga canadensis</i> ¹
<i>Juniperus horizontalis</i> ¹	<i>Pinus strobus</i> ¹	

¹ Already registered for Pendulum 3.3EC

Table 7. List of Prowl 4E treated crops where more information is needed.

Acer sp.*

* For this plant, the one presented here indicate no phytotoxicity or slight, transient injury, but this finding need to be confirmed.

Table 8. Detailed Summary of Crop Safety Testing with Corral / Southern Weed Grass Control 2.68G (Pendimethalin)

Notes: Table entries are sorted by crop Latin name. Only those reports received before 4/24/2017 are included.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
11278	Fern, Tree (<i>Asparagus virgatus</i>)	Shadehouse/ Lathhouse	Stamps	FL	1992	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre after 4 applications.
11277	Cast-Iron Plant, Ker-Gawl (<i>Aspidistra elatior</i>)	Shadehouse/ Lathhouse	Stamps	FL	1992	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre.
12395	Reed Grass (<i>Calamagrostis arundinacea</i>) C. acutiflora 'Karl Foerster'	Field Container	Fain	MS	2002	Over the top	No injury at 3, 6 and 12 lb ai per acre.
12392	Northern Sea Oats, Wild Oats (<i>Chasmanthium latifolium</i>)	Field Container	Fain	MS	2002	Over the top	No injury at 3, 6 and 12 lb ai per acre.
11469	Daylily (<i>Hemerocallis</i> sp.) <i>hemerocallis</i>	Field Container	Fraelich	GA	1996	Over the top	No injury at 3, 6 and 12 lb ai per acre; all plants marketable.
12394	Switch-Grass (<i>Panicum virgatum</i>) 'Heavy Metal'	Field Container	Fain	MS	2002	Over the top	No injury at 3, 6 and 12 lb ai per acre; excellent weed control.
11878	Fern, Leatherleaf (<i>Rumohra adiantiformis</i>)	Shadehouse/ Lathhouse	Stamps	FL	1992	Over the top	Slight injury to fronds, but not decrease in quality (frond weight or shelf life) at 2 and 4 lb ai per acre; mediocre control of long stalked <i>phyllanthus</i> , hairy bittercress, and american burnweed.
11884	Butchers Broom, Israeli Ruscus (<i>Ruscus aculeatus</i>)	Shadehouse/ Lathhouse	Stamps	FL	1992	Over the top	No significant injury with 2 and 4 lb ai per acre; poor to good weed control.
11461	Stonecrop (<i>Sedum</i> sp.) S. <i>telephium</i> 'Autumn Joy'	Field Container	Beste	MD	1994	Over the top	No significant injury at 1, 2 and 4 lb ai per acre, but significant growth reduction at 4 lb; excellent control of prostrate spurge, good control of yellow woodsorrel and Pennsylvania bittercress.

Table 9. Detailed Summary of Crop Safety Testing with Pendulum 2G (Pendimethalin)

Notes: Table entries are sorted by crop Latin name. Only those reports received before 4/24/2017 are included.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
13208	Maple, Paperbark (<i>Acer griseum</i>)	Field Container	Senesac	NY	1997	Over the top	Field Container: No to slight injury increasing with rate (1.5, 3.0, 6.0 lb ai per acre) occurring at the last rating date 8 WAT.
13208	Maple, Paperbark (<i>Acer griseum</i>)	Field Container	Senesac	NY	1997	Over the top	Pot in Pot: Very slight injury at all rates (1.5, 3.0, 6.0 lb ai per acre).
24395	Yarrow (<i>Achillea millefolium</i>)	Field Container	Reding	OH	2005	Broadcast	No injury
24395	Yarrow (<i>Achillea millefolium</i>) 'Apple Blossom'	Field Container	Boydston	WA	2005		No injury
12382	Yarrow (<i>Achillea millefolium</i>) 'Cerise Queen'	Field Container	Senesac	NY	1997	Over the top	No significant injury at 1.5, 3 and 6 lb ai per acre.
18717	Hyssop, Sunset;Giant (<i>Agastache rupestris</i>)	Field Container	Klett	CO	1999	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
18717	Hyssop, Sunset;Giant (<i>Agastache rupestris</i>)	Field Container	Klett	CO	2000	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
24678	Hyssop species (<i>Agastache</i> sp.) <i>A. aurantiaca</i> 'Coronado'	Field Container	Klett	CO	2005		No injury
24678	Hyssop species (<i>Agastache</i> sp.) <i>A. aurantiaca</i> 'Coronado'	Field Container	Klett	CO	2005	Broadcast	No injury
24678	Hyssop species (<i>Agastache</i> sp.) <i>A. rugosa</i> X <i>foeniculum</i> 'Blue Fortune'	Field Container	Boydston	WA	2005	Broadcast	No visible injury; the 8 lb ai per acre rate caused brittle stems that make plants susceptible to wind damage
24678	Hyssop species (<i>Agastache</i> sp.) 'Blue Fortune'	Field Container	Mathers (OSU)	OH	2005		No injury at the 2 and 4 lb ai per acre rates; severe injury (brittle stems) at the 8 lb ai per acre rate
23745	Lady's-Mantle (<i>Alchemilla</i> sp.)	Field Container	Klett	CO	2004		No injury or growth reduction at 2, 4 and 8 lb ai per acre
23745	Lady's-Mantle (<i>Alchemilla</i> sp.) <i>A. mollis</i>	Field Container	Mathers (OSU)	OH	2004		No injury at 2, 4 and 8 lb ai per acre
23745	Lady's-Mantle (<i>Alchemilla</i> sp.) <i>A. mollis</i> 'Auslese'	Field Container	Derr	VA	2004	Over the top	Slight injury at 2, 4 and 8 lb ai per acre
23745	Lady's-Mantle (<i>Alchemilla</i> sp.) <i>A. mollis</i> 'Auslese'	Field Container	Lieth	CA	2004	Over the top	No significant injury or growth reduction at 2, 4 and 8 lb ai per acre
23745	Lady's-Mantle (<i>Alchemilla</i> sp.) <i>A. mollis</i> 'Thriller'	Field Container	Ahrens/Mervosh	CT	2005	Ground, broadcast over top	No injury
23745	Lady's-Mantle (<i>Alchemilla</i> sp.) <i>A. mollis</i> 'Thriller'	Field Container	Senesac	NY	2004	Over the top	No significant injury at 3, 6 and 12 lb ai per acre
31901	American beachgrass (<i>Ammophila breviligulata</i>)	Field Container	Klett	CO	2015	Over the top	No injury or growth reduction with with 3, 6 and 12 lb ai per acre applied twice.

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31901	American beachgrass (<i>Ammophila breviligulata</i>)	Field Container	Mathers	OH	2015		No injury with 3, 6, and 12 lb ai per acre applied twice.
31901	American beachgrass (<i>Ammophila breviligulata</i>)	Field Container	Senesac	NY	2014	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
23746	Bluestar (<i>Amsonia</i> sp.) <i>A. hubrichtii</i>	Field Container	Neal	NC	2004	Over the top	No injury at 2, 4 and 8 lb ai per acre
23746	Bluestar (<i>Amsonia</i> sp.) <i>A. hubrichtii</i>	Field Container	Senesac	NY	2004	Over the top	No injury at 3, 6 and 12 lb ai per acre
23746	Bluestar (<i>Amsonia</i> sp.) <i>A. tabernaemontana</i>	Field Container	Gilliam	AL	2004	Over the top	Significant injury (leaf burn) at 2, 4 and 8 lb ai per acre
32031	Big Blue Stem (<i>Andropogon gerardii</i>)	Field Container	Derr	VA	2015	Over the top	No shoot weight reduction with 3, 6 and 12 lb ai per acre applied twice.
32031	Big Blue Stem (<i>Andropogon gerardii</i>)	Field Container	Senesac	NY	2015	Over the top	No injury with 3 lb ai per acre applied twice, minor with some recovery at 6 and 12 lb after 2nd application.
23747	Pussy-Toes, Stoloniferous (<i>Antennaria dioica</i>)	Field Container	Klett	CO	2004		No injury or growth reduction at 2, 4 and 8 lb ai per acre
23748	Pussy-Toes, Small-leaf (<i>Antennaria parvifolia</i>)	Field Container	Neal	NC	2005	Broadcast	No injury
23748	Pussy-Toes, Small-leaf (<i>Antennaria parvifolia</i>)	Field Container	Senesac	NY	2004		No injury
24684	Thrift, Sea Pink (<i>Armeria maritima</i>) 'Dusseldorf'	Field Container	Lieth	CA	2005	Broadcast	No injury at the 2 lb ai per acre rate; the 8 lb ai per acre rate reduced plant growth
24684	Thrift, Sea Pink (<i>Armeria maritima</i>) 'Splendens'	Field Container	Boydston	WA	2005		No injury
24684	Thrift, Sea Pink (<i>Armeria maritima</i>) 'Splendens'	Field Container	Gilliam	AL	2005	Broadcast	No injury
22947	Mugwort, White (<i>Artemisia lactiflora</i>) 'Guizho'	Field Container	Klett	CO	2002	Over the top	Trial 1: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
22947	Mugwort, White (<i>Artemisia lactiflora</i>) 'Guizho'	Field Container	Klett	CO	2002	Over the top	Trial 2: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
23749	Canadian Ginger (<i>Asarum canadense</i>)	Field Container	Senesac	NY	2005		No significant injury
23749	Canadian Ginger (<i>Asarum canadense</i>) <i>A. chinensis</i>	Field Container	Mathers (OSU)	OH	2004		No injury
23749	Canadian Ginger (<i>Asarum canadense</i>) <i>A. chinensis</i>	Field Container	Neal	NC	2005	Broadcast	No injury
24392	Aster, Michaelmas (<i>Aster dumosus</i> x <i>Aster novibelgii</i>)	Field Container	Reding	OH	2006	Over the top	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre); all plants marketable
24692	Aster (<i>Aster ericoides</i>) 'Snow Flurry'	Field Container	Chandran	WV	2005	Over the top	No injury at 2, 4 and 8 lb ai per acre
24692	Aster (<i>Aster ericoides</i>) 'Wood's Light Blue'	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
24393	Aster, New York (<i>Aster novibelgii</i>)	Field Container	Fraelich	GA	2005	Broadcast	No injury or growth differences at all rates

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24393	Aster, New York (Aster novibelgii)	Field Container	Simmons	SC	2005	Foliar	No significant injury
24393	Aster, New York (Aster novibelgii) 'Professor Anton Kippenberg'	Field Container	Boydston	WA	2005	Broadcast	No injury
24393	Aster, New York (Aster novibelgii) 'Sailor Boy'	Field Container	Beste/Frank (ARS)	MD	2005	Over the top	No injury at 2, 4 and 8 lb ai per acre
13204	False Spirea (Astilbe sp.)	Field Container	Senesac	NY	1997	Over the top	No significant injury at 1.5 and 3 lb ai per acre, but moderate injury occurred at 6 lb ai per acre 8 WAT.
24693	Fern, Lady (Athyrium nipponicum)	Field Container	Derr	VA	2005	Broadcast	All rates caused no visible injury but reduced shoot weight
24693	Fern, Lady (Athyrium nipponicum)	Field Container	Reding	OH	2006	Over the top	No injury at all rates (2, 4 and 8 lb ai per acre) after 1st, high injury and growth reduction after 2nd application
24693	Fern, Lady (Athyrium nipponicum) 'Pretum'	Field Container	Mathers (OSU)	OH	2005		No significant injury at the 2 lb ai per acre rate; the 4 and 8 lb ai per acre rates caused moderate to sever injury (frond scorching)
23750	Rock Cress (Aubrieta sp.)	Field Container	Klett	CO	2004		No injury
23750	Rock Cress (Aubrieta sp.) A. deltoidea 'Whitwell Gem'	Field Container	Neal	NC	2004		No significant injury
26017	Rock Cress (Aubrieta sp.) 'Large Flo'	Greenhouse	Freiberger	NJ	2006	Over the top	No injury at all rates (2, 4 and 8 lb ai per acre)
23750	Rock Cress (Aubrieta sp.) 'White Gem'	Field Container	Lieth	CA	2004		All rates caused no injury but reduced plant width
26017	Rock Cress (Aubrieta sp.) 'Whitwell Gem'	Greenhouse	Mickelbart	IN	2006	Over the top	No significant injury or growth reduction (2, 4 and 8 lb ai per acre)
23751	Blue False Indigo (Baptisia australis)	Field Container	Derr	VA	2004		All rates caused slight injury
23751	Blue False Indigo (Baptisia australis)	Field Container	Gilliam	AL	2004		No injury at the 2 and 4 lb ai per acre rates; slight injury at the 8 lb ai per acre rate
23751	Blue False Indigo (Baptisia australis)	Field Container	Klett	CO	2004		No injury
23751	Blue False Indigo (Baptisia australis)	Field Container	Neal	NC	2004		No injury
23751	Blue False Indigo (Baptisia australis)	Field Container	Senesac	NY	2005		No injury
24694	Heart-leaved Bergenia (Bergenia cordifolia) New Hybrid bergenia	Field Container	Neal	NC	2005	Broadcast	No injury
24694	Heart-leaved Bergenia (Bergenia cordifolia) New Hybrids	Field Container	Treat	WA	2006	Ground	No injury or growth reduction at all rates (2.5, 5 and 10 lb ai per acre)
24694	Heart-leaved Bergenia (Bergenia cordifolia) 'Red Bloom'	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
24694	Heart-leaved Bergenia (Bergenia cordifolia) 'Rotblum'	Field Container	Lieth	CA	2005	Broadcast	No injury

