



[Environment Horticulture Program Research Summaries](#)

IR-4 Environmental Horticulture Program Cyflufenamid Crop Safety

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**Acknowledgements
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Abstract

Cyflufenamid is an active ingredient for managing foliar diseases including powdery mildew and botrytis. It is not yet registered by EPA for the ornamental horticulture industry. From 2012 to 2018, the IR-4 Project completed 55 trials on 16 ornamental plant genera or species. In these trials, 9 species or genera exhibited minimal or no injury after foliar applications. For the remaining 7 crops, sufficient information has not yet been generated. However, to date all tested crops are not sensitive to foliar applications up to 4X the proposed high label rate.

Introduction

Cyflufenamid is an active ingredient for managing foliar diseases including powdery mildew and botrytis. It is not yet registered by EPA for the ornamental horticulture industry. From 2012 to 2018, the IR-4 Project completed 55 trials on 16 ornamental plant genera or species.

Materials and Methods

Foliar applications of cyflufenamid at 1.7, 3.4, and 6.8 oz per 100 gal were applied 3 times at 14 day intervals. All experiments had an untreated control. A minimum of 10 plants (replicate treatments) were required. Phytotoxicity was planned to be recorded on a scale of 0 to 10 (0 = no phytotoxicity; 10 = complete kill). Phytotoxicity was rated 7 days after each application. For testing, the following protocol were used: 12-010, 13-010 and 14-003. Please visit <https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-researcher-resources/#Protocols> to view and download these protocols.

Cyflufenamid was supplied to 8 researchers (See list of researchers in Appendix 1) by Cleary Chemical and Nisso America.

Results and Summary

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

Phytotoxicity

Across all plant species tested, cyflufenamid exhibited no or minimal negative impact (Table 1) on 9 plant genera or species fell into this category. No crops exhibited significant injury (Table 3). There are 7 species or genera where less than 3 trials were conducted so there is not enough information available at this time (Table 4).

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

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

Antirrhinum majus
Calibrachoa sp.
Hydrangea sp.
Osteospermum sp.
Pelargonium sp.
Petunia sp.
Pseudotsuga menziesii
Rosa sp.
Zinnia sp.

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

None

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

None

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

Chamaerops humilis
Chrysanthemum/Dendranthemum sp.
Narcissus sp.
Rhododendron sp. (Azalea)
Rhododendron sp. (Rhododendron)
Tulipa sp.
Viola sp.

Table 5 Detailed Summary of Crop Safety Testing with Cyflufenamid

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 8/1/2019 are listed below.

