



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

## **IR-4 Ornamental Horticulture Program Biathlon (Oxyfluorfen + Prodiamine) Crop Safety**

**Authors: Ely Vea and Cristi L. Palmer  
Date: April 25, 2017**

### **Acknowledgements**

**Edith Lurvey  
Kathleen Hester  
Diane Infante  
Lori Harrison  
Karen Sims**

This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2015-34383-23710 with substantial cooperation and support from the State Agricultural Experiment Stations and USDA-ARS.

## Table of Contents

Table of Contents .....	2
Table of Tables .....	3
Abstract .....	4
Introduction.....	5
Materials and Methods.....	5
Results and Summary .....	5
Phytotoxicity .....	5
Label Suggestions .....	16
Appendix 1: Contributing Researchers.....	17

## Table of Tables

Table 1.	List of Biathlon treated crops with no or minimal transitory injury in a minimum of three trials.....	6
Table 2.	List of Biathlon treated crops with no or minimal transitory injury seen at the 1X rate, but the 2X or 4X rate did cause significant phytotoxicity. ....	6
Table 3.	List of Biathlon treated crops exhibiting significant injury at the 1X rate. ....	6
Table 4.	List of Biathlon treated crops with no or minimal transitory injury where more information is needed.....	6
Table 5.	Detailed Summary of Crop Safety Testing with Oxyfluorfen + Prodiamine .....	8

## Abstract

From 2009 through 2016 IR-4 completed 155 trials evaluating Biathlon (oxyfluorfen + prodiamine) crop safety. The data contained in this report were generated to register uses of oxyfluorfen + prodiamine as over-the-top applications on and around ornamental horticulture plants. The rates tested were 2.75 (1X), 5.5 (2X) and 11.0 (4X) pounds active ingredient per acre (lb ai per acre).

Biathlon was applied to fifty-six (56) plant species or genera. Twenty-one (21) genera or species exhibited no or minimal transient injury in at least 3 trials. One species exhibited phytotoxicity or growth reduction in at least one trial at the 2X and/or 4X rate, but it may not affect the marketability of the crop. No species tested consistently exhibited significant phytotoxicity or growth reduction in more than one trial. Forty (40) species require further testing. Results are summarized at the species level, as there is some evidence that crop safety can differ at the varietal level. On the Biathlon label, *Potentilla fruticosa* appears twice: it may be used on the variety 'Abbotwood' but is not recommended on 'Goldfinger'. More data is needed to establish the actual varietal sensitivities within *Potentilla fruticosa*, and identify other species with the same difficulty. We recommend *Betula nigra*, *Camelia japonica*, *Chasmantium latifolium*, *Dasiphora fruticosa*, *Dryopteris erythrosora*, *Lantana camara*, *Quercus rubra*, *Rosmarinus officinalis*, *Rudbeckia spp.*, *Salvia nemorosa*, and *Sedum spp.* be added to the Biathlon label along with 13 additional varieties of species already listed in the label.

## **Introduction**

Non-phytotoxic and effective residual control of broadleaved weeds and sedges in the production of woody and herbaceous perennials can be problematic. Nurseries grow many different types of plants, and not all genera or species are listed on labels. Some weeds may also be difficult to control in landscape settings for the same reason. Between 2009 and 2016, the IR-4 Project has conducted 155 trials evaluating Biathlon crop safety applied as over-the-top applications on and around ornamental horticulture plants. The data contained in this summary report were generated to help add new crops to the Biathlon label.

## **Materials and Methods**

From 2009 to 2016, two applications of Biathlon were made approximately 6 weeks apart, with the first application within 7 days of transplanting. The application rates were 2.75, 5.5 and 11.0 lb ai per acre, plus a water treated control. A minimum number of 10 plants (replicate treatments) were required. Phytotoxicity was recorded using a scale of 0 to 10 (0 = No phytotoxicity; 10 = Complete kill) at approximately 1, 2, 4, 7, 8 and 10 weeks after initial application. Plant size was also evaluated for several species at the time of the first application and again at the time of the last evaluation. The protocols used were 09-020, 10-001, 11-004, 12-014, 13-014, 14-009, 15-009 and 16-010. Please visit <http://ir4.rutgers.edu/ornamental/OrnamentalDrafts.cfm> to view and download these protocols.

Biathlon was supplied to researchers (See list of researchers in Appendix 1) by OHP, Inc.

## **Results and Summary**

### ***Phytotoxicity***

Based on the type and nature of injury seen with Biathlon applications in the conducted research, tested plant species were placed into four categories: 1) no significant phytotoxicity or growth differences from the untreated check or any injury was transitory, 2) no or minimal transitory injury seen at the 1X rate, but the 2X and/or 4X rates did cause significant phytotoxicity, 3) significant injury sufficient to recommend growers not utilize this product, and 4) more data is needed to make informed recommendations.

Biathlon exhibited no or minimal negative impact on twenty-one genera or species when applied as a broadcast, over the top application (Table 1). Minimal injury may be acceptable for growers if applications are made several weeks to months in advance of crop sale particularly for woody ornamental crops.

One species exhibited significant injury or growth reduction with Biathlon at either the 2X or 4X rate (Table 2). None of the tested species exhibited damage sufficient to recommend growers not utilize Biathlon as an over-the-top treatment for pre-emergent weed control at the recommended label rate (Table 3). For forty genera or 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 4). *Potentilla fruticosa* ‘Goldfinger’ exhibited no signs of injury in three trials conducted by IR-4, although use is not recommended specifically for this variety in the Biathlon label. Use of Biathlon is allowed in another variety of the same species, *Potentilla fruticosa* ‘Abbotswood’.

Please see Table 5 for a list of individual trial summaries on Biathlon.