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26020	Heart-leaved Bergenia (<i>Bergenia cordifolia</i>) 'Winter Glow'	Greenhouse	Mickelbart	IN	2006	Over the top	No significant injury or growth reduction (2, 4 and 8 lb ai per acre)
20153	Butterfly Bush, Silver (<i>Buddleia alternifolia</i>)	Field Container	Klett	CO	2000	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
20153	Butterfly Bush, Silver (<i>Buddleia alternifolia</i>) 'Argentea'	Field Container	Klett	CO	2001	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
24386	Butterfly Bush (<i>Buddleia davidii</i>)	Field Container	Simmons	SC	2005	Foliar	No significant injury
24386	Butterfly Bush (<i>Buddleia davidii</i>) 'Pink Delight'	Field Container	Boydston	WA	2005		No injury
24386	Butterfly Bush (<i>Buddleia davidii</i>) 'White Profusion'	Field Container	Beste/Frank (ARS)	MD	2005	Over the top	No significant injury
31902	Feather Reed Grass (<i>Calamagrostis acutiflora</i>)	Field Container	Derr	VA	2014	Over the top	Excellent crop tolerance with 3, 6 and 12 lb ai per acre applied twice.
31902	Feather Reed Grass (<i>Calamagrostis acutiflora</i>)	Field Container	Wade	SC	2014	Over the top	No injury with 3, 6 and 12 lb ai per acre applied twice; all plants marketable.
31903	<i>Carex buchanani</i> (<i>Carex buchanani</i>) 'Red Rooster'	Field Container	Neal	NC	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31903	<i>Carex buchanani</i> (<i>Carex buchanani</i>) 'Red Rooster'	Field Container	Senesac	NY	2014	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
32383	Sedge, Cherokee (<i>Carex cherokeensis</i>)	Field Container	Neal	NC	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31904	<i>Carex morrowii</i> (<i>Carex morrowii</i>) 'Ice Dance'	Field Container	DeFrancesco	OR	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31904	<i>Carex morrowii</i> (<i>Carex morrowii</i>) 'Ice Dancer'	Field Container	Senesac	NY	2014	Over the top	Slight injury after 2nd applic. with 3, 6 and 12 lb ai per acre; no significant growth reduction.
24695	Jupiter's Beard (<i>Centranthus ruber</i>)	Field Container	Reding	OH	2005	Broadcast	No injury
24695	Jupiter's Beard (<i>Centranthus ruber</i>) 'Coccineus'	Field Container	Treat	WA	2006	Ground	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre)
31905	Northern Sea Oats, Wild Oats (<i>Chasmanthium latifolium</i>)	Field Container	Mathers	OH	2015	Over the top	No injury with 3 and 6, minor with 12 lb ai per acre applied twice.
31905	Northern Sea Oats, Wild Oats (<i>Chasmanthium latifolium</i>)	Field Container	Senesac	NY	2014	Over the top	No injury or significant growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31905	Northern Sea Oats, Wild Oats (<i>Chasmanthium latifolium</i>)	Field Container	Wilen	CA	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
23752	Turtlehead, Snakehead (<i>Chelone</i> sp.) <i>C. lyonii</i> 'Hot Lips'	Field Container	Derr	VA	2004	Over the top	Slight injury at 2, 4 and 8 lb ai per acre
23752	Turtlehead, Snakehead (<i>Chelone</i> sp.) <i>C. lyonii</i> 'Hot Lips'	Field Container	Neal	NC	2004	Over the top	No injury at 2, 4 and 8 lb ai per acre
23752	Turtlehead, Snakehead (<i>Chelone</i> sp.) <i>C. lyonii</i> 'Hot Lips'	Field Container	Senesac	NY	2004	Over the top	No significant injury at 3, 6 and 12 lb ai per acre
23753	Golden Star (<i>Chrysogonum</i> sp.) <i>C. virginianum</i> 'Alan Bush'	Field Container	Derr	VA	2004		All rates caused slight injury

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23753	Golden Star (<i>Chrysogonum</i> sp.) <i>C. virginianum</i> 'Alan Bush'	Field Container	Neal	NC	2004		No injury at the 2 and 4 lb ai per acre rates; very slight injury at 8 lb ai per acre
23753	Golden Star (<i>Chrysogonum</i> sp.) <i>C. virginianum</i> 'Alan Bush'	Field Container	Senesac	NY	2005		No significant injury
23754	Bugbane & Cohosh, Black (<i>Cimicifuga racemosa</i>)	Field Container	Neal	NC	2005	Broadcast	No injury at the 2 and 4 lb ai per acre rates; moderate injury at 8 lb ai per acre
24822	Clematis (<i>Clematis</i> sp.) 'Midnight Showers'	Field Container	Mathers (OSU)	OH	2005		No injury
25295	Mexican Heather, False Heather, Elfin Herb (<i>Cuphea hyssopifolia</i>)	Field In-Ground	Chen	LA	2005		No significant injury
20150	Broom, Andorra (<i>Cytisus purgans</i>)	Field Container	Klett	CO	2000	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
24824	Hardy Ice Plant, Yellow Ice Plant (<i>Delosperma nubigenum</i>)	Field Container	Boydston	WA	2005	Broadcast	No visible injury; significantly lower plant width at 4 and 8 lb ai per acre but plants are saleable
24824	Hardy Ice Plant, Yellow Ice Plant (<i>Delosperma nubigenum</i>)	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
24824	Hardy Ice Plant, Yellow Ice Plant (<i>Delosperma nubigenum</i>)	Field Container	Linderman	OR	2006	Over the top	No injury at 2, 4 and 8 lb ai per acre
31907	Tufted hairgrass (<i>Deschampsia caespitosa</i>)	Field Container	Klett	CO	2014	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31907	Tufted hairgrass (<i>Deschampsia caespitosa</i>)	Field Container	Neal	NC	2015	Over the top	No injury or growth reduction with 3, moderate with 6 and 12 lb ai per acre, applied twice.
31907	Tufted hairgrass (<i>Deschampsia caespitosa</i>) 'Pixie Fountain'	Field Container	DeFrancesco	OR	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
18718	Twinspur (<i>Diascia integerrima</i>) 'Coral Canyon'	Field Container	Klett	CO	2000	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
18718	Twinspur (<i>Diascia integerrima</i>) <i>D. barbaeae</i>	Field Container	Klett	CO	1999	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
11467	Foxglove (<i>Digitalis</i> sp.) <i>D. purpurea</i>	Field Container	Gilliam	AL	1996	Over the top	No significant injury or growth reduction at 3, 6 and 12 lb ai per acre.
24696	Foxglove (<i>Digitalis</i> sp.) <i>D. thaspi</i> 'Foxy'	Field Container	Boydston	WA	2005		No injury
24696	Foxglove (<i>Digitalis</i> sp.) <i>D. thaspi</i> 'Spanish Peaks'	Field Container	Klett	CO	2005	Broadcast	No significant injury
26023	Foxglove (<i>Digitalis</i> sp.) 'Excelsior Mix'	Greenhouse	Freiberger	NJ	2006	Over the top	No injury at all rates (2, 4 and 8 lb ai per acre)
26023	Foxglove (<i>Digitalis</i> sp.) 'Pam's Choice'	Greenhouse	Mickelbart	IN	2006	Over the top	No significant injury or growth reduction (2, 4 and 8 lb ai per acre)
24391	Purple Coneflower (<i>Echinacea</i> sp.)	Field Container	Simmons	SC	2005	Foliar	No significant injury
24391	Purple Coneflower (<i>Echinacea</i> sp.) <i>E. purpurea</i> 'Magnus'	Field Container	Boydston	WA	2005		No injury
24391	Purple Coneflower (<i>Echinacea</i> sp.) <i>E. purpurea</i> 'Magnus'	Field Container	Derr	VA	2005	Broadcast	No injury

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24391	Purple Coneflower (Echinacea sp.) Echinacea purpurea	Field Container	Fraelich	GA	2005	Broadcast	No injury or growth differences
24391	Purple Coneflower (Echinacea sp.) 'Magnus'	Field Container	Gilliam	AL	2005	Broadcast	No injury
23089	Alpine Willowherb (Epilobium fleischeri)	Field Container	Klett	CO	2001	Over the top	Trial 1: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
23089	Alpine Willowherb (Epilobium fleischeri)	Field Container	Klett	CO	2001	Over the top	Trial 2: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
23755	Barrenwort (Epimedium sp.) E. x rubrum	Field Container	Ahrens/Mervosh	CT	2005	Ground, broadcast over the top	Slight injury at 2 lb ai per acre; the 4 and 8 lb ai per acre rates caused significant injury and reduced plant vigor
23755	Barrenwort (Epimedium sp.) E. x rubrum	Field Container	Senesac	NY	2005		Slight injury at 2 lb ai per acre; the 4 and 8 lb ai per acre rates caused significant injury
31908	Weeping lovegrass (Eragrostis curvula)	Field Container	Derr	VA	2014	Over the top	Excellent crop tolerance with 3, 6 and 12 lb ai per acre applied twice.
31908	Weeping lovegrass (Eragrostis curvula)	Field Container	Klett	CO	2014	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
32032	Purple Lovegrass (Eragrostis spectabilis)	Field Container	Senesac	NY	2015	Over the top	No injury with 3, 6 and 12 lb ai per acre after first application, minor with 2X and 4X after second.
32027	Plume Grass; Ravenna (Erianthus sp.)	Field Container	Senesac	NY	2016	Over the top	No injury with 3, 6 and 12 lb ai per acre applied twice.
32027	Plume Grass; Ravenna (Erianthus sp.) E. ravennae	Field Container	Derr	VA	2016	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
23756	Joepyee weed, Spotted (Eupatorium maculatum) 'Gateway'	Field Container	Ahrens/Mervosh	CT	2005	Ground, broadcast over the top	No injury
23757	Boneset (Eupatorium perfoliatum) 'Chocolate'	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
23758	Joepyee weed, Sweetscented (Eupatorium purpureum)	Field Container	Senesac	NY	2004		No injury
23758	Joepyee weed, Sweetscented (Eupatorium purpureum) E. dubium 'Little Joe'	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
23758	Joepyee weed, Sweetscented (Eupatorium purpureum) E. 'Sweet Scented'	Field Container	Treat	WA	2006	Ground	No injury at 2, 4 and 8 lb ai per acre
23758	Joepyee weed, Sweetscented (Eupatorium purpureum) 'Gateway'	Field Container	Neal	NC	2005	Broadcast	No injury
24698	Thoroughwort (Eupatorium sp.)	Field Container	Reding	OH	2006	Over the top	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre); all plants marketable
24698	Thoroughwort (Eupatorium sp.) E. rugosa 'Chocolate'	Field Container	Mathers (OSU)	OH	2004		No injury; great control of crabgrass, little control of groundsel

