Environment Horticulture Program Research Summaries

IR-4 Environmental Horticulture Program
Azoxystrobin + Difenoconazole Crop Safety

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Acknowledgements
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Abstract

Alibi Flora (azoxystrobin + difenoconazole) was registered on January 12, 2015 for use on ornamental horticulture crops and landscape ornamental horticulture plants in the United States to manage foliar, stem and crown diseases. From 2014 to 2016, the IR-4 Project conducted 41 trials on 15 ornamental plant species / genera examining phytotoxicity related to Alibi Flora applications. The data contained in this report were generated to register uses of azoxystrobin + difenoconazole for use on environmental horticulture plants. The rates tested were 8 (1X), 14 (2X) and 28 (4X) fl oz per 100 gal.

Alibi Flora was applied to fifteen (15) plant species or genera. Eight exhibited no or minimal transient injury in at least 3 trials, and two of these (*Buddleia davidii* and *Dianthus* spp.) are already in the Alibi Flora label. Seven species or genera exhibited no injury in one or two trials; six of them are already in the label. Six additional species can be considered for labelling: *Aquilegia* spp., *Calibrachoa* spp., *Lamium* spp., *Lavandula* spp., *Monarda didyma* and *Osteospermum* sp. be added to the Alibi Flora label.

Introduction

Alibi Flora (azoxystrobin + difenoconazole) was registered on January 12, 2015 for use on environmental horticulture crops and landscape environmental horticulture plants in the United States to manage foliar, stem and crown diseases. From 2014 to 2016, the IR-4 Project conducted 41 trials on 15 ornamental plant species / genera examining phytotoxicity related to Alibi Flora applications.

Materials and Methods

Azoxystrobin + difenoconazole was tested as foliar treatment typically three times at approximately 14 days intervals. The foliar application rates were typically 8, 14 and 28 fl oz per 100 gal, plus a water treated control. A minimum of three plants (replicate treatments) were required with most researchers exceeding this minimum. Phytotoxicity was recorded on a scale of 0 to 10 (0 = no phytotoxicity; 10 = complete kill) one to four times from 1 to 6 weeks after initial application. For IR-4 testing, the following protocols were used: 14-008 and 15-008. For more detailed materials and methods, including application rates for various products, please visit https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-researcher-resources/#Protocols to view and download these protocols.

Azoxystrobin + difenoconazole was supplied to researchers (See list of researchers in Appendix 1) by Syngenta.

Results and Summary

Phytotoxicity

Based on the type and nature of injury seen with pesticide applications, 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 azoxystrobin + difenoconazole, and 4) more data are needed to make informed recommendations.

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

Table 1. List of Azoxystrobin + Difenoconazole treated crops with no or minimal transitory injury.

Aquilegia spp.
Buddleia davidii [1]
Calibrachoa spp.
Dianthus spp. [1]
Lamium spp.
Lavandula spp.
Monarda didyma
Osteospermum sp.

[1] Already registered for Alibi Flora.

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

None

Table 3. List of Azoxystrobin + Difenoconazole treated crops with significant injury at 1X.

None

Table 4. List of Azoxystrobin + Difenoconazole treated crops where more information is needed.

Aster sp. [1]
Catharanthus roseus [1]
Chamaerops humilis [2]
Ceanothus americanus [1]
Hydrangea spp. [1]
Phlox paniculata [1]
Zinnia sp. [1]

[1] Already registered for Alibi Flora. The one or two trials presented here indicate no phytotoxicity or slight, transient injury.
[2] The one trial presented here indicate no phytotoxicity.

Table 5 Detailed Summary of Crop Safety Testing with Azoxystrobin + Difenoconazole

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 6/1/2017 are listed below.

PR#	Crop	Production Site	Researcher	Trial	Trial	Application Type	Results
31739	Columbine (Aquilegia sp.)	Field Container	Grunwald	OR	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal; all plants saleable.
31739	Columbine (Aquilegia sp.) A. canadensis 'Little Lanterns'	Field Container	Catlin	NY	2014	Foliar	No injury or significant growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times; very slight spray residue after 3rd application.
31739	Columbine (Aquilegia sp.) A. chrysantha 'Yellow Queen'	Field Container	DeFrancesco	OR	2015	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times biweekly.
31740	Aster (Aster sp.) 'Believe Purple'	Field Container	Freiberger	NJ	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31740	Aster (Aster sp.) 'Wood Pink'	Field Container	Gu	TX	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31741	Butterfly Bush (Buddleia davidii)	Field Container	Grunwald	OR	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal; all plants saleable.
31741	Butterfly Bush (Buddleia davidii)	Field Container	Harvey	WA	2014	Foliar	No injury with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31741	Butterfly Bush (Buddleia davidii) 'Royal Red'	Field Container	Fraelich	GA	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31705	Calibrachoa (Calibrachoa sp.)	Greenhouse	Koivunen	CA	2015	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31705	Calibrachoa (Calibrachoa sp.)	Greenhouse	Williams	IL	2013	Drench	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal applied 3 times at monthly intervals; moderate growth reduction.
31705	Calibrachoa (Calibrachoa sp.)	Greenhouse	Williams	IL	2013	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal applied 3 times at monthly intervals.
31705	Calibrachoa (Calibrachoa sp.) ‘Superbells® Strawberry Punch’ and‘Superbells® Che	Greenhouse	Wick	MA	2015	Foliar	No injury to 3 cultivars with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31705	Calibrachoa (Calibrachoa sp.) 'Cabaret Purple'	Greenhouse	Williams-Woodward	GA	2013	Foliar	No significant injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31705	Calibrachoa (Calibrachoa sp.) 'Kabloom White'	Greenhouse	Freiberger	NJ	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
32216	Periwinkle, Madagascar (Catharanthus roseus) 'Pacifica XP Burgundy Halo'	Greenhouse	Hand	OH	2016	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.