**Table 1. List of Biathlon treated crops with no or minimal transitory injury in a minimum of three trials.**

<i>Acer spp.</i>	<i>Juniper spp.</i>
<i>A. palmatum</i>	<i>J. chinensis</i> ‘variegata’ <sup>1</sup>
<i>A. rubrum</i> <sup>1</sup>	<i>J. horizontalis</i> <sup>1</sup>
<i>Berberis thunbergii</i> <sup>1</sup>	<i>J. virginiana</i> <sup>1</sup>
<i>Betula nigra</i>	<i>Lantana camara</i>
<i>Camellia japonica</i>	<i>Potentilla fruticosa</i> <sup>2,3</sup>
<i>Chasmantium latifolium</i>	<i>Quercus rubra</i>
<i>Cornus spp.</i>	<i>Rhododendron sp. (Azalea)</i> <sup>1</sup>
<i>C. kousa</i>	<i>Rosa spp.</i> <sup>1</sup>
<i>C. sanguinea</i> <sup>1</sup>	<i>Rosmarinus officinalis</i>
<i>C. sericea</i>	<i>Rudbeckia sp.</i>
<i>Dasiphora fruticosa</i>	<i>Salvia nemorosa</i>
<i>Dryopteris erythrosora</i>	<i>Sedum sp.</i>
<i>Euonymus japonica</i> <sup>1</sup>	<i>Viburnum sp.</i> <sup>1</sup>
<i>Gardenia jasminoides</i> <sup>1</sup>	

**Table 2. List of Biathlon treated crops with no or minimal transitory injury seen at the 1X rate, but the 2X or 4X rate did cause significant phytotoxicity.**

*Hemerocallis sp.*

**Table 3. List of Biathlon treated crops exhibiting significant injury at the 1X rate.**

*None*

<sup>1</sup>Already registered

<sup>2</sup>On label, Use not recommended

<sup>3</sup>Variations in crop safety at the varietal level: IR-4 tested ‘Abbotswood’, ‘Goldfinger’ and ‘Pink Beauty’ with no observed injury, but the label indicates ‘Goldfinger’ is sensitive to Biathlon.

**Table 4. List of Biathlon treated crops with no or minimal transitory injury where more information is needed.**

<i>Arctostaphylos sp.</i>	<i>Hosta fortunei</i>
<i>Aucuba japonica</i>	<i>Hosta sp.</i>
<i>Buddleia davidii</i> <sup>1</sup>	<i>Hydrangea macrophylla</i> <sup>2</sup>
<i>Camellia sasanqua</i>	<i>Iberis sempervirens</i>
<i>Chrysanthemum x rubellum</i>	<i>Iberis sp.</i>
<i>Cryptomeria japonica</i> <sup>1</sup>	<i>Leucanthemum x superbum</i>
<i>Dendranthema zawadskii</i>	<i>Lonicera sempervirens</i>
<i>Distylium sp.</i>	<i>Mahonia aquifolium</i>
<i>Echeveria sp.</i>	<i>Nandina domestica</i> <sup>1</sup>
<i>Echinacea spp.</i>	<i>Oxydendron arboreum</i>
<i>Enkianthus campanulatus</i>	<i>Pachysandra terminalis</i>
<i>Euonymus alata</i> <sup>2</sup>	<i>Penstemon sp.</i>
<i>Forsythia intermedia</i>	<i>Pieris japonica</i>
<i>Gladiolus sp.</i>	<i>Prunus sp.</i>
<i>Hemerocallis sp.</i>	<i>Prunus x cistena</i>
<i>Heuchera x brizoides</i>	<i>Quercus alba</i>
<i>Heuchera micrantha</i>	<i>Quercus pinnata</i>
<i>Heuchera sanquinea</i>	<i>Quercus virginiana</i>
<i>Hibiscus moscheuto</i>	<i>Taxus x media</i> <sup>1</sup>
<i>Hibiscus syriacus</i> <sup>1</sup>	<i>Vinca minor 'Bowles'</i> <sup>1</sup>