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24698	Thoroughwort (Eupatorium sp.) E. rugosum 'Chocolate'	Field Container	Boydston	WA	2005	Broadcast	No injury
23090	Apache Plume (Fallugia paradoxa)	Field Container	Klett	CO	2001	Over the top	Trial 1: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
23090	Apache Plume (Fallugia paradoxa)	Field Container	Klett	CO	2001	Over the top	Trial 2: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
24385	Gaura (Gaura lindheimeri)	Field Container	Reding	OH	2006	Over the top	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre); all plants marketable
24385	Gaura (Gaura lindheimeri) 'Pink Fountain'	Field Container	Boydston	WA	2005		No injury
24385	Gaura (Gaura lindheimeri) 'Whirling Butterflies	Field Container	Linderman	OR	2006	Over the top	No injury at 2, 4 and 8 lb ai per acre
24385	Gaura (Gaura lindheimeri) 'Whirling Butterflies'	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
24699	Gazania (Gazania linearis) Colorado Gold	Field Container	Neal	NC	2005	Broadcast	No injury
24699	Gazania (Gazania linearis) Colorado Gold	Field Container	Treat	WA	2006	Ground	Injury (minor stunting) noted only at the 4X rate(8 lb ai per acre)
24699	Gazania (Gazania linearis) 'Colorado Gold'	Field Container	Linderman	OR	2006	Over the top	No injury at 2, 4 and 8 lb ai per acre
26830	Treasure Flower (Gazania sp.) 'Daybreak Mix'	Greenhouse	Freiberger	NJ	2006	Over the top	No injury at all rates (2, 4 and 8 lb ai per acre)
24701	Transvaal Daisy (Gerbera sp.)	Field Container	Reding	OH	2006	Over the top	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre); all plants marketable
24701	Transvaal Daisy (Gerbera sp.) G. festival 'Dark Eye Orange'	Field Container	Treat	WA	2006	Ground	Injury (stunting) noted only at the 4X rate (8 lb ai per acre).
24701	Transvaal Daisy (Gerbera sp.) G. jamesonii	Field Container	Chandran	WV	2005	Over the top	No injury at 2, 4 and 8 lb ai per acre
24701	Transvaal Daisy (Gerbera sp.) G. jamesonii	Field Container	Linderman	OR	2006	Over the top	No injury at 2, 4 and 8 lb ai per acre
24701	Transvaal Daisy (Gerbera sp.) G. jamesonii 'Lambada'	Field Container	Lieth	CA	2005	Broadcast	No injury or growth suppression
24701	Transvaal Daisy (Gerbera sp.) Gerbera jamesonii	Field Container	Fraelich	GA	2006	Broadcast	Slight injury at higher rates; no growth differences; plants marketable
24702	Globe Amaranth (Gomphrena sp.)	Field Container	Chandran	WV	2005	Over the top	No injury at 2, 4 and 8 lb ai per acre
24702	Globe Amaranth (Gomphrena sp.)	Field Container	Reding	OH	2006	Over the top	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre); all plants marketable
24702	Globe Amaranth (Gomphrena sp.) G. globosa 'Buddy Series Purple'	Field Container	Treat	WA	2006	Ground	Injury (stunting) noted only at the 4X rate (8 lb ai per acre)
24702	Globe Amaranth (Gomphrena sp.) G. globosa	Field Container	Gilliam	AL	2005	Broadcast	No injury

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31911	Hakone Grass, Japanese Forest Grass (<i>Hakonechloa</i> sp.) H. macra 'Aureola'	Field Container	Klett	CO	2014	Over the top	No injury with 3, 6 and 12 lb ai per acre after 1st applic.; very slight injury at 2X and 4X after 2nd applic. attributed to sun exposure of plants.
31911	Hakone Grass, Japanese Forest Grass (<i>Hakonechloa</i> sp.) H. macra 'Aureola'	Field Container	Senesac	NY	2014	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
23759	Common sneezeweed (<i>Helenium autumnale</i>)	Field Container	Klett	CO	2004		No injury
23759	Common sneezeweed (<i>Helenium autumnale</i>)	Field Container	Lieth	CA	2004		No significant injury
23759	Common sneezeweed (<i>Helenium autumnale</i>)	Field Container	Neal	NC	2004		No injury
23759	Common sneezeweed (<i>Helenium autumnale</i>)	Field Container	Senesac	NY	2005		No injury
26846	Helen's Flower, Sneezeweed (<i>Helenium</i> sp.) 'Hoopes II Yellow'	Greenhouse	Freiberger	NJ	2006	Over the top	No injury at all rates (2, 4 and 8 lb ai per acre)
24703	Sun Rose, Rock Rose (<i>Helianthemum</i> sp.) 'Belgravia Rose'	Field Container	Lieth	CA	2005	Broadcast	No injury
23760	Sunflower, Willowleaf (<i>Helianthus salicifolius</i>)	Field Container	Senesac	NY	2005		No injury
24704	Sunflower (<i>Helianthus</i> sp.) 'First Light'	Field Container	Mathers (OSU)	OH	2005		No injury
24704	Sunflower (<i>Helianthus</i> sp.) H. salicifolius 'First Light'	Field Container	Treat	WA	2006	Ground	Injury (stunting) noted only at the 4X rate (8 lb ai per acre)
23762	False Sunflower, Smooth Oxeye (<i>Heliopsis helianthoides</i>)	Field Container	Boydston	WA	2005	Broadcast	No injury
23762	False Sunflower, Smooth Oxeye (<i>Heliopsis helianthoides</i>)	Field Container	Neal	NC	2004		No injury
23762	False Sunflower, Smooth Oxeye (<i>Heliopsis helianthoides</i>)	Field Container	Reding	OH	2006	Over the top	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre); all plants marketable
23762	False Sunflower, Smooth Oxeye (<i>Heliopsis helianthoides</i>) H. helianthoides var. scabra	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
26029	False Sunflower, Smooth Oxeye (<i>Heliopsis helianthoides</i>) 'Summer Nights'	Greenhouse	Mickelbart	IN	2006	Over the top	No significant injury or growth reduction (2, 4 and 8 lb ai per acre)
25790	Hellebore, Christmas rose, Lenten Rose (<i>Helleborus niger</i>)	Field Container	Senesac	NY	2005		No injury
23763	Hellebore, Christmas rose, Lenten Rose (<i>Helleborus niger</i>) H. orientalis	Field Container	Czarnota	GA	2004	Over the top	No injury at 4 lb ai per acre through 4 weeks after treatment, but slight injury appeared 8 and 12 weeks after treatment.

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23763	Hellebore, Christmas rose, Lenten Rose (<i>Helleborus niger</i>) <i>H. orientalis</i>	Field Container	Mathers (OSU)	OH	2004		Unacceptable injury (cupped leaves) at 2, 4 and 8 lb ai per acre
24705	Coral Bells, Alumroot (<i>Heuchera sanguinea</i>)	Field Container	Klett	CO	2005	Broadcast	No significant injury
24705	Coral Bells, Alumroot (<i>Heuchera sanguinea</i>) 'Crimson Curls'	Field Container	Boydston	WA	2005	Broadcast	No injury at 2 and 4 lb ai per acre; significant stunting at 8 lb ai per acre
24705	Coral Bells, Alumroot (<i>Heuchera sanguinea</i>) 'Firefly'	Field Container	Lieth	CA	2005	Broadcast	No injury or growth suppression
25787	Rose-Of-Sharon, Althaea (<i>Hibiscus syriacus</i>) 'Splash Pinot Nior'	Field Container	Senesac	NY	2005		No injury
32018	Indian Grass (<i>Hierochloa odorata</i>)	Field Container	Senesac	NY	2015	Over the top	No injury with 3, 6 and 12 lb ai per acre applied twice.
24399	Lily, Plantain (<i>Hosta fortunei</i>)	Field Container	Boydston	WA	2005	Broadcast	No injury
24399	Lily, Plantain (<i>Hosta fortunei</i>) 'Gold Standard'	Field Container	Fraelich	GA	2005	Broadcast	No injury or growth differences at all rates
26839	Candytuft (<i>Iberis</i> sp.)	Greenhouse	Freiberger	NJ	2006	Over the top	No injury at 2, 4 and 8 lb ai per acre
24826	Candytuft (<i>Iberis</i> sp.) 'Snowflake'	Field Container	Lieth	CA	2005	Broadcast	No injury
31912	Soft rush (<i>Juncus effusus</i>)	Field Container	Senesac	NY	2015	Over the top	No injury with 3, 6 and 12 lb ai per acre applied twice.
31912	Soft rush (<i>Juncus effusus</i>)	Field Container	Wade	SC	2014	Over the top	No injury with 3, 6 and 12 lb ai per acre applied twice; all plants marketable.
31912	Soft rush (<i>Juncus effusus</i>) 'Spiralis'	Field Container	Hu	OH	2016	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
23764	Poker Plant, Red-Hot-Poker (<i>Kniphofia</i> sp.)	Field Container	Derr	VA	2005	Broadcast	All rates caused no visible injury but reduced shoot weight
23764	Poker Plant, Red-Hot-Poker (<i>Kniphofia</i> sp.)	Field Container	Gilliam	AL	2005	Broadcast	No injury
23764	Poker Plant, Red-Hot-Poker (<i>Kniphofia</i> sp.)	Field Container	Mathers (OSU)	OH	2004		No injury
23764	Poker Plant, Red-Hot-Poker (<i>Kniphofia</i> sp.) 'Flamenco'	Field Container	Boydston	WA	2005	Broadcast	No injury
23764	Poker Plant, Red-Hot-Poker (<i>Kniphofia</i> sp.) <i>K. uvaria</i>	Field Container	Klett	CO	2004		No injury
23764	Poker Plant, Red-Hot-Poker (<i>Kniphofia</i> sp.) <i>K. uvaria</i>	Field Container	Lieth	CA	2004		No significant injury
23764	Poker Plant, Red-Hot-Poker (<i>Kniphofia</i> sp.) 'Pfizer's Hybrid'	Field Container	Neal	NC	2005	Broadcast	No injury
25442	Shrub Verbena (<i>Lantana</i> sp.) <i>L. hybrida</i> 'New Gold'	Field In-Ground	Chen	LA	2005		No injury