PR#	Crop	Production Site	Researcher	Trial	Trial	Application Type	Results
31742	Ceanothus (Ceanothus sp.) C. americanus	Field Container	Brazee	MA	2015	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
33067	Palm, Mediterranean Fan (Chamaerops humilis)	Field Container	Palmateer (UF)	FL	2016	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31743	Pink (Dianthus sp.)	Field Container	Grunwald	OR	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal; all plants saleable.
31743	Pink (Dianthus sp.) D. chinensis 'First Love'	Field Container	DeFrancesco	OR	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31743	Pink (Dianthus sp.) D. gratianopolitanus‘Firewitch’	Field Container	Hausbeck	MI	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times; visible spray residue on treated plants.
31743	Pink (Dianthus sp.) 'Neon Star'	Field Container	Hand	OH	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31748	Coral Bells (Heuchera sanguinea) H. micrantha 'Palace Purple'	Field Container	Baysal-Gurel	TN	2016	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31744	Hydrangea (Hydrangea sp.)	Field Container	Harvey	WA	2014	Foliar	No injury with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31744	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Henn	MS	2014	Foliar	No injury or significant growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31745	Dead Nettle (Lamium sp.)	Field Container	Grunwald	OR	2015	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31745	Dead Nettle (Lamium sp.) L. maculatum 'Golden Anniversary'	Field Container	Catlin	NY	2015	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times biweekly.
31745	Dead Nettle (Lamium sp.) L. maculatum 'Lemon Frost'	Field Container	Klett	CO	2016	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times (6/23, 8/5, 8/18).
31750	Lavender (Lavandula sp.)	Field Container	Grunwald	OR	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal; all plants saleable.
31750	Lavender (Lavandula sp.)	Field Container	Harvey	WA	2014	Foliar	No injury with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31750	Lavender (Lavandula sp.) L. angustifolia 'Munstead'	Field Container	Hand	OH	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31750	Lavender (Lavandula sp.) L. angustifolia 'Munstead'	Field Container	Hausbeck	MI	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31750	Lavender (Lavandula sp.) L. x intermedia 'Grosso'	Field Container	DeFrancesco	OR	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31746	Bee Balm, Scarlet (Monarda didyma)	Field Container	Grunwald	OR	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal; all plants saleable.
31746	Bee Balm, Scarlet (Monarda didyma) 'Marshal's Delight'	Field Container	DeFrancesco	OR	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.

PR#	Crop	Production Site	Researcher	Trial	Trial	Application Type	Results
31746	Bee Balm, Scarlet (Monarda didyma) 'Pink Supreme'	Field Container	Gu	TX	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31886	Daisybush (Osteospermum sp.)	Greenhouse	Grunwald	OR	2015	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31886	Daisybush (Osteospermum sp.)	Greenhouse	Williams	IL	2013	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal applied 3 times at monthly intervals.
31886	Daisybush (Osteospermum sp.) ‘Zion Orange’, ‘Ostica Pink’, and ‘Flower Power Ye	Greenhouse	Wick	MA	2015	Foliar	No injury to 3 cultivars with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31886	Daisybush (Osteospermum sp.) 'White With Purple Eye'	Greenhouse	Freiberger	NJ	2014	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times; earlier blooming at all rates.
31747	Phlox, Fall (Phlox paniculata)	Field Container	Harvey	WA	2014	Foliar	No injury with 8, 14 and 28 fl oz per 100 gal applied 3 times.
31747	Phlox, Fall (Phlox paniculata) 'David'	Field Container	Catlin	NY	2015	Foliar	Minor injury with 8, moderate with 14 and severe with 28 fl oz per 100 gal, applied 3 times biweekly. No growth reduction.
32218	Zinnia (Zinnia sp.) 'Zahara Double Cherry'	Greenhouse	Freiberger	NJ	2015	Foliar	No injury or growth reduction with 8, 14 and 28 fl oz per 100 gal applied 3 times.

Label Suggestions

In this report, 8 species / genera exhibited no or minimal injury after foliar sprays of Alibi Flora; two of these are already in the label. We recommend that the following 6 species / genera be added to the current label.

Aquilegia spp.
Calibrachoa spp.
Lamium spp.
Lavandula spp.
Monarda didyma
Osteospermum sp.

Appendix 1: Contributing Researchers

Dr. Nicholas Brazee	University of Massachusetts Plant Diagnostic Laboratory 101 University Drive, Suite A7 Amherst MA 01002
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