<sup>1</sup>Already registered

<sup>2</sup>On label, Use not recommended

**Table 5. Detailed Summary of Crop Safety Testing with Oxyfluorfen + Prodiamine**

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 4/20/2017 are listed below.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
28979	Maple (Acer sp.) <i>A. palmatum atropurpureum</i>	Field Container	Beste/Frank (ARS)	MD	2010	Over the top	No crop injury or reduction in growth with one or two applications 2.75, 5.5, 11.0 lb ai per acre (unrelated leaf necrosis). Effective yel. Woodsorrel and spotted spurge control.
28979	Maple (Acer sp.) <i>A. rubrum</i>	Field Container	Beste/Frank (ARS)	MD	2011	Over the top	No significant injury, growth or marketability reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
28979	Maple (Acer sp.) <i>A. rubrum</i>	Field Container	Derr	VA	2010	Over the top	No crop injury with 2.75, 5.5, 11.0 lb ai per acre. Effective control of eclipta, crabgrass, and annual sedge with increasing rates.
28983	Bearberry ( <i>Arctostaphylos</i> sp.)	Field Container	Koivunen	CA	2016	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
28985	<i>Aucuba</i> ( <i>Aucuba</i> sp.) <i>A. japonica</i> 'Gold Dust'	Field Container	Czarnota	GA	2013	Over the top	Inconclusive results due to variable injury from treatments, including untreated check.
28985	<i>Aucuba</i> ( <i>Aucuba</i> sp.) <i>A. japonica</i> 'Variegata'	Field Container	Beste/Frank (ARS)	MD	2012	Over the top	Summer heat stress caused injury to all plants including untreated; trial should be repeated.
28985	<i>Aucuba</i> ( <i>Aucuba</i> sp.) <i>A. japonica</i> 'Variegata'	Field Container	Pemberton	TX	2012	Over the top	No injury or growth reduction with 2.65, 5.3 and 10.6 lb ai per acre applied twice.
28985	<i>Aucuba</i> ( <i>Aucuba</i> sp.) 'Lavender Dew'	Field Container	Uber	CA	2014	Over the top	Data not viable due to heat stress on plants.
28986	Barberry ( <i>Berberis</i> sp.) <i>B. thunbergii</i> 'atropurpurea'	Field Container	Chandran	WV	2010	Over the top	No significant injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
28986	Barberry ( <i>Berberis</i> sp.) <i>B. thunbergii</i> 'Crimson Pigmy'	Field Container	Beste/Frank (ARS)	MD	2011	Over the top	No significant injury, growth or marketability reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
28986	Barberry ( <i>Berberis</i> sp.) <i>B. thunbergii</i> 'Crimson Pigmy'	Field Container	Beste/Frank (ARS)	MD	2010	Over the top	No crop injury or significant stunting with two applications at 2.75, 5.5, and 11 lb ai per acre. Excellent control of Eclipta, spotted spurge, PA bittercress and yel. Woodsorrel.
28986	Barberry ( <i>Berberis</i> sp.) <i>B. thunbergii</i> 'Crimson Pigmy'	Field Container	Lieth	CA	2009	Over the top	No significant injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
28986	Barberry ( <i>Berberis</i> sp.) <i>B. thunbergii</i> 'Crimson Pigmy'	Field Container	Mathers (OSU)	MI	2010	Over the top	Lincoln: No crop injury at 2.75, 5.5, and 11.0 lb ai per acre.
28986	Barberry ( <i>Berberis</i> sp.) <i>B. thunbergii</i> 'Crimson Pigmy'	Field Container	Mathers (OSU)	OH	2010	Over the top	Ohio: No crop injury at 2.75, 5.5, and 11.0 lb ai per acre.
28986	Barberry ( <i>Berberis</i> sp.) <i>B. thunbergii</i> 'Crimson Pigmy'	Field Container	Mathers (OSU)	MI	2010	Over the top	Spring Meadow: No crop injury at 2.75, 5.5, and 11.0 lb ai per acre.
28986	Barberry ( <i>Berberis</i> sp.) <i>B. thunbergii</i> 'Crimson Pigmy'	Field Container	Mathers (OSU)	MI	2010	Over the top	Zelenka: No crop injury at 2.75, 5.5, and 11.0 lb ai per acre.
28986	Barberry ( <i>Berberis</i> sp.) <i>B. thunbergii</i> 'Helmond Pillar'	Field Container	Trader	MS	2009	Over the top	No injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
28987	Birch, River ( <i>Betula nigra</i> )	Field Container	Witcher	TN	2016	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.



PR#	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
28987	Birch, River (Betula nigra) B. nigra 'Little King'	Field Container	Beste/Frank (ARS)	MD	2013	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice; no reduction in marketability.
28987	Birch, River (Betula nigra) B. nigra 'Summer Cascade'	Field Container	Boydston	WA	2013	Over the top	No injury or growth reduction with 2.75, 5.5, and 11.0 lb ai per acre applied twice; all plants saleable.
28728	Butterfly Bush (Buddleia davidii) B. 'Nanho White'	Field Container	Derr	VA	2010	Over the top	No crop injury with 2.75, 5.5, and 11.0 lb ai per acre. Effective control of eclipta, crabgrass, and annual sedge with increasing rates.
28991	Camellia (Camellia sp.) C. japonica 'Kanjiro'	Field Container	Gilliam	AL	2010	Over the top	No crop injury or reduction in growth with one or two applications at 2.75, 5.5, 11 lb ai per acre.
28991	Camellia (Camellia sp.) C. japonica 'Mrs. Tingley'	Field Container	Uber	CA	2010	Over the top	No crop injury observed with 2.75, 5.5, and 11.0 lb ai per acre at any time. Good efficacy on euphorbia maculata noted.
28991	Camellia (Camellia sp.) C. japonica 'Spring's Promise'	Field Container	Beste/Frank (ARS)	MD	2010	Over the top	No significant injury at 2.75, 5.5 and 11.0 lb ai per acre, but 27% reduction in height at 4X; no reduction in marketability at all rates. Excellent control of oxalis.
28991	Camellia (Camellia sp.) C. sasanqua 'Yuletide'	Field Container	Beste/Frank (ARS)	MD	2011	Over the top	No significant injury, growth or marketability reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
31098	Northern Sea Oats, Wild Oats (Chasmanthium latifolium)	Field Container	Cochran	IA	2014	Over the top	Moderate injury with 2.75, 5.5 and 11 lb ai per acre applied twice; no significant growth reduction.
31098	Northern Sea Oats, Wild Oats (Chasmanthium latifolium)	Field Container	Hanson	CA	2013	Over the top	Slight injury (leaf necrosis) after the 2nd applic. with 2.75, 5.5 and 11 lb ai per acre; no significant growth reduction.
31098	Northern Sea Oats, Wild Oats (Chasmanthium latifolium)	Field Container	Senesac	NY	2015	Over the top	No injury after the first application, minor injury after second, with 2.75, 5.5 and 11 lb ai per acre.
31098	Northern Sea Oats, Wild Oats (Chasmanthium latifolium)	Field Container	Wilen	CA	2015	Over the top	No significant injury with 100, 200 and 400 lb per acre after 1st application, slight acceptable injury after 2nd applic. with 2X and 4X; no growth reduction. However, 4 months after application, shoot and root growth was decreased with increasing rate.
32713	Chrysanthemum x rubellum (Chrysanthemum x rubellum) Dendranthema zawadskii 'Clara Curtis'	Field Container	Klett	CO	2016	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
29002	Dogwood (Cornus sp.) C. florida	Field Container	Mathers (OSU)	OH	2010	Over the top	Ohio: No crop injury at 2.75, 5.5, and 11.0 lb ai per acre.
29002	Dogwood (Cornus sp.) C. kousa	Field Container	Derr	VA	2011	Over the top	No crop injury and little to no reduction in growth with 2.75, 5.5 or 11 lb ai per acre. Good bittercress control, poor to good control of spotted spurge, phyllanthus, and chamberbitter, good to excellent fragrant flatsedge control and poor eclipta control
29002	Dogwood (Cornus sp.) C. kousa 'Chinensis'	Field Container	Beste/Frank (ARS)	MD	2011	Over the top	No significant injury, growth or marketability reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
29002	Dogwood (Cornus sp.) C. sanguinea 'Arctic Sun'	Field Container	Mathers (OSU)	MI	2010	Over the top	Spring Meadow: No crop injury at 2.75, 5.5, and 11.0 lb ai per acre.
29002	Dogwood (Cornus sp.) C. sericea 'Arctic Sun'	Field Container	Trader	MS	2009	Over the top	No injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29002	Dogwood (Cornus sp.) C. sericea 'Bailey'	Field Container	Mathers (OSU)	MI	2010	Over the top	Lincoln: No crop injury at 2.75, 5.5, and 11.0 lb ai per acre.