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24679	Shrub Verbena (<i>Lantana</i> sp.) <i>L. montevidensis</i>	Field Container	Lieth	CA	2005	Broadcast	No injury or plant growth suppression
23765	Lavender, English (<i>Lavandula angustifolia</i>)	Field Container	Klett	CO	2004		No injury at 2, 4 and 8 lb ai per acre
23765	Lavender, English (<i>Lavandula angustifolia</i>)	Field Container	Klett	CO	2004		No injury or growth reduction at 2, 4 and 8 lb ai per acre
23765	Lavender, English (<i>Lavandula angustifolia</i>)	Field Container	Mathers (OSU)	OH	2004		No injury or growth reduction at 2, 4 and 8 lb ai per acre
23765	Lavender, English (<i>Lavandula angustifolia</i>)	Field Container	Senesac	NY	2004	Over the top	No injury at 3, 6 and 12 lb ai per acre
23765	Lavender, English (<i>Lavandula angustifolia</i>) 'Munstead'	Field Container	Neal	NC	2004	Over the top	No injury at 2, 4 and 8 lb ai per acre
23765	Lavender, English (<i>Lavandula angustifolia</i>) 'Vera'	Field Container	Lieth	CA	2004	Over the top	No injury but some growth reduction at 2, 4 and 8 lb ai per acre
24400	Lavender (<i>Lavandula</i> sp.) <i>L. angustifolia</i>	Field Container	Gilliam	AL	2004	Over the top	No significant injury or growth reduction at 2, 4 and 8 lb ai per acre
24390	Shasta Daisy (<i>Leucanthemum maximum</i>) 'Snowcap'	Field Container	Boydston	WA	2005		No injury.
31913	Blue Lyme Grass (<i>Leymus arenarius</i>)	Field Container	Derr	VA	2015	Over the top	No shoot weight reduction with 3, 6 and 12 lb ai per acre applied twice.
31913	Blue Lyme Grass (<i>Leymus arenarius</i>) 'Blue Dune'	Field Container	Neal	NC	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31913	Blue Lyme Grass (<i>Leymus arenarius</i>) 'Blue Dune'	Field Container	Senesac	NY	2014	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
23766	Golden Rockets (<i>Ligularia stenocephala</i>)	Field Container	Fraelich	GA	2005	Broadcast	No injury or growth differences
23766	Golden Rockets (<i>Ligularia stenocephala</i>) <i>L. dentata</i>	Field Container	Mathers (OSU)	OH	2004		No injury
23766	Golden Rockets (<i>Ligularia stenocephala</i>) <i>L. dentata</i> 'Dark Leaf'	Field Container	Boydston	WA	2005	Broadcast	No injury
23766	Golden Rockets (<i>Ligularia stenocephala</i>) 'The Rocket'	Field Container	Senesac	NY	2005		No injury
23767	Blue flax (<i>Linum perenne</i> L. ssp. <i>Perenne</i>)	Field Container	Klett	CO	2004		No injury at 2, 4 and 8 lb ai per acre
23767	Blue flax (<i>Linum perenne</i> L. ssp. <i>Perenne</i>)	Field Container	Klett	CO	2004		No injury or growth reduction at 2, 4 and 8 lb ai per acre
23767	Blue flax (<i>Linum perenne</i> L. ssp. <i>Perenne</i>)	Field Container	Senesac	NY	2004	Over the top	No injury at 3, 6 and 12 lb ai per acre
23767	Blue flax (<i>Linum perenne</i> L. ssp. <i>Perenne</i>) 'Saphyr'	Field Container	Neal	NC	2004	Over the top	No injury at 2, 4 and 8 lb ai per acre
23767	Blue flax (<i>Linum perenne</i> L. ssp. <i>Perenne</i>) 'Sapphire'	Field Container	Lieth	CA	2004	Over the top	No injury or growth reduction at 2, 4 and 8 lb ai per acre

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11455	Lilyturf, Big Blue;Giant (Liriope muscari) 'Big Blue'	Field In-Ground	Chen	LA	2005		No significant injury
13203	Loosestrife, Circle Flower (Lysimachia sp.) L. punctata	Field Container	Senesac	NY	1997	Over the top	No to very slight injury increasing with rate (1.5, 3, 6 lb ai per acre); slight reduction in dry wt at highest rate.
24388	Bee Balm (Monarda didyma)	Field Container	Simmons	SC	2005	Foliar	Slight injury (chlorosis) but all plants marketable
24388	Bee Balm (Monarda didyma) 'Cambridge Scarlet'	Field Container	Beste/Frank (ARS)	MD	2005	Over the top	No injury
24388	Bee Balm (Monarda didyma) 'Gardeview Scarlet'	Field Container	Boydston	WA	2005	Broadcast	No injury
31914	Muhly, hairyawn (Muhlenbergia capillaris)	Field Container	Klett	CO	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31914	Muhly, hairyawn (Muhlenbergia capillaris)	Field Container	Neal	NC	2014	Over the top	No injury, growth reduction or delayed blooming with 3, 6 and 12 lb ai per acre applied twice.
31914	Muhly, hairyawn (Muhlenbergia capillaris)	Field Container	Senesac	NY	2014	Over the top	No injury or significant growth reduction with 3, 6 and 12 lb ai per acre applied twice.
32033	Mexican deergrass (Muhlenbergia dubia)	Field Container	Marble	FL	2016	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice; all plants marketable.
32033	Mexican deergrass (Muhlenbergia dubia)	Field Container	Senesac	NY	2015	Over the top	No injury with 3, 6 and 12 lb ai per acre applied twice.
32020	Bamboo Muhly (Muhlenbergia dumosa)	Field Container	Derr	VA	2016	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
32020	Bamboo Muhly (Muhlenbergia dumosa)	Field Container	Marble	FL	2016	Over the top	No injury with 3, 6 and 12 lb ai per acre applied twice; slight growth reduction with 4X; all plants marketable.
32020	Bamboo Muhly (Muhlenbergia dumosa)	Field Container	Senesac	NY	2015	Over the top	No injury with 3 lb ai per acre applied twice, minor injury with 6 and 12 lb after 2nd application.
12906	Bayberry (Myrica pensylvanica)	Field Container	Hart	NJ	2003	Over the top	No injury at 2, 4 and 8 lb ai per acre; 65 WDG used
31915	Mexican feather grass (Nassella tenuissima)	Field Container	Cochran	IA	2014	Over the top	Moderate injury with 3, 6 and 12 lb ai per acre applied twice; significant growth reduction with 4X.
31915	Mexican feather grass (Nassella tenuissima)	Field Container	Koivunen	CA	2016	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31915	Mexican feather grass (Nassella tenuissima)	Field Container	Mathers	OH	2015	Over the top	Severe injury with 3, 6, and 12 lb ai per acre after 1st applic, with 1X recovering to commercially acceptable level after 2nd applic; 2X and 4X unacceptable. Abnormally hot weather might have increased injury.
23769	Catmint (Nepeta x faasseni)	Field Container	Gilliam	AL	2004		No injury at 2, 4, 8 lb ai per acre.
23769	Catmint (Nepeta x faasseni)	Field Container	Klett	CO	2004		No injury or growth reduction at 2, 4 and 8 lb ai per acre
23769	Catmint (Nepeta x faasseni)	Field Container	Mathers (OSU)	OH	2004		No injury or growth reduction at 2, 4 and 8 lb ai per acre
23769	Catmint (Nepeta x faasseni)	Field Container	Senesac	NY	2004	Over the top	No injury at 3, 6 and 12 lb ai per acre

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23769	Catmint (Nepeta x faasseni) 'Dropmore'	Field Container	Lieth	CA	2004	Over the top	No injury or growth reduction at 2, 4 and 8 lb ai per acre
23769	Catmint (Nepeta x faasseni) N. nervosa 'Blue Carpet'	Field Container	Neal	NC	2004	Over the top	Unacceptable injury at 2, 4 and 8 lb ai per acre
23769	Catmint (Nepeta x faasseni) 'Walker's Low'	Field Container	Derr	VA	2004	Over the top	Slight injury at 2, 4 and 8 lb ai per acre
13205	Evening Primrose, Sundrops (Oenothera sp.) O. fruticosa	Field Container	Senesac	NY	1997	Over the top	Slight injury with quick recovery at 1.5, 3 and 6 lb ai per acre.
23770	Devil's-tongue prickly pear (Opuntia humifusa) 'Lemon Form'	Field Container	Senesac	NY	2005		No injury
29262	Hopflower Oregano (Origanum libanoticum)	Field Container	Klett	CO	2002	Over the top	Trial 1: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
29262	Hopflower Oregano (Origanum libanoticum)	Field Container	Klett	CO	2002	Over the top	Trial 2: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
24709	Hopflower Oregano (Origanum libanoticum)	Field Container	Klett	CO	2004		No injury
24709	Hopflower Oregano (Origanum libanoticum)	Field Container	Klett	CO	2005	Broadcast	No significant injury
23091	Little-Pickles (Othonna capensis)	Field Container	Klett	CO	2001	Over the top	Trial 1: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
23091	Little-Pickles (Othonna capensis)	Field Container	Klett	CO	2001	Over the top	Trial 2: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
24396	Peony (Paeonia sp.) 'Karl Rosenfield'	Field Container	Fraelich	GA	2005	Broadcast	No injury or growth differences at all rates
31916	Switch-Grass (Panicum virgatum)	Field Container	Cochran	IA	2014	Over the top	Minor injury with 3, 6 and 12 lb ai per acre applied twice; no significant growth reduction.
26832	Switch-Grass (Panicum virgatum)	Greenhouse	Freiberger	NJ	2006	Over the top	High injury at all rates (2, 4 and 8 lb ai per acre)
25209	Switch-Grass (Panicum virgatum)	Field Container	Lieth	CA	2006	Over the top	No injury but over 50 % growth reduction at 2, 4 and 8 lb ai per acre
31916	Switch-Grass (Panicum virgatum)	Field Container	Senesac	NY	2015	Over the top	No injury at 3, 6 and 12 lb ai per acre applied twice.
31916	Switch-Grass (Panicum virgatum) 'Northwind'	Field Container	Neal	NC	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
25209	Switch-Grass (Panicum virgatum) 'Trailblazer'	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
12385	Geranium (Pelargonium sp.) P. x hortorum	Field Container	Talbert	AR	1998	Over the top	No to minor injury increasing with rate (2, 4, 8 lb ai per acre). NOTE: one plant in the 4 lb ai per acre treatment died; because other plants did not exhibit injury at the same level, some other issue might have been involved. Additional research is warr
31917	Chinese Fountaingrass (Pennisetum alopecuroides)	Field Container	Derr	VA	2014	Over the top	Good crop tolerance with 3, 6 and 12 lb ai per acre applied twice.

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31917	Chinese Fountaingrass (Pennisetum alopecuroides)	Field Container	Senesac	NY	2014	Over the top	Virtually no injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31917	Chinese Fountaingrass (Pennisetum alopecuroides) 'Little Bunny'	Field Container	Marble	FL	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31918	Oriental Pennisetum (Pennisetum orientale)	Field Container	Cochran	IA	2014	Over the top	Minor injury with 3, 6 and 12 lb ai per acre applied twice; no significant growth reduction.
31918	Oriental Pennisetum (Pennisetum orientale)	Field Container	Klett	CO	2015	Over the top	No injury with 3, 6 and 12 lb ai per acre applied twice; slight growth reduction at 2X.
31918	Oriental Pennisetum (Pennisetum orientale)	Field Container	Senesac	NY	2014	Over the top	Slight injury and no significant growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31918	Oriental Pennisetum (Pennisetum orientale) 'Karley Rose'	Field Container	Marble	FL	2015	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
24397	Beard-Tongue (Penstemon sp.)	Field Container	Simmons	SC	2005	Foliar	No injury
24397	Beard-Tongue (Penstemon sp.) 'Husker Red'	Field Container	Beste/Frank (ARS)	MD	2005	Broadcast	No injury at 2, 4 and 8 lb ai per acre
24397	Beard-Tongue (Penstemon sp.) 'Husker Red'	Field Container	Neal	NC	2004	Broadcast	No injury
24397	Beard-Tongue (Penstemon sp.) P. digitalis	Field Container	Derr	VA	2005	Broadcast	No injury
24397	Beard-Tongue (Penstemon sp.) P. hartwegii 'Scarlet Queen'	Field Container	Boydston	WA	2005	Broadcast	No injury
24397	Beard-Tongue (Penstemon sp.) P. x mexicali 'Red Rocks'	Field Container	Lieth	CA	2005	Broadcast	No injury or plant growth suppression
26835	Pentas (Pentas sp.) 'New Look Pink'	Greenhouse	Freiberger	NJ	2006	Over the top	No injury at all rates (2, 4 and 8 lb ai per acre)
12388	Perovskia (Perovskia sp.) P. atriplicifolia	Field Container	Senesac	NY	1997	Over the top	No significant injury at 1.5, 3 and 6 lb ai per acre, but dry weight decreased significantly with increasing rate.
32521	Sedum hybridum (Phedimus hybridus)	Field Container	Senesac	NY	2016	Over the top	Minor injury with 3 and 6, moderate with 12 lb ai per acre applied twice.
24485	Phlox, Fall (Phlox paniculata) 'Bright Eyes'	Field Container	Boydston	WA	2005		All rates caused brittle stems susceptible to wind damage
24398	Creeping Phlox, Moss Pink (Phlox subulata)	Field Container	Simmons	SC	2005	Foliar	Slight injury but all plants marketable
24430	Creeping Phlox, Moss Pink (Phlox subulata) 'Candy Strip'	Field In-Ground	Chen	LA	2005		No injury
24398	Creeping Phlox, Moss Pink (Phlox subulata) 'Emerald Blue'	Field Container	Boydston	WA	2005		No injury
24398	Creeping Phlox, Moss Pink (Phlox subulata) 'Emerald Cushion Pink'	Field Container	Beste/Frank (ARS)	MD	2005	Over the top	Slight injury but all marketable
24713	New Zealand Flax (Phormium sp.) P. colinsoi	Field Container	Lieth	CA	2005	Broadcast	No injury; significant increase in plant growth at 4 and 8 lb ai per acre