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results
30675	Snapdragon (<i>Antirrhinum majus</i>) A. majus 'Rocket'	Greenhouse	Grunwald	OR	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants saleable.
30675	Snapdragon (<i>Antirrhinum majus</i>) 'Montego Mix'	Greenhouse	Grunwald	OR	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants marketable.
30675	Snapdragon (<i>Antirrhinum majus</i>) 'Montego Rose'	Greenhouse	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30675	Snapdragon (<i>Antirrhinum majus</i>) 'Purple'	Greenhouse	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30675	Snapdragon (<i>Antirrhinum majus</i>) 'Rocket Mix'	Greenhouse	Gu (TX A&M)	TX	2013	Foliar	No leaf injury, very minor flower tip burn, and no growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30679	Calibrachoa (<i>Calibrachoa</i> sp.) 'Cabaret Purple'	Greenhouse	Williams-Woodward	GA	2013	Foliar	No significant injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30679	Calibrachoa (<i>Calibrachoa</i> sp.) 'Mini-famous Orange'	Greenhouse	Grunwald	OR	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants marketable.
30679	Calibrachoa (<i>Calibrachoa</i> sp.) 'Minifamous Red'	Greenhouse	Grunwald	OR	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants saleable.
31626	Chrysanthemum, Garden (<i>Chrysanthemum/Dendranthema</i> sp.)	Field Container	Harvey	WA	2013	Foliar	No injury with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30683	Hydrangea (<i>Hydrangea</i> sp.) H. arborescens 'Annabelle'	Greenhouse	Grunwald	OR	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants marketable.
30683	Hydrangea (<i>Hydrangea</i> sp.) H. macrophylla 'Endless Summer'	Greenhouse	DeFrancesco	OR	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30683	Hydrangea (<i>Hydrangea</i> sp.) H. paniculata 'Little Lamb'	Greenhouse	Brazeo	MA	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30684	Daffodil (<i>Narcissus</i> sp.) 'Tete-a-Tete'	Greenhouse	Freiberger	NJ	2013	Foliar	Slight injury after the final application with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; slight growth reduction
30685	African Daisy (<i>Osteospermum</i> sp.) 'Copper Purple'	Greenhouse	Grunwald	OR	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants saleable.
30685	African Daisy (<i>Osteospermum</i> sp.) 'Margarita White'	Greenhouse	Freiberger	NJ	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30685	African Daisy (<i>Osteospermum</i> sp.) O. ecklonis 'Summertime Blueberry'	Greenhouse	DeFrancesco	OR	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
31629	Geranium (<i>Pelargonium</i> sp.)	Field Container	Harvey	WA	2013	Foliar	No injury with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30686	Geranium (<i>Pelargonium</i> sp.) 'Pink Elite'	Greenhouse	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30686	Geranium (<i>Pelargonium</i> sp.) 'Pink Elite'	Greenhouse	Freiberger	NJ	2014	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results
30686	Geranium (Pelargonium sp.) 'Scarlet'	Greenhouse	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
31630	Petunia (Petunia sp.)	Field Container	Harvey	WA	2013	Foliar	No injury with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30692	Petunia (Petunia sp.) 'Dream Neon Rose'	Greenhouse	Freiberger	NJ	2014	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30692	Petunia (Petunia sp.) 'Dream Rose'	Greenhouse	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30692	Petunia (Petunia sp.) 'Purple'	Greenhouse	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30693	Fir, Douglas (Pseudotsuga menziesii)	Greenhouse	DeFrancesco	OR	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30693	Fir, Douglas (Pseudotsuga menziesii)	Greenhouse	Grunwald	OR	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants saleable.
30693	Fir, Douglas (Pseudotsuga menziesii)	Greenhouse	Grunwald	OR	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants marketable.
30694	Azalea (Rhododendron sp.)	Greenhouse	DeFrancesco	OR	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30695	Rhododendron (Rhododendron sp.)	Greenhouse	DeFrancesco	OR	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
31631	Rose (Rosa sp.)	Field Container	Harvey	WA	2013	Foliar	No injury with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30696	Rose (Rosa sp.) R. nutkana	Greenhouse	Grunwald	OR	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants saleable.
30696	Rose (Rosa sp.) R. rugosa	Greenhouse	Brazee	MA	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30696	Rose (Rosa sp.) 'Radrazz'	Greenhouse	DeFrancesco	OR	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30697	Tulip (Tulipa sp.) 'Oxford'	Greenhouse	Freiberger	NJ	2013	Foliar	Virtually no injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30698	Pansy (Viola sp.) 'Golden Yellow'	Greenhouse	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30698	Pansy (Viola sp.) 'Lavender Blue'	Greenhouse	Freiberger	NJ	2012	Foliar	Virtually no injury with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; very minor stunting.
30699	Zinnia (Zinnia sp.) 'Elegans Envy'	Greenhouse	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30699	Zinnia (Zinnia sp.) 'Thumbelina'	Greenhouse	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times.
30699	Zinnia (Zinnia sp.) Z. elegans 'Zinnita Mix'	Greenhouse	Grunwald	OR	2013	Foliar	No injury or growth reduction with 1.7, 3.4 and 6.8 fl oz per 100 gal applied 3 times; all plants marketable.

Label Suggestions

In this report, 9 species exhibited minimal or no injury after foliar sprays of cyflufenamid.

Antirrhinum majus

Calibrachoa sp.

Hydrangea sp.

Osteospermum sp.

Pelargonium sp.

Petunia sp.

Pseudotsuga menziesii

Rosa sp.

Zinnia sp.

More research is needed to understand crop safety among a wider range of crops.

Appendix 1: Contributing Researchers

Dr. Nick Brazee	University of Massachusetts Plant Diagnostic Lab 101 University Drive, Suite A7 Amherst, MA 01002
Mr. Joe DeFrancesco <i>(retired)</i>	Oregon State University 2040 Cordley Hall Corvallis, OR 97331
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Mr. Paul Harvey	USDA-ARS 4230 Konnawac Pass Road Wapato, WA, 98941
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