PR#	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
29002	Dogwood (Cornus sp.) C. sericea 'Silver and Gold'	Field Container	Beste/Frank (ARS)	MD	2010	Over the top	Very slight transient injury at 2.75, 5.5 and 11.0 lb ai per acre, but no reduction in height or width and all plants were marketable; good to excellent control of various weeds.
29301	Japanese Cedar (Cryptomeria japonica) C. japonica 'Yoshino'	Field Container	Neal	NC	2010	Over the top	No injury from any dose (2.75, 5.5. and 11 lb ai per) at anytime during the evaluation.
29301	Japanese Cedar (Cryptomeria japonica) 'Yoshino'	Field Container	Trader	MS	2009	Over the top	No injury or significant growth reduction at 2.75, 5.5 and 11 lb ai per acre..
29053	Cinquefoil, Shrubby (Dasiphora fruticosa) 'Abbotswood'	Field Container	Lieth	CA	2009	Over the top	No significant injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29053	Cinquefoil, Shrubby (Dasiphora fruticosa) 'Abbotswood'	Field Container	Trader	MS	2009	Over the top	No injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29053	Cinquefoil, Shrubby (Dasiphora fruticosa) 'Goldfinger'	Field Container	Boydston	WA	2010	Over the top	Trial 1: No injury during the 6 week evaluation period with two applications of Biathlon 2.75G (OHP 052908) at 2.7, 5.5 and 11 lb ai per acre to shrubby cinquefoil. This experiment was repeated due to overwatering concerns and reported as PR#29053B or tr
29053	Cinquefoil, Shrubby (Dasiphora fruticosa) 'Goldfinger'	Field Container	Boydston	WA	2010	Over the top	Trial 2: Two sequential applications of Biathlon 2.75G applied 6 weeks apart at 2.75, 5.5, and 11.0 lb ai per acre did not injure shrubby cinquefoil plants. All plants were saleable.
29053	Cinquefoil, Shrubby (Dasiphora fruticosa) 'Goldfinger'	Field Container	Mathers (OSU)	OH	2010	Over the top	Ohio: No crop injury at 2.75, 5.5, and 11.0 lb ai per acre.
29053	Cinquefoil, Shrubby (Dasiphora fruticosa) 'Pink Beauty'	Field Container	Mathers (OSU)	MI	2010	Over the top	Lincoln: No crop injury at 2.75, 5.5, and 11.0 lb ai per acre.
33018	Distylium sp. (Distylium sp.)	Field Container	Neal	NC	2016	Over the top	No injury or growth reduction with 2.75 and 5.5 lb ai per acre applied twice; moderate with 11 lb ai per acre after 2nd applic.
30970	Fern, Autumn & Wood (Dryopteris sp.) D. erythroa 'Brilliance'	Field Container	Senesac	NY	2016	Over the top	Minimal injury with 2.75, minor with 5.5 and 11 lb ai per acre applied twice.
30970	Fern, Autumn & Wood (Dryopteris sp.) D. erythrosora	Field Container	Gilliam	AL	2013	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
30970	Fern, Autumn & Wood (Dryopteris sp.) D.erythroa	Field Container	DeFrancesco	OR	2015	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
31216	Echeveria sp. (Echeveria sp.) 'Blue 2'	Field Container	Wilén	CA	2016	Over the top	Moderate injury with 100, 200 and 400 lb per acre applied twice.
30971	Purple Coneflower (Echinacea sp.) E. purpurea 'Hot Summer'	Field Container	Boydston	WA	2014	Over the top	Slight injury and growth reduction with 2.75, 5.5 and 11.0 lb ai per acre applied twice; all treated plants marketable.
30971	Purple Coneflower (Echinacea sp.) E. purpurea 'Magnus'	Field Container	Senesac	NY	2015	Over the top	Minor injury with 2.75, 5.5 and 11 lb ai per acre applied twice.
30971	Purple Coneflower (Echinacea sp.) 'Magnus'	Field Container	Boydston	WA	2013	Over the top	Very minor injury with complete recovery with 2.75, 5.5, and 11.0 lb ai per acre applied twice; no growth reduction; all plants saleable.
33019	Enkianthus (Enkianthus sp.) E. campanulatus	Field Container	Neal	NC	2016	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice. High incidence of Phytophthora root rot in plants in this study.