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12389	False Dragon Head, Lion's Heart (Physostegia sp.) P. virginiana 'Vivid'	Field Container	Senesac	NY	1997	Over the top	No significant injury at 1.5, 3.0 and 6.0 lb ai per acre.
23771	Jacob's Ladder (Polemonium sp.)	Field Container	Reding	OH	2006	Over the top	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre); all plants marketable
23771	Jacob's Ladder (Polemonium sp.) 'Caeruleum Blue'	Field Container	Treat	WA	2006	Ground	Data unreliable because of crop failure
23771	Jacob's Ladder (Polemonium sp.) P. reptans	Field Container	Fraelich	GA	2006		Slight to moderate injury and severe stunting
23771	Jacob's Ladder (Polemonium sp.) P. boreale	Field Container	Mathers (OSU)	OH	2004		No injury
23771	Jacob's Ladder (Polemonium sp.) P. boreale 'Heavenly Habit'	Field Container	Boydston	WA	2005		Single application at all rates had no impact, but second application did cause minor stunting.
23771	Jacob's Ladder (Polemonium sp.) P. reptans 'Stairway to Heaven'	Field Container	Linderman	OR	2006	Over the top	No injury at 2, 4 and 8 lb ai per acre
24715	Primrose, Fairy (Primula malacoides)	Field Container	Lieth	CA	2005	Broadcast	No injury but there was some plant growth suppression
24715	Primrose, Fairy (Primula malacoides) P. malacoides 'Fairy Prima Carmine Rose'	Field Container	Treat	WA	2006	Ground	Trial abandoned due to crop failure
20152	Buckthorn (Rhamnus sp.) R. smithii	Field Container	Klett	CO	2000	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre.
20152	Buckthorn (Rhamnus sp.) R. Smithii	Field Container	Klett	CO	2001	Over the top	No injury at 2 and 4 lb ai per acre; good weed control at 4 lb ai per acre.
25303	Mexican Petunia (Ruellia carolinensis) R. brittoniana 'Katie'	Field In-Ground	Chen	LA	2005		No significant injury
22949	Sage (Salvia daghestanica)	Field Container	Klett	CO	2002	Over the top	Trial 1: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
22949	Sage (Salvia daghestanica)	Field Container	Klett	CO	2002	Over the top	Trial 2: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
24387	Woodland Sage (Salvia sylvestris) 'Marcus'	Field Container	Boydston	WA	2005		No injury
24717	Lavender cotton (Santolina chamaecyparissus)	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
24717	Lavender cotton (Santolina chamaecyparissus) 'Compacta'	Field Container	Lieth	CA	2005	Broadcast	No injury; significant increase in plant growth
24488	Pincushions (Scabiosa sp.)	Field Container	Reding	OH	2006	Over the top	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre); all plants marketable
24489	Pincushions (Scabiosa sp.) 'Blue Diamonds'	Greenhouse	Mickelbart	IN	2006	Over the top	No significant injury or growth reduction (2, 4 and 8 lb ai per acre)
24488	Pincushions (Scabiosa sp.) 'Butterfly Blue'	Field Container	Boydston	WA	2005		No injury

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24488	Pincushions (Scabiosa sp.) 'Pink Mist'	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at all rates
24488	Pincushions (Scabiosa sp.) S. 'Butterfly Blue'	Field Container	Treat	WA	2006	Ground	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre).
24488	Pincushions (Scabiosa sp.) S. columbaria 'Butterfly Blue'	Field Container	Linderman	OR	2006	Over the top	No injury at 2, 4 and 8 lb ai per acre
31919	Little Blue Stem (Schizachyrium scoparium)	Field Container	Cochran	IA	2014	Over the top	Moderate initial injury, with complete recovery, with 3, 6 and 12 lb ai per acre applied twice; no significant growth reduction.
31919	Little Blue Stem (Schizachyrium scoparium)	Field Container	Derr	VA	2014	Over the top	Good crop tolerance with 3, 6 and 12 lb ai per acre applied twice.
31919	Little Blue Stem (Schizachyrium scoparium)	Field Container	Neal	NC	2014	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31919	Little Blue Stem (Schizachyrium scoparium)	Field Container	Senesac	NY	2014	Over the top	Slight injury after 2nd applic. with 3, 6 and 12 lb ai per acre; no significant growth reduction.
22950	South American Skullcap (Scutellaria racemosa) S. resinosa	Field Container	Klett	CO	2002	Over the top	Trial 1: Insufficient crop safety data collected due to crop failure; good weed control.
22950	South American Skullcap (Scutellaria racemosa) S. resinosa	Field Container	Klett	CO	2002	Over the top	Trial 2: No injury or growth reduction at 2 and 4 lb ai per acre; good weed control.
32520	Goldmoss Stonecrop (Sedum acre)	Field Container	Senesac	NY	2016	Over the top	Minor injury with 3, 6 and 12 lb ai per acre applied twice.
32523	Sedum pachyclados (Sedum pachyclados)	Field Container	Senesac	NY	2016	Over the top	Moderate to severe injury with 3 and 6 and 12 lb ai per acre applied twice.
32524	Jenny's Stonecrop (Sedum reflexum)	Field Container	Senesac	NY	2016	Over the top	Very minimal injury with 3 and 6 and 12 lb ai per acre applied twice.
32525	Tasteless Stonecrop (Sedum sexangulare)	Field Container	Senesac	NY	2016	Over the top	Minor injury with 3, moderate with 6 and 12 lb ai per acre applied twice.
24389	Stonecrop (Sedum sp.)	Field Container	Simmons	SC	2005		No significant injury
24389	Stonecrop (Sedum sp.) 'Autumn Joy'	Field Container	Boydston	WA	2005	Broadcast	No injury
23774	Hen and chicks (Sempervivum arachnoideum)	Field Container	Senesac	NY	2004		No injury
23774	Hen and chicks (Sempervivum arachnoideum) 'Cobweb'	Field Container	Mathers (OSU)	OH	2004		No injury
23773	Common Houseleek (Sempervivum tectorum)	Field Container	Klett	CO	2004		No injury
23773	Common Houseleek (Sempervivum tectorum)	Field Container	Lieth	CA	2004		No significant injury
23773	Common Houseleek (Sempervivum tectorum)	Field Container	Mathers (OSU)	OH	2004		No injury
23773	Common Houseleek (Sempervivum tectorum) 'Cobweb'	Field Container	Ahrens/Mervosh	CT	2005	Ground, broadcast over the top	No significant injury

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23777	Goldenrod, Wrinkleleaf (Solidago rugosa)	Field Container	Fraelich	GA	2005	Broadcast	No injury or growth differences at all rates
23777	Goldenrod, Wrinkleleaf (Solidago rugosa)	Field Container	Lieth	CA	2004		No significant injury
23777	Goldenrod, Wrinkleleaf (Solidago rugosa)	Field Container	Neal	NC	2004		No injury
23777	Goldenrod, Wrinkleleaf (Solidago rugosa)	Field Container	Reding	OH	2005	Broadcast	No injury
23778	Goldenrod, Seaside (Solidago sempervirens)	Field Container	Fraelich	GA	2005	Broadcast	No injury or growth differences at all rates
23778	Goldenrod, Seaside (Solidago sempervirens)	Field Container	Fraelich	GA	2006	Broadcast	No injury or growth differences at all rates
23778	Goldenrod, Seaside (Solidago sempervirens)	Field Container	Senesac	NY	2004		No injury
24718	Goldenrod (Solidago sp.) S. cabadensis 'Crown of Rays'	Field Container	Treat	WA	2006	Ground	No injury or growth reduction at all rates (2, 4 and 8 lb ai per acre)
24718	Goldenrod (Solidago sp.) S. sempervirens	Field Container	Linderman	OR	2006	Broadcast	No injury at 2, 4 and 8 lb ai per acre
24718	Goldenrod (Solidago sp.) S. speciosa	Field Container	Fraelich	GA	2006	Broadcast	No injury or growth differences at all rates
23779	Goldenrod, Showy (Solidago speciosa)	Field Container	Klett	CO	2004		No injury
32028	Indian Grass (Sorghastrum nutans)	Field Container	Derr	VA	2016	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
32028	Indian Grass (Sorghastrum nutans)	Field Container	Senesac	NY	2015	Over the top	No injury with 3, 6 and 12 lb ai per acre after first application, minor injury with some recovery after the second.
32028	Indian Grass (Sorghastrum nutans) 'Indian Steel'	Field Container	Marble	FL	2016	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice; all plants marketable.
31920	Prairie dropseed (Sporobolus heterolepis)	Field Container	Cochran	IA	2014	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
31920	Prairie dropseed (Sporobolus heterolepis)	Field Container	Derr	VA	2015	Over the top	No shoot weight reduction with 3, 6 and 12 lb ai per acre applied twice.
31920	Prairie dropseed (Sporobolus heterolepis)	Field Container	Senesac	NY	2014	Over the top	No injury or growth reduction with 3, 6 and 12 lb ai per acre applied twice.
23780	Foamflower, Heartleaf (Tiarella cordifolia)	Field Container	Klett	CO	2004		No injury
23780	Foamflower, Heartleaf (Tiarella cordifolia)	Field Container	Mathers (OSU)	OH	2004		No injury
23780	Foamflower, Heartleaf (Tiarella cordifolia)	Field Container	Senesac	NY	2005		Injury apparent after second application; 4 and 8 lb ai per acre rates exhibited moderate injury
23780	Foamflower, Heartleaf (Tiarella cordifolia) T. wherryi	Field Container	Neal	NC	2004		All rates caused significant injury
25781	Foamflower, False Miterwort (Tiarella sp.) T. wherryi	Field Container	Neal	NC	2004		

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
26845	Spiderwort (Tradescantia sp.)	Greenhouse	Freiberger	NJ	2006	Over the top	No injury at all rates (2, 4 and 8 lb ai per acre)
24721	Virginia Spiderwort (Tradescantia virginiana)	Field Container	Boydston	WA	2006	Broadcast	No injury or growth reduction at 2, 4 and 8 lb ai per acre
24721	Virginia Spiderwort (Tradescantia virginiana) Spiderwort 'Osprey'	Field Container	Boydston	WA	2005	Broadcast	No injury
24720	Spiderwort (Tradescantia x andersoniana)	Field Container	Derr	VA	2005	Broadcast	No injury
24720	Spiderwort (Tradescantia x andersoniana) 'Sweet Kate'	Field Container	Mathers (OSU)	OH	2005		No injury
25308	Vervain (Verbena sp.) V. canadensis 'Homestead Purple'	Field In-Ground	Chen	LA	2005		No significant injury
24685	Vervain (Verbena sp.) V. canadensis 'Homestead Purple'	Field Container	Neal	NC	2005	Broadcast	No injury
23781	Ironweed, New York (Vernonia noveboracensis)	Field Container	Neal	NC	2004		No injury
23781	Ironweed, New York (Vernonia noveboracensis)	Field Container	Senesac	NY	2004		No injury
24722	Turkish veronica (Veronica liwanensis)	Field Container	Boydston	WA	2005		All rates caused no injury but reduced plant width; all treated plants were saleable
24722	Turkish veronica (Veronica liwanensis)	Field Container	Boydston	WA	2006	Broadcast	No injury after first application, but moderate injury and reduced plant width at all rates after 2nd application.
24722	Turkish veronica (Veronica liwanensis) Veronica repens 'Big Blue'	Field Container	Lieth	CA	2006	Over the top	Unacceptable injury at 2, 4 and 8 lb ai per acre and growth reduction at 2X and 4X rates
11460	Pansy (Viola sp.) V. tricolor 'Majestic GT Yellow'	Field Container	Beste (ARS)	MD	1994	Over the top	No significant injury or growth reduction at 1, 2 and 4 lb ai per acre; good weed control.

