IR-4 Ornamental Horticulture Program
Mandestrobin Crop Safety

Authors: Ely Vea and Cristi L. Palmer
Date: June 14, 2016

Acknowledgements
Susan Bierbrunner

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 .................................................................................................................... 8
Appendix 1: Contributing Researchers .................................................................................... 9
Table of Tables

Table 1. List of Mandestrobin treated crops with no or minimal transitory injury..................6
Table 2. List of Mandestrobin treated crops with no injury at 1X but significant injury
at 2X or 4X...........................................................................................................6
Table 3. List of Mandestrobin treated crops with significant injury at 1X.........................6
Table 4. List of Mandestrobin treated crops where more information is needed................6
Table 5 Detailed Summary of Crop Safety Testing with Mandestrobin............................7
Abstract

Mandestrobin is a new systemic and translaminar fungicide being developed by Syngenta for the control of Botrytis and other foliar diseases of ornamental horticulture crops. The IR-4 Project completed 18 crop safety trials on 17 ornamental horticulture plant species or genera during 2015 to 2017. In these trials, all 17 species or genera exhibited minimal or no injury in the limited number of trials (one or two) for each crop; Syngenta can consider adding these to the label.
Introduction
Mandestrobin is a new systemic and translaminar fungicide being developed by Valent for the control of Botrytis and other foliar diseases of ornamental horticulture crops. The IR-4 Project completed 18 crop safety trials on 17 ornamental horticulture plant species or genera during 2015 to 2017.

Materials and Methods
Mandestrobin was applied as foliar treatment typically 3 times at approximately 14 days intervals. The application rates were 7.5, 15 and 30 fl oz per 100 gal, plus a water treated control. A minimum of ten 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 weekly up to 6 weeks after initial application. For IR-4 testing, the following protocols were used: 15-003 and 16-004 and 17-004. For more detailed materials and methods, including application rates for various products, please visit http://ir4.rutgers.edu/ornamental/OrnamentalDrafts.cfm to view and download these protocols.

Mandestrobin was supplied to researchers (See list of researchers in Appendix 1) by Valent.

Results and Summary
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 at the 1X rate sufficient to recommend growers not utilize Mandestrobin, and 4) more data is needed to make informed recommendations.

Phytotoxicity
Across all crops tested, Mandestrobin exhibited no or minimal negative impact on all plant species or genera. However none of these crops had the minimum number of 3 tests for definitive conclusion of crop safety. There are 17 species or genera where less than 3 trials were conducted so there is not enough information available at this time (Table 4). All trials for each of these crops showed no or minimal, transitory phytotoxicity.

Please see Table 5 for a summary of the individual trial results.
Table 1. List of Mandestrobin treated crops with no or minimal transitory injury.

None

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

None

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

None

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

Alyssum montanum. 
Alyssum sp. 
Antirrhinum majus
Begonia semperflorens
Begonia sp.
Calibrachoa sp.
Chamaerops humilis
Chrysanthemum/Dendranthema x morifolium
Coreopsis sp.

Dianthus sp.
Euphorbia pulcherrima
Impatiens hawkeri
Lupinus sp.
Pelargonium x hortorum
Petunia hybrida
Salvia sp.
Viola x wittrockiana

¹ No injury in 1 trial
² No injury in 2 trials
Table 5  Detailed Summary of Crop Safety Testing with Mandestrobin.

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 5/31/2018 are listed below.