PR#	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
29013	Euonymus (Euonymus sp.) E. alatus 'compactus'	Field Container	Boydston	WA	2010	Over the top	No injury during the 6 week evaluation period with two applications of Biathalon 2.75G (OHP 052908) at 2.7, 5.5 and 11 lb ai per acre.
29013	Euonymus (Euonymus sp.) E. alatus 'Compactus'	Field Container	Boydston	WA	2011	Over the top	No crop injury or reduction in growth with two applications at 2.75, 5.5 and 11.0 lb ai per acre.
29013	Euonymus (Euonymus sp.) E. japonica 'Aurea Marginata'	Field Container	Uber	CA	2010	Over the top	No crop injury observed with 2.75, 5.5, and 11.0 lb ai per acre at any time. Good efficacy on euphorbia maculata noted.
29013	Euonymus (Euonymus sp.) E. japonicas 'Japanese Spindle'	Field Container	Uber	CA	2011	Over the top	No crop injury or reduction in growth with 2.75, 5.5, and 11.0 lb ai per acre.
29013	Euonymus (Euonymus sp.) E. japonicus 'Aureomarginatus'	Field Container	Lieth	CA	2009	Over the top	Slight injury where granules were not washed off (leaf burning) at 2.75, 5.5 and 11 lb ai per acre.
29015	Golden Bells (Forsythia sp.) F. intermedia 'Golden Bells'	Field Container	Beste/Frank (ARS)	MD	2013	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
29015	Golden Bells (Forsythia sp.) Forsythia x intermedia	Field Container	Gilliam	AL	2015	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
29015	Golden Bells (Forsythia sp.) 'Lynwood Gold'	Field Container	Uber	CA	2015	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
29016	Jasmine, Cape, Common Gardenia (Gardenia sp.) G. jasminoides 'Daisy'	Field Container	Trader	MS	2009	Over the top	No injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29016	Jasmine, Cape, Common Gardenia (Gardenia sp.) G. jasminoides 'Frostproof'	Field Container	Derr	VA	2010	Over the top	No crop injury with 2.75, 5.5, 11 lb ai per acre. Increasing control of spotted spurge, chamber bitter, eclipta, annual sedges with increasing rates.
29016	Jasmine, Cape, Common Gardenia (Gardenia sp.) G. jasminoides 'Veitchii'	Field Container	Uber	CA	2010	Over the top	No crop injury observed with 2.75, 5.5, and 11.0 lb ai per acre at any time. Good efficacy on euphorbia maculata noted.
29017	Corn Flag, Sword Lily (Gladiolus sp.)	Field Container	Koivunen	CA	2016	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
30972	Daylily (Hemerocallis sp.) 'Green Flutter'	Field Container	Senesac	NY	2014	Over the top	No injury with 2.75, 5.5 and 11 lb ai per acre applied twice.
30972	Daylily (Hemerocallis sp.) 'Lavender Dew'	Field Container	Uber	CA	2014	Over the top	No injury with 2.75, 5.5 and 11 lb ai per acre applied twice.
30972	Daylily (Hemerocallis sp.) 'Stella de Oro'	Field Container	Beste/Frank (ARS)	MD	2012	Over the top	No significant injury, growth or marketability reduction with 2.75 lb ai per acre applied twice; moderate injury, width reduction and reduced marketability with 5.5 and 11 lb.
30972	Daylily (Hemerocallis sp.) 'Stella d'Oro'	Field Container	Mathers (OSU)	OH	2013	Over the top	Minor injury with 100, moderate and high with 200 and 400 lb per acre applied twice.
30973	Alumroot (Heuchera sp.) H. micrantha 'Bressingham Hybrid'	Field Container	Klett	CO	2012	Over the top	No data analyzed because plants in all treatments had very non-uniform growth.
30973	Alumroot (Heuchera sp.) H. micrantha var. diversifolia 'Palace Purple'	Field Container	Boydston	WA	2012	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice; all plants saleable.
30973	Alumroot (Heuchera sp.) H. sanguinea	Field Container	Reding	OH	2012	Over the top	No injury and no significant difference in growth or marketability at 100, 200 and 400 lb per acre applied twice.

PR#	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
30973	Alumroot (Heuchera sp.) Heuchera x brizoides	Field Container	Klett	CO	2013	Over the top	No injury or growth reduction with 100 and 200, slight injury only with 400 lb per acre applied twice.
29019	Rosemallow (Hibiscus sp.) H. moscheutos 'Pink Swirl'	Field Container	Boydston	WA	2011	Over the top	Two sequential applications of Biathlon 2.75G applied 6 weeks apart at 2.75, 5.5, and 11.0 lb ai per acre did not injure or affect growth of hibiscus plants.
29019	Rosemallow (Hibiscus sp.) H. moscheutos 'Luna Rose'	Field Container	Senesac	NY	2010	Over the top	Moderate crop injury (25-35%) from 5.5 and 11.0 lb ai per acre at 2 WAT with recovery by season end.
29019	Rosemallow (Hibiscus sp.) H. syriacus 'Minerva'	Field Container	Lieth	CA	2009	Over the top	No significant injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29019	Rosemallow (Hibiscus sp.) H. syriacus 'Sanchoyo'	Field Container	Trader	MS	2009	Over the top	No injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
30974	Hosta (Hosta sp.)	Field Container	Reding	OH	2012	Over the top	No injury and no significant difference in growth or marketability at 100, 200 and 400 lb per acre applied twice.
30974	Hosta (Hosta sp.) H. fortunei 'Francee'	Field Container	Boydston	WA	2014	Over the top	Slight injury (leaf necrosis) but no growth reduction with 2.75, 5.5 and 11.0 lb ai per acre applied twice; all 1X- and most 2X- and 4X-treated plants marketable.
30974	Hosta (Hosta sp.) H. fortunei 'Francee'	Field Container	Fraelich	GA	2013	Over the top	No injury with 100, 200 and 400 lb per acre after 1st application, very slight leaf burn with complete recovery after 2nd; no growth reduction; all plants marketable.
30974	Hosta (Hosta sp.) H. fortunei 'Gold Standard'	Field Container	Senesac	NY	2014	Over the top	Slight injury with 2.75, 5.5 and 11 lb ai per acre applied twice.
30974	Hosta (Hosta sp.) 'Hadspen Blue'	Field Container	Boydston	WA	2012	Over the top	Moderate injury but no growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice; some treated plants saleable.
29020	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Lieth	CA	2009	Over the top	No to slight injury in leaf margins where granules were not washed off (leaf burning) at 2.75, 5.5 and 11 lb ai per acre.
31101	Candytuft (Iberis sp.) 'Candytuft'	Field Container	Boydston	WA	2013	Over the top	No injury or growth reduction with 2.75, 5.5, and 11.0 lb ai per acre applied twice; all plants saleable.
31101	Candytuft (Iberis sp.) I. sempervirens	Field Container	Uber	CA	2013	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
31101	Candytuft (Iberis sp.) Iberis sempervirens	Field Container	Klett	CO	2013	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
29023	Flag (Iris sp.) I. versicolor	Field Container	Derr	VA	2016	Over the top	No significant injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
29026	Juniper (Juniperus sp.) J. chinensis 'Old Gold'	Field Container	Uber	CA	2010	Over the top	No crop injury observed with 2.75, 5.5, and 11.0 lb ai per acre at any time. Good efficacy on euphorbia maculata noted.
29026	Juniper (Juniperus sp.) J. chinensis 'Sea Green'	Field Container	Senesac	NY	2011	Over the top	No crop injury with two applications at 2.75, 5.5, and 11.0 lb aia.
29026	Juniper (Juniperus sp.) J. horizontalis 'Andorra'	Field Container	Gilliam	AL	2010	Over the top	No crop injury with one or two applications at 2.75, 5.5, 11 lb ai per acre. Plants treated with 1 and 2x were larger than the control.
29026	Juniper (Juniperus sp.) J. virginiana 'Grey Owl'	Field Container	Trader	MS	2009	Over the top	No injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29205	Shrub Verbena (Lantana sp.) L. camara 'Lemon Drop'	Field Container	Klett	CO	2010	Over the top	Trial 1: no crop injury with 2.75, 5.5, 11 lb ai per acre. The untreated control had greater width and dry mass than treated.