Table 10. Detailed Summary of Crop Safety Testing with Pendulum Aqua Cap (Pendimethalin)

Notes: Table entries are sorted by crop Latin name. Only those reports received before 4/24/2017 are included

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
29261	Fern, Lady (<i>Athyrium nipponicum</i>)	Field Container	Czarnota	GA	2002	Over the top	No injury at 2, 4 and 8 lb ai per acre; all plants marketable; excellent control of large crabgrass.
19594	Moonbeam, Tickseed (<i>Coreopsis verticillata</i>)	Field Container	Czarnota	GA	2002	Over the top	No injury at 2, 4 and 8 lb ai per acre; all plants marketable; excellent control of morning glory and large crabgrass.
29263	Daylily (<i>Hemerocallis</i> sp.)	Field Container	Czarnota	GA	2002	Over the top	No injury with 2, 4, 8 lb ai per acre; excellent control of morningglory and large crabgrass.
19479	Shrub Verbena (<i>Lantana</i> sp.) <i>L. camara</i>	Field Container	Czarnota	GA	2002	Over the top	No injury at 2, 4 and 8 lb ai per acre; all plants marketable; excellent control of morning glory and large crab grass.

Table 11. Detailed Summary of Crop Safety Testing with Pendulum WDG (Pendimethalin)

Notes: Table entries are sorted by crop Latin name. Only those reports received before 4/24/2017 are included.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
28431	Fir, Fraser (<i>Abies fraseri</i>)	Field In-Ground	Ahrens	CT	1986	Over the top	No injury with 4 lb ai per acre.
10994	Yarrow (<i>Achillea millefolium</i>)	Field In-Ground	Elmore	CA	1993	Over the top	No injury at 3.3 and 6.6 lb ai per acre; excellent weed control at 3.3 lb ai per acre, but anomaly occurred with higher rate exhibiting poor control.
11005	Yarrow (<i>Achillea millefolium</i>)	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
10994	Yarrow (<i>Achillea millefolium</i>) 'Cerise Queen'	Field In-Ground	Senesac	NY	1987	Over the top	No significant injury at 2 and 4 lb ai per acre; excellent control of broadleaf and grassy weeds.
11454	Basket-Of-Gold, Rock Madwort, <i>Aurinia saxatilis</i> (<i>Alyssum saxatile</i>) A. saxatilis	Field In-Ground	Buriff	OH	1998	Over the top	Results unreliable due to poor growing conditions.
10996	Madwort (<i>Alyssum</i> sp.) 'Basket of Gold'	Field In-Ground	Senesac	NY	1987	Over the top	No significant injury at 2 and 4 lb ai per acre; great control of broadleaf and grassy weeds.
12383	Bluestar (<i>Amsonia</i> sp.) <i>A. ciliata</i>	Field Container	Buriff	OH	1998	Over the top	No injury at 2, 4 and 8 lb ai per acre after 1st application, unreliable data after 2nd application.
11165	Columbine (<i>Aquilegia</i> sp.) <i>A. hybrida</i> 'Music'	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
11596	Thrift, Sea Pink (<i>Armeria maritima</i>)	Field Container	?	OH	2003		
11590	Western sage (<i>Artemisia ludoviciana</i>) <i>A. ludoviciana</i> 'Valerie Finnis'	Field Container	Buriff	OH	1998	Over the top	No injury at 2, 4 and 8 lb ai per acre.
28433	False Spirea (<i>Astilbe</i> sp.) <i>A. chinensis</i>	Field Container	Buriff	OH	1998	Over the top	Slight injury at 2, moderate at 4 and 8 lb ai per acre.
11589	Fern, Japanese Painted (<i>Athyrium goeringianum</i>)	Field Container	Senesac	NY	1995	Over the top	Minor injury increasing with rate at 2, 4, and 8 lb ai per acre with 2 higher rates causing slight stunting.
19428	Begonia (<i>Begonia</i> sp.) 'Derby'	Field Container	Senesac	NY	1989	Over the top	Moderate injury with 1.5 and 3.0 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
19428	Begonia (<i>Begonia</i> sp.) 'Gin'	Field Container	Senesac	NY	1989	Over the top	Moderate injury with 1.5 and 3.0 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
12384	Aster, Bolton (<i>Boltonia</i> sp.)	Field Container	?	OH	2003		No trial report posted
10059	Blue clips (<i>Campanula carpatica</i>) 'Canterbury Bells'	Field In-Ground	Senesac	NY	1987	Over the top	No injury at 2 lb ai per acre, slight reduction in vigor at 4 lb ai per acre; great control of broadleaf and grassy weeds.
10999	Canterbury-Bells (<i>Campanula medium</i>) <i>C. persicifolia</i>	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
12879	Red Bud, Eastern (<i>Cercis canadensis</i>)	Field Container	?	OH	2003		