PR#	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
29205	Shrub Verbena (Lantana sp.) L. camara 'Lemon Drop'	Field Container	Klett	CO	2010	Over the top	Trial 2: no crop injury with 2.75, 5.5, 11 lb ai per acre. Control plants had greater height than treated.
29205	Shrub Verbena (Lantana sp.) L. camara 'Radiation'	Field Container	Lieth	CA	2009	Over the top	Slight injury (leaf burning), no growth reduction at 2.75, 5.5 and 11 lb ai per acre.
32711	Leucanthemum x superbum (Leucanthemum x superbum) 'Snowcap'	Field Container	Klett	CO	2016	Over the top	No injury with 2.75, 5.5 and 11 lb ai per acre applied twice; moderate growth reduction with 2X and 4X.
29031	Honeysuckle (Lonicera sp.) L. sempervirens 'Alabama'	Field Container	Senesac	NY	2016	Over the top	No injury with 2.75, 5.5 and 11 lb ai per acre applied twice.
29033	Oregon Grape (Mahonia aquifolium)	Field Container	Lieth	CA	2009	Over the top	No significant injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29036	Heavenly Bamboo (Nandina domestica)	Field Container	Lieth	CA	2009	Over the top	No significant injury at 2.75 and 5.5, slight at 11 lb ai per acre; no growth reduction.
29036	Heavenly Bamboo (Nandina domestica)	Field Container	Neal	NC	2010	Over the top	No crop injury with one or two applications at 2.75, 5.5 or 11.0 lb ai per acre.
29042	Sourwood, Sorrel Tree (Oxydendrum arboreum) 'Sourwood'	Field Container	Boydston	WA	2013	Over the top	No injury or growth reduction with 2.75, 5.5, and 11.0 lb ai per acre applied twice; all plants saleable.
29043	Japanese Spurge (Pachysandra terminalis) 'Green Carpet'	Field Container	Aulakh	CT	2015	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
31105	Beard-Tongue (Penstemon sp.) 'Dark Towers'	Field Container	Klett	CO	2016	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
29048	Japanese Andromeda, Japanese Pieris (Pieris japonica) 'Red Mill'	Field Container	Mathers (OSU)	OH	2012	Over the top	No injury with 100, 200 and 400 lb per acre applied twice.
29048	Japanese Andromeda, Japanese Pieris (Pieris japonica) 'Red Mill'	Field Container	Mathers (OSU)	OH	2013	Over the top	No injury with 100, 200 and 400 lb per acre.
29048	Japanese Andromeda, Japanese Pieris (Pieris japonica) 'Shojo'	Field Container	Lieth	CA	2009	Over the top	Data inconclusive because of plant death within all treatments.
29054	Plum (Prunus sp.) 'Black Gold'	Field Container	Cochran	IA	2015	Over the top	No significant injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
29054	Plum (Prunus sp.) 'Montmorency'	Field Container	Cochran	IA	2016	Over the top	No injury with 2.75 and 5.5, minor injury with complete recovery with 11 lb ai per acre applied twice; no growth reduction.
29054	Plum (Prunus sp.) P. x cistena 'Big Cis'	Field Container	Boydston	WA	2013	Over the top	No injury or growth reduction with 2.75, 5.5, and 11.0 lb ai per acre applied twice; all plants saleable.
29058	Oak, Northern Red (Quercus rubra)	Field Container	Aulakh	CT	2016	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
29058	Oak, Northern Red (Quercus rubra) Q. rubra	Field Container	Boydston	WA	2011	Over the top	No crop injury or reduction in growth with two applications at 2.75, 5.5, 11.0 lb ai per acre.
29058	Oak, Northern Red (Quercus rubra) Q. rubra	Field Container	Reding	OH	2012	Over the top	No injury and no significant difference in growth or marketability at 100, 200 and 400 lb per acre applied twice.
32544	Oak (Quercus sp.) Q. alba	Field Container	Aulakh	CT	2016	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
32544	Oak (Quercus sp.) Q. pinnata	Field Container	Mathers (OSU)	OH	2011	Over the top	Two sequential applications at 2.75, 5.5, 11.0 lb ai per acre caused marginal leaf yellowing at all rates and significant growth reduction at 2x. All plants marketable. More research warranted.

PR#	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
32544	Oak (Quercus sp.) Q. virginiana	Field Container	Marble	FL	2016	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice; all plants marketable.
29061	Rhododendron (Rhododendron sp.) 'Delaware Valley'	Field Container	Senesac	NY	2015	Over the top	Minor injury with some recovery at 2.75, 5.5 and 11 lb ai per acre applied twice.
29060	Rhododendron (Rhododendron sp.) 'Karen'	Field Container	Mathers (OSU)	OH	2012	Over the top	No injury with 100 and 200 lb per acre applied twice, very slight with 400 lb.
29061	Rhododendron (Rhododendron sp.) 'Nova Zembla'	Field Container	Mathers (OSU)	OH	2013	Over the top	No injury with 100, 200 and 400 lb per acre.
29060	Rhododendron (Rhododendron sp.) R. 'Fashion' azalea	Field Container	Gilliam	AL	2010	Broadcast	No injury or reduction in growth with any rate during the evaluation period.
29060	Rhododendron (Rhododendron sp.) 'Red Bird'	Field Container	Uber	CA	2013	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
29061	Rhododendron (Rhododendron sp.) 'Virginia Richards'	Field Container	DeFrancesco	OR	2015	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
29062	Rose (Rosa sp.) 'Candy OH Vivid Red'	Field Container	Trader	MS	2009	Over the top	No injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29062	Rose (Rosa sp.) 'Flower Red Carpet'	Field Container	Lieth	CA	2009	Over the top	No significant injury at 2.75, slight at 5.5 and 11 lb ai per acre; no growth reduction.
29062	Rose (Rosa sp.) 'Knock Out'	Field Container	Boydston	WA	2010	Over the top	No injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre; all treated plants saleable.
29062	Rose (Rosa sp.) 'Knock Out Red'	Field Container	Senesac	NY	2010	Over the top	No crop injury but significant reduction in root rating.
29062	Rose (Rosa sp.) R. 'Knock Out Red'	Field Container	Gilliam	AL	2011	Over the top	No crop injury or reduction in growth with 2.75, 5.5, 11.0 lb ai per acre.
29062	Rose (Rosa sp.) R. megililli 'Peach Drift'	Field Container	Chandran	WV	2010	Over the top	No significant injury or growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29063	Rosemary (Rosmarinus officinalis)	Field Container	Denny	MS	2013	Over the top	No injury or growth reduction with 2.75, 5.5 and 11.0 lb ai per acre applied twice.
29063	Rosemary (Rosmarinus officinalis)	Field Container	Uber	CA	2013	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
29063	Rosemary (Rosmarinus officinalis) 'Arp'	Field Container	Beste/Frank (ARS)	MD	2012	Over the top	No significant injury, growth or marketability reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
29063	Rosemary (Rosmarinus officinalis) 'Arp'	Field Container	Senesac	NY	2014	Over the top	No injury with 2.75, 5.5 and 11 lb ai per acre applied twice.
29063	Rosemary (Rosmarinus officinalis) 'Tuscan Blue'	Field Container	DeFrancesco	OR	2014	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
30975	Coneflower (Rudbeckia sp.)	Field Container	Reding	OH	2012	Over the top	No injury and no significant difference in growth or marketability at 100, 200 and 400 lb per acre applied twice.
30975	Coneflower (Rudbeckia sp.) 'Goldstrum'	Field Container	Boydston	WA	2013	Over the top	No injury or growth reduction with 2.75, 5.5, and 11.0 lb ai per acre applied twice; all plants saleable.
30975	Coneflower (Rudbeckia sp.) R. fulgida 'Goldstrum'	Field Container	Beste/Frank (ARS)	MD	2012	Over the top	No significant injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice; no reduction in marketability.
30976	Woodland Sage (Salvia sylvestris) 'May Night'	Field Container	Beste/Frank (ARS)	MD	2012	Over the top	No injury, growth or marketability reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
30976	Woodland Sage (Salvia sylvestris) 'May Night'	Field Container	Boydston	WA	2014	Over the top	No injury with 2.75, slight stunting with full recovery at 5.5 and 11.0 lb ai per acre applied twice; all treated plants marketable.

PR#	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
30976	Woodland Sage (Salvia sylvestris) 'May Night'	Field Container	Derr	VA	2012	Over the top	No injury at 2.75, 5.5 and 11 lb ai per acre applied twice.
30976	Woodland Sage (Salvia sylvestris) 'Blue Hill'	Field Container	Senesac	NY	2014	Over the top	No injury with 2.75, 5.5 and 11 lb ai per acre applied twice.
30976	Woodland Sage (Salvia sylvestris) 'Sensation Deep Rose'	Field Container	Klett	CO	2014	Over the top	No injury or significant growth reduction with 100, 200 and 400 lb per acre applied twice.
29066	Stonecrop (Sedum sp.)	Field Container	Reding	OH	2012	Over the top	No injury and no significant difference in growth or marketability at 100, 200 and 400 lb per acre applied twice.
29066	Stonecrop (Sedum sp.) 'Autumn Joy'	Field Container	Boydston	WA	2012	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice; all treated plants saleable.
29066	Stonecrop (Sedum sp.) S. album 'Coral Carpet'	Field Container	Boydston	WA	2012	Over the top	No injury or growth reduction with 2.75 and 5.5 lb ai per acre applied twice; all plants saleable.
29066	Stonecrop (Sedum sp.) S. spurium 'Red Carpet'	Field Container	Klett	CO	2012	Over the top	No injury with 2.75, 5.5 and 11 lb ai per acre applied twice, slight growth reduction.
29070	Yew (Taxus sp.) T. media 'Margarita'	Field Container	Trader	MS	2009	Over the top	No injury or significant growth reduction at 2.75, 5.5 and 11 lb ai per acre.
29075	Arrowwood (Viburnum sp.) V. dentatum	Field Container	Neal	NC	2010	Over the top	No significant injury observed at 1, 2, or 6 WAT or 1 WAT2.
29075	Arrowwood (Viburnum sp.) V. dentatum	Field Container	Uber	CA	2011	Over the top	No crop injury or reduction in growth with 2.75, 5.5, and 11.0 lb ai per acre.
29075	Arrowwood (Viburnum sp.) V. rhytidophyllum 'Alleghany'	Field Container	Beste/Frank (ARS)	MD	2011	Over the top	No injury, growth or marketability reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.
29076	Periwinkle (Vinca sp.) 'Bowles'	Field Container	Aulakh	CT	2015	Over the top	No injury with 2.75, 5.5 and 11 lb ai per acre applied twice; moderate growth reduction with 2X and 4X.
29076	Periwinkle (Vinca sp.) V. minor 'Bowles'	Field Container	Koivunen	CA	2016	Over the top	No injury or growth reduction with 2.75, 5.5 and 11 lb ai per acre applied twice.