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
12881	White Fringetree (<i>Chionanthus retusus</i>)	Field Container	Buriff	OH	1998	Over the top	No injury at 2, 4 and 8 lb ai per acre.
13444	Palm, Areca (<i>Chrysalidocarpus lutescens</i>)	Field Container	Broschat	FL	1998	Over the top	Trial 1: No significant injury with 3.9 and 7.8 lb ai per acre; excellent weed control through 2 months.
13444	Palm, Areca (<i>Chrysalidocarpus lutescens</i>)	Field Container	Broschat	FL	1998	Over the top	Trial 2: No significant injury with 3.9 and 7.8 lb ai per acre; excellent weed control through 2 months.
11003	Chrysanthemum, Garden (<i>Chrysanthemum/Dendranthema</i> sp.) <i>C. maximum</i> x <i>superbum</i> 'Silver Princess'	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
11003	Chrysanthemum, Garden (<i>Chrysanthemum/Dendranthema</i> sp.) <i>Chrysanthemum maximum</i> x <i>superbum</i>	Field Container	Senesac	NY	1994	Over the top	No significant injury at 3.3, 6.6 and 13.2 lb ai per acre.
10992	Chrysanthemum, Garden (<i>Chrysanthemum/Dendranthema</i> sp.) <i>Chrysanthemum maximum</i> 'Alaska'	Field In-Ground	Senesac	NY	1987	Over the top	No significant injury at 2 and 4 lb ai per acre; great control of broadleaf and grassy weeds.
10992	Chrysanthemum, Garden (<i>Chrysanthemum/Dendranthema</i> sp.) <i>R. hirta</i>	Field In-Ground	Talbert	AR	1993	Over the top	Slight injury at 3.3 and 6.6 lb ai per acre, excellent weed control.
11006	Tickseed (<i>Coreopsis</i> sp.) <i>C. lanceolata</i>	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
10995	Tickseed (<i>Coreopsis</i> sp.) <i>C. lanceolata</i> 'Sunray'	Field In-Ground	Senesac	NY	1987	Over the top	No significant injury at 2 and 4 lb ai per acre; great control of broadleaf and grassy weeds.
11021	Cypress, Leyland (<i>Cupressocyparis leylandii</i>)	Field Container	Glaze	GA	1992	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre, and all plants marketable; excellent weed control.
11021	Cypress, Leyland (<i>Cupressocyparis leylandii</i>)	Field Container	Glaze	GA	1993	Over the top	No injury at 3.3 and 6.6 lb ai per acre; very good weed control except for black willow.
19447	Larkspur (<i>Delphinium</i> sp.)	Field Container	?	OH	2003		
11591	Fern, Hayscented (<i>Dennstaedtia punctilobula</i>)	Field Container	Senesac	NY	1995	Over the top	No significant injury at 2 and 4, slight with almost complete recovery at 8 lb ai per acre.
11161	Foxglove (<i>Digitalis</i> sp.) <i>D. grandiflora</i>	Field Container	Ferree	IL	1995	Over the top	No significant injury at 3.3, 6.6 and 13.2 lb ai per acre; excellent weed control.
29237	Foxglove (<i>Digitalis</i> sp.) <i>D. purpurea</i>	Greenhouse	Talbert	AR	1998	Over the top	No to very minor injury at 2, 4, and 8 lb ai per acre.
11161	Foxglove (<i>Digitalis</i> sp.) <i>D. purpurea</i> 'Excelsior Hybrids'	Field Container	Senesac	NY	1987	Over the top	No to slight injury increasing with rate (1.5 and 3 lb ai per acre).
11161	Foxglove (<i>Digitalis</i> sp.) <i>D. x mertonensis</i>	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
29239	Leopards-Bane (<i>Doronicum</i> sp.) <i>D. cordatum</i>	Field Container	Senesac	NY	1987	Over the top	No significant injury at 1.5 and 3 lb ai per acre.
11345	Purple Coneflower (<i>Echinacea</i> sp.) <i>E. purpurea</i>	Field Container	Derr	VA	1993	Over the top	No injury or growth reduction at 3.3 and 6.6 lb ai per acre; excellent control of spotted spurge and yellow woodsorrel.
11345	Purple Coneflower (<i>Echinacea</i> sp.) <i>E. purpurea</i> 'Gloriosa Daisy'	Field Container	Senesac	NY	1987	Over the top	No injury at 2 and 4 lb ai per acre; great to excellent control of broadleaf and grassy weeds.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
11020	Eucalypt, Australian Gum (Eucalyptus sp.) E. cinerea	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
28435	Golden Bells (Forsythia sp.) F. x intermedia 'Lynwood Gold'	Field In-Ground	Ahrens	CT	1996	Over the top	No injury with 4 lb ai per acre.
12885	Witch Alder (Fothergilla gardenii)	Field Container	Buriff	OH	1998	Over the top	No injury at 2, 4 and 8 lb ai per acre.
11163	Blanket Flower (Gaillardia sp.) G. aristata	Field Container	Derr	VA	1992	Over the top	No injury at 2 and 4 lb ai per acre.
11162	Blanket Flower (Gaillardia sp.) G. aristata	Field In-Ground	Derr	VA	1994	Over the top	Slight injury at 3.3, 6.6 and 13.2 lb ai per acre; excellent control of carpetweed and fall panicum at all rates, but excellent control of cutleaf evening primrose only at high rate.
11163	Blanket Flower (Gaillardia sp.) G. aristata 'Goblin'	Field Container	Senesac	NY	1987	Over the top	No injury at 1.5 and 3.0 lb ai per acre.
11163	Blanket Flower (Gaillardia sp.) G. grandiflora 'Baby Cole'	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
11163	Blanket Flower (Gaillardia sp.) G. pulchella	Field Container	Talbert	AR	1992	Over the top	No injury at 2 and 4 lb ai per acre.
11162	Blanket Flower (Gaillardia sp.) G. pulchella	Field In-Ground	Talbert	AR	1992	Over the top	No significant injury at 2 lb ai per acre and slight transient injury at 4 lb ai per acre.
11168	Treasure Flower (Gazania sp.)	Field In-Ground	Senesac	NY	1987	Over the top	Slight reduction in crop quality increasing with rate (2, 4 lb ai per acre).
10989	Avens (Geum sp.)	Field In-Ground	Elmore	CA	1993	Over the top	No significant injury at 3.3 and 6.6 lb ai per acre; excellent control of chickweed, poor control of annual bluegrass.
10989	Avens (Geum sp.) G. quellyon 'Lady Strathedon'	Field In-Ground	Senesac	NY	1987	Over the top	No injury at 2 and 4 lb ai per acre; great to excellent control of broadleaved and grassy weeds.
10989	Avens (Geum sp.) G. quellyon 'Mrs. Bradshaw'	Field In-Ground	Senesac	NY	1987	Over the top	No significant injury at 2 and 4 lb ai per acre; great to excellent control of broadleaved and grassy weeds.
11000	Avens (Geum sp.) G. triflorum	Field Container	Buriff	OH	1998	Over the top	Slight injury at 2 and 4 lb ai per acre, moderate yellowing and stunting at 8 lb ai per acre.
11000	Avens (Geum sp.) 'Lady Stradhelen'	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
13240	German Statice (Goniolimon tataricum)	Field In-Ground	Elmore	CA	1993	Over the top	No significant injury at 3.3 and 6.6 lb ai per acre; satisfactory weed control.
10058	Baby's Breath (Gypsophila paniculata) G. paniculata	Field In-Ground	Elmore	CA	1994	Over the top	No significant injury at 3.3 and 6.6 lb ai per acre; excellent control of annual bluegrass and rough pigweed, poor for shepherds purse.
10998	Baby's Breath (Gypsophila paniculata) G. paniculata	Field Container	Senesac	NY	1987	Over the top	No injury at 1.5 and 3.0 lb ai per acre.
10058	Baby's Breath (Gypsophila paniculata) G. paniculata 'Bristol Fairy'	Field In-Ground	Senesac	NY	1987	Over the top	No injury at 2 and 4 lb ai per acre; great to excellent control of broadleaved and grassy weeds.
19435	Daylily (Hemerocallis sp.) 'Sammy Russell'	Field Container	Fare	TN	1996	Over the top	No injury or growth reduction at 2, 4 and 8 lb ai per acre, and all plants marketable; good control of spurge.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
12890	Hydrangea, Oakleaf (<i>Hydrangea quercifolia</i>)	Field Container	Hart	NJ	2003	Over the top	Slight, moderate, and severe stunting at 2, 4 and 8 lb ai per acre, respectively
11010	Balsam (<i>Impatiens</i> sp.) 'Accent D. Pink'	Field In-Ground	Senesac	NY	1989	Over the top	Moderate to significant injury with 1.5 and 3.0 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
11010	Balsam (<i>Impatiens</i> sp.) 'Accent Salmon'	Field In-Ground	Senesac	NY	1989	Over the top	Moderate to significant injury with 1.5 and 3.0 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
11592	Japanese Iris (<i>Iris kaempferi</i>)	Field Container	Senesac	NY	1995	Over the top	No significant injury at 2, 4 and 8 lb ai per acre.
11594	Blazing-Star, Gayfeather (<i>Liatris</i> sp.) L. <i>pycnostachya</i> 'Purple'	Field Container	Senesac	NY	1995	Over the top	No injury at 2, 4 and 8 lb ai per acre.
11169	Statice (<i>Limonium</i> sp.)	Field In-Ground	Senesac	NY	1987	Over the top	No injury at 2 and 4 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
11169	Statice (<i>Limonium</i> sp.) L. <i>latifolia</i>	Field In-Ground	Ferree	IL	1992	Over the top	No significant injury at 2 and 4 lb ai per acre; excellent weed control.
11169	Statice (<i>Limonium</i> sp.) L. <i>sinuatum</i>	Field In-Ground	Elmore	CA	1993	Over the top	No significant injury at 3.3 and 6.6 lb ai per acre but some vigor reduction at 6.6 lb; good weed control.
19437	Evening Primrose, Sundrops (<i>Oenothera</i> sp.)	Field Container	?	OH	2003		
19455	Oriental Poppy (<i>Papaver orientale</i>)	Field Container	?	OH	2003		
11014	Petunia (<i>Petunia</i> sp.) P. x <i>hybrida</i>	Field In-Ground	Talbert	AR	1994	Over the top	Applied 8 days after transplanting. Moderate injury to mortality increasing with rate (1.5, 3.0, 6.0 lb ai per acre); excellent control of goosegrass, crabgrass, common purslane, and giant foxtail.
11014	Petunia (<i>Petunia</i> sp.) 'Pink Flush'	Field In-Ground	Senesac	NY	1989	Over the top	Applied 2 days after transplanting. Moderate to significant injury with 1.5 and 3.0 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
11014	Petunia (<i>Petunia</i> sp.) 'Salmon Flush'	Field In-Ground	Senesac	NY	1989	Over the top	Applied 2 days after transplanting. Moderate injury with 1.5 and 3.0 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
19439	Creeping Phlox, Moss Pink (<i>Phlox subulata</i>)	Field Container	?	OH	2003		
19622	Palm, Pygmy Date (<i>Phoenix roebelinii</i>)	Field Container	Broschat	FL	1998	Over the top	Trial 1: No significant injury with 3.9 and 7.8 lb ai per acre; excellent weed control through 2 months.
19622	Palm, Pygmy Date (<i>Phoenix roebelinii</i>)	Field Container	Broschat	FL	1998	Over the top	Trial 2: No significant injury with 3.9 and 7.8 lb ai per acre; excellent weed control through 2 months.
19622	Palm, Pygmy Date (<i>Phoenix roebelinii</i>)	Field Container	Broschat	FL	1998	Over the top	Trial 2: No significant injury with 3.9 and 7.8 lb ai per acre; excellent weed control through 2 months.
29238	False Dragon Head, Lion's Heart (<i>Physostegia</i> sp.) P. <i>virginiana</i>	Field Container	Buriff	OH	1998	Over the top	High injury at 2, 4 and 8 lb ai per acre.
11595	Fern, Christmas (<i>Polystichum acrostichoides</i>)	Field Container	Senesac	NY	1995	Over the top	Slight injury and growth reduction at 2, 4 and 8 lb ai per acre.
12390	Rodgersia (<i>Rodgersia</i> sp.) R. <i>henricii</i>	Field Container	Buriff	OH	1998	Over the top	No injury at 2, 4 and 8 lb ai per acre.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
19456	Coneflower, Orange (<i>Rudbeckia fulgida speciosa</i>)	Field Container	?	OH	2003		
10991	Coneflower (<i>Rudbeckia</i> sp.) <i>R. hirta</i>	Field In-Ground	Talbert	AR	1993	Over the top	Slight injury at 3.3 and 6.6 lb ai per acre; good control of goosegrass.
19458	Butterfly Blue, Scabious (<i>Scabiosa columbaria</i>)	Field Container	?	OH	2003		
12396	Little Blue Stem (<i>Schizachyrium scoparium</i>)	Field Container	?	OH	2003		
10990	Stonecrop (<i>Sedum</i> sp.) <i>S. spurium</i> cv <i>coccineum</i> 'Dragons Blood'	Field In-Ground	Senesac	NY	1987	Over the top	No to Very slight injury increasing with rate (2, 4 lb ai per acre); great to excellent control of broadleaf and grassy weeds.
11001	Stonecrop (<i>Sedum</i> sp.) <i>S. spurium</i> 'Dragon's Blood'	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
11004	Lamb's-Ears (<i>Stachys byzantina</i>)	Field Container	Fare	TN	1994	Over the top	Moderate injury at 3.3, 6.6 and 13.2 lb ai per acre with complete recovery at 1X, but 2X and 4X plants smaller and unmarketable; excellent weed control.
11004	Lamb's-Ears (<i>Stachys byzantina</i>)	Field Container	Fare	TN	1995	Over the top	Moderate to slight injury at 2 and 4, moderate at 8 lb ai per acre; 4X plants smaller and unmarketable; excellent crabgrass and marestalk control.
11004	Lamb's-Ears (<i>Stachys byzantina</i>)	Field Container	Fare	TN	1996	Over the top	Moderate initial injury with complete recovery at 2, 4 and 8 lb ai per acre; all plants marketable; excellent weed control.
10993	Lamb's-Ears (<i>Stachys byzantina</i>) <i>S. lanata</i>	Field In-Ground	Senesac	NY	1987	Over the top	No significant injury with 2 and 4 lb ai per acre; great to excellent broadleaf and grassy weed control.
10993	Lamb's-Ears (<i>Stachys byzantina</i>) 'Silver Carpet'	Field In-Ground	Ferree	IL	1993	Over the top	All treatments including untreated were not marketable at conclusion of study, however there was a trend toward higher phytotoxicity with increasing rate (3.3, 6.6 lb ai per acre); excellent weed control.
10997	Stokes Aster (<i>Stokesia</i> sp.) 'Cyanea Blue'	Field In-Ground	Senesac	NY	1987	Over the top	No injury at 2 and 4 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
10997	Stokes Aster (<i>Stokesia</i> sp.) <i>S. laevis</i> 'Blue Danube'	Field In-Ground	Ferree	IL	1993	Over the top	No injury at 3.3 and 6.6 lb ai per acre.
11011	Marigold (<i>Tagetes</i> sp.) 'Bonanza Yellow'	Field In-Ground	Senesac	NY	1989	Over the top	Moderate injury with 1.5 and 3.0 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
11022	Elm, Winged (<i>Ulmus alata</i>)	Field Container	Schreiber	OH	1992	Over the top	No injury at 2 and 4 lb ai per acre.
11015	Periwinkle (<i>Vinca</i> sp.) 'Little Pinkie'	Field In-Ground	Senesac	NY	1987	Over the top	Applied 2 days after transplanting. Slight injury with 1.5 and 3.0 lb ai per acre; great to excellent control of broadleaf and grassy weeds.
11013	Pansy (<i>Viola</i> sp.) <i>V. tricolor</i>	Field In-Ground	Talbert	AR	1994	Over the top	Severe injury at 3.3, 6.6 and 13.2 lb ai per acre; excellent control of large crabgrass, goosegrass, common purslane, smooth pigweed, giant foxtail, common lambsquarters.
19623	Palm, Mexican Fan (<i>Washingtonia robusta</i>)	Field Container	Broschat	FL	1998	Over the top	Trial 1: Significant injury with 3.9 and 7.8 lb ai per acre; excellent weed control through 2 months.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
20151	California Fuschia (Zauschneria californica)	Field Container	Klett	CO	1999	Over the top	No injury with 2 and 4 lb ai per acre; good weed control; 2G used
20151	California Fuschia (Zauschneria californica)	Field Container	Klett	CO	2000	Over the top	No injury or growth reduction at 2 and 4 lb ai per acre; good weed control; 2G used

Table 12. Detailed Summary of Crop Safety Testing with Prowl 4E (Pendimethalin)

Notes: Table entries are sorted by crop Latin name. Only those reports received before 4/24/2017 are included.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
09407	Fir, Fraser (<i>Abies fraseri</i>)	Field In-Ground	Ahrens	CT	1984	Over the top	No injury at 2, 4 and 8 lb ai per acre.
09407	Fir, Fraser (<i>Abies fraseri</i>)	Field In-Ground	Ahrens	CT	1985	Over the top	No injury at 2 and 4 lb ai per acre and very slight at 8 lb ai per acre.
09407	Fir, Fraser (<i>Abies fraseri</i>)	Field In-Ground	Ahrens	CT	1986	Over the top	No injury at 2, 4 and 8 lb ai per acre.
28402	Maple (<i>Acer sp.</i>)	Field Container	Skroch	NC	1984	Over the top	Virtually no injury with 4 lb ai per acre; good control of oxalis and excellent control of spotted spurge.
12876	Birch, River (<i>Betula nigra</i>)	Field Container	Skroch	NC	1984	Over the top	No injury with 4 lb ai per acre.
12876	Birch, River (<i>Betula nigra</i>)	Field Container	Skroch	NC	1985	Over the top	Very slight injury with 4 lb ai per acre, followed with oxyfluorfen.
09404	Golden Bells (<i>Forsythia sp.</i>) F. intermedia 'Lynwood Gold'	Field In-Ground	Ahrens	CT	1984	Over the top	No injury with 2, 4, and 8 lb ai per acre
09404	Golden Bells (<i>Forsythia sp.</i>) F. intermedia 'Lynwood Gold'	Field In-Ground	Ahrens	CT	1985	Over the top	No injury at 2 and 4 lb ai per acre and very slight at 8 lb ai per acre.
09404	Golden Bells (<i>Forsythia sp.</i>) F. intermedia 'Lynwood Gold'	Field In-Ground	Ahrens	CT	1986	Over the top	No injury with 2, 4, and 8 lb ai per acre.
12886	Ash (<i>Fraxinus sp.</i>) F. pennsylvanica	Field In-Ground	Skroch	NC	1984	Over the top	No injury with 4 lb ai per acre.
12886	Ash (<i>Fraxinus sp.</i>) F. pennsylvanica	Field In-Ground	Skroch	NC	1985	Over the top	No injury with 4 lb ai per acre; followed with oxyfluorfen.
28402	Holly, Chinese (<i>Ilex cornuta</i>) 'Bufordii Nana'	Field Container	Skroch	NC	1984	Over the top	Virtually no injury with 4 lb ai per acre; good control of oxalis and excellent control of spotted spurge.
28407	Holly, Japanese (<i>Ilex crenata</i>) 'Helleri'	Field Container	Skroch	NC	1984	Over the top	No injury with 4 lb ai per acre; good control of oxalis and excellent control of spotted spurge.
28434	Juniper (<i>Juniperus sp.</i>) J. horizontalis	Field In-Ground	Ahrens	CT	1984	Over the top	No injury with 2, 4, and 8 lb ai per acre.
28434	Juniper (<i>Juniperus sp.</i>) J. horizontalis	Field In-Ground	Ahrens	CT	1985	Over the top	No injury at 2 and 4 lb ai per acre and very slight at 8 lb ai per acre.
28405	Juniper (<i>Juniperus sp.</i>) J. horizontalis 'Youngstown'	Field Container	Skroch	NC	1984	Over the top	No injury with 4 lb ai per acre; good control of oxalis and excellent control of spotted spurge.
12898	Crape Myrtle (<i>Lagerstroemia indica</i>)	Field In-Ground	Skroch	NC	1984	Over the top	No injury with 4 lb ai per acre.
12898	Crape Myrtle (<i>Lagerstroemia indica</i>)	Field In-Ground	Skroch	NC	1985	Over the top	No injury with 4 lb ai per acre, followed by oxyfluorfen.
28406	Lilyturf, Big Blue;Giant (<i>Liriope muscari</i>) 'Variegata'	Field Container	Skroch	NC	1984	Over the top	Very slight injury with 4 lb ai per acre; good control of oxalis and excellent control of spotted spurge.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
28402	Lilyturf, Creeping (<i>Liriope</i> sp.) <i>L. spicata</i>	Field Container	Skroch	NC	1984	Over the top	Very slight injury with 4 lb ai per acre; good control of oxalis and excellent control of spotted spurge.
06062	Peony (<i>Paeonia</i> sp.) 'Felix Crousse'	Field In-Ground	Hauser	PA	1981	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Felix Crousse'	Field In-Ground	Hauser	PA	1982	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Felix Crousse'	Field In-Ground	Hauser	PA	1983	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Festiva Maxima'	Field In-Ground	Hauser	PA	1981	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Festiva Maxima'	Field In-Ground	Hauser	PA	1982	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Festiva Maxima'	Field In-Ground	Hauser	PA	1983	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Mons. Julius Elie'	Field In-Ground	Hauser	PA	1981	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Mons. Julius Elie'	Field In-Ground	Hauser	PA	1982	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Mons. Julius Elie'	Field In-Ground	Hauser	PA	1983	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Richard Carvel'	Field In-Ground	Hauser	PA	1981	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Richard Carvel'	Field In-Ground	Hauser	PA	1982	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
06062	Peony (<i>Paeonia</i> sp.) 'Richard Carvel'	Field In-Ground	Hauser	PA	1983	Soil	No injury with 0.75, 1.5, 3.0 and 6.0 lb ai per acre, when applied prior to shoot emergence.
28403	Photinia (<i>Photinia</i> sp.) <i>P. fraseri</i>	Field Container	Skroch	NC	1984	Over the top	Virtually no injury with 4 lb ai per acre; good control of oxalis and excellent control of spotted spurge.
19484	Spruce (<i>Picea</i> sp.) <i>P. pungens</i>	Field In-Ground	Ahrens	CT	1985	Over the top	Virtually no injury at 6 lb ai per acre.
19484	Spruce (<i>Picea</i> sp.) <i>P. pungens</i>	Field In-Ground	Ahrens	CT	1986	Over the top	No injury at 6 lb per acre prior to fall application of either imazapyr or sulfometuron; injury did occur after these fall applications.
09408	Pine (<i>Pinus</i> sp.) <i>P. strobus</i>	Field In-Ground	Ahrens	CT	1985	Over the top	No injury at 6 lb ai per acre.
09408	Pine (<i>Pinus</i> sp.) <i>P. strobus</i>	Field In-Ground	Ahrens	CT	1986	Over the top	No injury at 6 lb per acre prior to fall application of either imazapyr or sulfometuron; injury did occur after these fall applications.
09408	Pine (<i>Pinus</i> sp.) <i>P. strobus</i>	Field In-Ground	Skroch	NC	1984	Over the top	Minor injury with 4 lb ai per acre.
09408	Pine (<i>Pinus</i> sp.) <i>P. strobus</i>	Field In-Ground	Skroch	NC	1985	Over the top	Minor injury with 4 lb ai per acre, followed with oxyflourfen.
09408	Pine (<i>Pinus</i> sp.) <i>P. taeda</i>	Field In-Ground	Skroch	NC	1984	Over the top	No injury with 4 lb ai per acre.

PR#	Crop	Production Site	Researcher	Trial State	Trial Year	Application Type	Results
09408	Pine (Pinus sp.) P. taeda	Field In-Ground	Skroch	NC	1985	Over the top	No injury with 4 lb ai per acre, followed with oxyflourfen.
29238	Oak (Quercus sp.) Q. nigra	Field In-Ground	Skroch	NC	1984	Over the top	No injury with 4 lb ai per acre.
29238	Oak (Quercus sp.) Q. nigra	Field In-Ground	Skroch	NC	1985	Over the top	No injury with 4 lb ai per acre, followed with oxyflourfen.
28404	Azalea (Rhododendron sp.) R. x obtusum 'Sunglo'	Field Container	Skroch	NC	1984	Over the top	Slight injury with 4 lb ai per acre; good control of oxalis and excellent control of spotted spurge.
09413	Yew (Taxus sp.) T. cuspidata	Field In-Ground	Ahrens	CT	1984	Over the top	No injury at 2, 4, and 8 lb ai per acre.
09413	Yew (Taxus sp.) T. cuspidata	Field In-Ground	Ahrens	CT	1985	Over the top	Moderate injury at 2, 4, and 8 lb ai per acre on freshly pruned trees.
09413	Yew (Taxus sp.) T. cuspidata	Field In-Ground	Ahrens	CT	1986	Over the top	Slight stunting at 2, 4 and 8 lb ai per acre; Prowl 4E used
28430	Arborvitae (Thuja sp.) T. occidentalis	Field In-Ground	Ahrens	CT	1984	Over the top	No injury at 2, 4 and 8 lb ai per acre.
28430	Arborvitae (Thuja sp.) T. occidentalis	Field In-Ground	Ahrens	CT	1985	Over the top	No injury at 2 and 4 lb ai per acre and very slight at 8 lb ai per acre on freshly pruned trees.
09406	Hemlock, Canada (Tsuga canadensis)	Field In-Ground	Ahrens	CT	1984	Over the top	No injury at 2, 4, and 8 lb ai per acre.
09406	Hemlock, Canada (Tsuga canadensis)	Field In-Ground	Ahrens	CT	1984	Over the top	No injury at 2, 4, and 8 lb ai per acre.
09406	Hemlock, Canada (Tsuga canadensis)	Field In-Ground	Ahrens	CT	1985	Over the top	Minor injury increasing with rate (2, 4, 8 lb ai per acre).
09406	Hemlock, Canada (Tsuga canadensis)	Field In-Ground	Ahrens	CT	1986	Over the top	No injury at 2, slight and moderate stunting at 4 and 8 lb ai per acre.

Label Suggestions

It is suggested that the following 19 genera or species exhibiting no injury in these experiments be added to the Pendulum 2G label.

<i>Athyrium nipponicum</i>	<i>Leymus arenarius</i>	<i>Scabiosa</i> sp.
<i>Chasmanthium latifolium</i>	<i>Muhlenbergia capillaris</i>	<i>Schizachyrium scoparium</i>
<i>Chrysogonum virginianum</i>	<i>Muhlenbergia dumosa</i>	<i>Sedum</i> sp.
<i>Digitalis thaspi</i>	<i>Nepeta x faassenii</i>	<i>Sorghastrum nutans</i>
<i>Gazania linearis</i>	<i>Pennisetum alopecuroides</i>	<i>Sporobolus heterolepis</i>
<i>Juncus effusus</i>	<i>Pennisetum orientale</i>	
<i>Kniphofia</i> sp.	<i>Penstemon</i> sp.	

IR-4 has very limited data for following list of 67 plants. However, if other available data demonstrate no or minimal transient injury for these crops, IR-4 supports placing these on the Pendulum 2G label also.

<i>Alchemilla</i> sp.	<i>Epilobium fleischeri</i>	<i>Oenothera fruticosa</i>
<i>Arachniodes simplicor</i>	<i>Eragrostis curvula</i>	<i>Opuntia humifusa</i>
<i>Asarum chinensis</i>	<i>Eragrostis spectabilis</i>	<i>Othonna capensis</i>
<i>Aster dumosus x Aster novibelgii</i>	<i>Erianthus ravennae</i>	<i>Paeonia</i> sp.
<i>Aster ericoides</i>	<i>Erianthus</i> sp.	<i>Penstemon hartwegii</i>
<i>Buddleia alternifolia</i>	<i>Eupatorium maculatum</i>	<i>Pentas</i> sp.
<i>Calamagrostis arundinacea</i>	<i>Eupatorium perfoliatum</i>	<i>Phormium colinsoi</i>
<i>Carex buchananii</i>	<i>Eupatorium rugosum</i>	<i>Polemonium</i> sp.
<i>Carex cherokeensis</i>	<i>Eupatorium</i> sp.	<i>Rhamnus smithii</i>
<i>Carex morrowi</i>	<i>Fallugia paradoxa</i>	<i>Ruellia brittoniana</i>
<i>Centranthus ruber</i>	<i>Gazania</i> sp.	<i>Ruscus aculeatus</i>
<i>Chasmanthium latifolium</i>	<i>Gomphrena</i> sp.	<i>Salvia daghestanica</i>
<i>Clematis</i> sp.	<i>Hakonechloa macra</i>	<i>Salvia sylvestris</i>
<i>Coreopsis</i> sp.	<i>Helenium</i> sp.	<i>Santolina chamaecyparissus</i>
<i>Cuphea hyssopifolia</i>	<i>Helianthemum</i> sp.	<i>Scabiosa columbaria</i>
<i>Cyrtomium falcatum</i>	<i>Helleborus niger</i>	<i>Scutellaria resinosa</i>
<i>Cytisus purgans</i>	<i>Hierochloe odorata</i>	<i>Sempervivum arachnoideum</i>
<i>Dianthus</i> sp.	<i>Iberis</i> sp.	<i>Solidago cabadensis</i>
<i>Diascia integerrima</i>	<i>Lantana hybrida</i>	<i>Stachys byzantina</i>
<i>Digitalis</i> sp.	<i>Leucanthemum maximum</i>	<i>Tradescantia</i> sp.
<i>Dryopteris erythrosora</i>	<i>Ligularia dentata</i>	<i>Tradescantia virginiana</i>
<i>Dryopteris ludoviciana</i>	<i>Ligularia stenocephala</i>	
<i>Echinacea</i> sp.	<i>Muhlenbergia dubia</i>	

IR-4 has very limited data for following list of 14 plants. However, if other available data demonstrate no or minimal transient injury for these crops, IR-4 supports placing these on the Pendulum AquaCap label also.

Alyssum sp.
Amsonia ciliata
Athyrium nipponicum
Chionanthus retusus
Coreopsis verticillata
Cyrtomium falcatum
Digitalis grandiflora

Digitalis x mertonensis
Dryopteris ludoviciana
Lantana camara
Myrica pensylvanica
Polystichum polyblepharum
Stachys lanata
Stokesia sp.

It is suggested that *Paeonia* sp., exhibiting no injury in these experiments, be added to the Pendulum 3.3EC label.

IR-4 has very limited data for *Acer* sp. However, many species under this genus are already on the Pendulum 3.3EC label so if other available data demonstrate no or minimal transient injury, IR-4 supports placing *Acer* sp. on the label also.

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