## Label Suggestions

For Biathlon, it is suggested the following crops not currently on the label be added for over-the-top applications.

*Betula nigra*  
*Camelia japonica*  
*Chasmantium latifolium*  
*Dasiphora fruticosa*  
*Dryopteris erythrosora*  
*Lantana camara*  
*Quercus rubra*  
*Rosmarinus officinalis*  
*Rudbeckia spp.*  
*Salvia nemorosa*  
*Sedum spp.*

Several new varieties might be added to the label, as other varieties within the same species are already registered.

*Buddleia davidii* 'Nanho White', as 'Nanho Blue' and 'Nanho Purple' are labeled.  
*Cornus sanguinea* (= *stolonifera*) 'Artic Sun', as 'Artic Fire' is labeled.  
*Gardenia jasminoides* 'Frostproof' as 'Daisy', *G. japonica* and *G. veitchii* are labeled.  
*Hibiscus syriacus* 'Minerva' as *Hibiscus syriacus* 'Sanchoyo' is already labeled.  
*Rhododendron sp.* azalea 'Fashion', 'Karen' and 'Red Bird' as *Rhododendron indicum* azalea 'Coral Bells' is already labeled.  
*Rhododendron* 'Delaware Valley', 'Nova Zembla' and 'Virginia Richards' as  
*Rhododendron yakushimanum* hybrid is already labeled.  
*Rosa* 'Knock Out' and 'Red Knock out', as 'Rainbow & Double Knock out' are labeled.



## Appendix 1: Contributing Researchers

Dr. Jatinder S Aulakh	Connecticut Agricultural Experiment Station Valley Laboratory 143 Cook Hill Road, P.O. Box 228 Windsor, CT
Dr. Ed Beste	University of Maryland LESREC – Salisbury Facility 27664 Nanticoke Road Salisbury, MD 21801
Dr. Rick Boydston ( <i>retired</i> )	USDA-ARS IAREC 24106 N Bunn Road Prosser, WA 99350
Dr. Rakesh S. Chandran	West Virginia University 1076 Agricultural Science Building P. O. Box 6108 Morgantown, WV 26506-6108
Dr. Diana Cochran	Iowa State University Department of Horticulture 125 Horticulture Hall Ames, IA 50011
Dr. Mark Czarnota	University of Georgia Dept. of Horticulture 1109 Experiment St. Griffin, GA 30223
Dr. Joe DeFrancesco	Western Region IPM Integrated Plant Protection Center Oregon State University 2057 Cordley Hall Corvallis OR 97331-2915
Dr. Geoffrey Denny	Mississippi State University Plant & Soil Science Department 246 Dorman Hall Mississippi State, MS 39762
Dr. Jeffrey Derr	Hampton Roads Ag. Exp. Station 1444 Diamond Springs Road, Virginia Beach, VA 23455

Mr. Ben Fraelich	USDA-ARS CPES P.O. Box 748 Tifton, GA 31793
Dr. Ray Frank	6916 Boyers Mill Road New Market, MD 21774
Dr. Charles Gilliam	Auburn University Department of Horticulture 101 Funchess Hall Auburn, AL 36849
Dr. Brad Hanson	University of California, Davis Department of Plant Sciences One Shield Avenue Davis, CA 95616
Dr. Jim Klett	Colorado State University Department of Horticulture and Landscape Architecture Fort Collins, CO 80523
Dr. Marja Koivunen	California State University, Chico College of Agriculture 400 West First Street Chico CA 95929
Dr. Heiner Lieth	University of California, Davis Department of Plant Sciences One Shield Avenue Davis, CA 95616
Dr. Chris Marble	University of Florida Mid-Florida Research and Education Center 2725 S. Binion Rd. Apopka, FL 32703
Dr. Hannah Mathers ( <i>changed affiliation</i> )	The Ohio State University Dept. Hort. and Crop Science 2001 Fyffe Ct. Columbus, OH 43210

Dr. Joe Neal North Carolina State University  
Department of Horticultural Science  
262 Kilgore Hall  
Box 7609, NCSU  
Raleigh, NC 27695-7609

Dr. Brent Pemberton Texas A & M University, Agr. Research and Education Center  
P. O. Box E  
Overton, TX 75684

Dr. Michael Reding USDA-ARS  
Application Technology Research Rm 2269  
1680 Madison Ave.  
Wooster, OH, 22691

Dr. Andy Senesac Long Island Horticultural Research Laboratory  
39 Sound Avenue  
Riverhead, NY 11901

Dr. Brian Trader Mississippi State University  
(*changed affiliation*) 158 Dorman Hall, Box 9555  
Mississippi State, MS 39762

Mr. Buzz Uber Crop Inspection Service  
31130 Hilltop Drive  
Valley Center, CA 92082

Dr. Cheryl Wilen University of California, San Diego  
4444 Overland Ave., Bldg. 2  
San Diego, CA 92123

Dr. Anthony Witcher Tennessee State University  
Otis L. Floyd Nursery Research Center  
472 Cadillac Lane  
McMinnville, TN 37110