<table>
<thead>
<tr>
<th>PR#</th>
<th>Crop Description</th>
<th>Production Site</th>
<th>Researcher</th>
<th>State</th>
<th>Year</th>
<th>Application Type</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>33061</td>
<td>Madwort (Alyssum sp.) A. montanum</td>
<td>Shadehouse/Lathehouse</td>
<td>Klett</td>
<td>CO</td>
<td>2017</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32422</td>
<td>Madwort (Alyssum sp.) 'Clear Crystal Lavender'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32392</td>
<td>Garden Snapdragon (Antirrhinum majus) 'Rocket Mix'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32389</td>
<td>Begonia (Begonia sp.) B. semperflorens 'Bada Bing'</td>
<td>Greenhouse</td>
<td>Hausbeck</td>
<td>MI</td>
<td>2016</td>
<td>Foliar</td>
<td>No leaf injury, slight to moderate flower bleaching, with 7.5, 15 and 30 fl oz per 100 gal applied 3 times; no growth reduction.</td>
</tr>
<tr>
<td>33059</td>
<td>Begonia (Begonia sp.) 'Summerwings Rose'</td>
<td>Shadehouse/Lathehouse</td>
<td>Klett</td>
<td>CO</td>
<td>2017</td>
<td>Foliar</td>
<td>No injury or significant growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>33060</td>
<td>Calibrachoa (Calibrachoa sp.) Minifamous Double Amethyst</td>
<td>Shadehouse/Lathehouse</td>
<td>Klett</td>
<td>CO</td>
<td>2017</td>
<td>Foliar</td>
<td>No injury or significant growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>33073</td>
<td>Palm, Mediterranean Fan (Chamaerops humilis)</td>
<td>Field Container</td>
<td>Palmateer</td>
<td>FL</td>
<td>2016</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32396</td>
<td>Hardy Mum (Chrysanthemum/Dendranthema x morifolium) 'Snow Lady'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32419</td>
<td>Tickseed (Coreopsis sp.) 'Early Sunrise Yellow'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32423</td>
<td>Pink (Dianthus sp.) 'Bouquet Rose Magic'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>33062</td>
<td>Pink (Dianthus sp.) Dianthus SCENT FIRST POT Coral Reef</td>
<td>Shadehouse/Lathehouse</td>
<td>Klett</td>
<td>CO</td>
<td>2017</td>
<td>Foliar</td>
<td>No injury with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32385</td>
<td>Poinsettia (Euphorbia pulcherrima) 'Jubilee Red'</td>
<td>Greenhouse</td>
<td>Freiberger</td>
<td>NJ</td>
<td>2016</td>
<td>Foliar</td>
<td>No injury, growth reduction or delayed blooming with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32386</td>
<td>Impatiens, New Guinea (Impatiens hawkeri) 'Harmony Deep Red'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No significant injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32424</td>
<td>Lupine (Lupinus sp.) 'Gallery Mix'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32390</td>
<td>Geranium, Zonal (Pelargonium x hortorum) 'Maverick Violet'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32391</td>
<td>Petunia (Petunia sp.) Petunia x hybrida 'Dreams Midnight'</td>
<td>Greenhouse</td>
<td>Uber</td>
<td>CA</td>
<td>2017</td>
<td>Foliar</td>
<td>No injury with 7.5 fl oz, minor injury with 15 and 30 fl oz per acre applied 3 times biweekly; no growth reduction.</td>
</tr>
<tr>
<td>32421</td>
<td>Sage (Salvia sp.) 'New Dimension Blue'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
<tr>
<td>32420</td>
<td>Wittrock's Violet; Pansy (Viola x wittrockiana) 'Delta Orange Blotch'</td>
<td>Greenhouse</td>
<td>Bodine</td>
<td>NJ</td>
<td>2015</td>
<td>Foliar</td>
<td>No injury or growth reduction with 7.5, 15 and 30 fl oz per 100 gal applied 3 times.</td>
</tr>
</tbody>
</table>
**Label Suggestions**

In this report, all plants exhibited no or minimal injury after foliar treatments of Mandestrobin at 7.5, 15 and 30 fl oz per 100 gal, suggesting that this active ingredient is safe to ornamental horticulture crops. Given the lack of phytotoxicity across so many different plant species and genera, it is suggested that all the 17 plants in Table 4 (listed below) that showed no injury be placed on the Mandestrobin label if Syngenta has similar results on these crops. Or a general statement can be placed on the label such as ‘has not been demonstrated to cause damage on various ornamental plant species according to labeled use instructions. Mandestrobin may be used on a wide number of crops, but must be tested on a limited portion of the crop prior to applying to the whole crop if the grower has no previous experience applying Mandestrobin to that crop’.

*Alyssum montanum*
*Alyssum* sp.
*Antirrhinum majus*
*Begonia semperflorens*
*Begonia* sp.
*Calibrachoa* sp.
*Chamaerops humilis*
*Chrysanthemum/Dendranthema x morifolium*
*Coreopsis* sp.
*Dianthus* sp.
*Euphorbia pulcherrima*
*Impatiens hawkeri*
*Lupinus* sp.
*Pelargonium x hortorum*
*Petunia hybrida*
*Salvia* sp.
*Viola x wittrockiana*
Appendix 1: Contributing Researchers

Mr. Dave Bodine  
Rutgers University  
Cream Ridge Experiment Station  
283 Rt. 539  
Cream Ridge, NJ 08514

Mr. Tom Freiberger  
Rutgers University  
Cream Ridge Experiment Station  
283 Rt. 539  
Cream Ridge, NJ 08514

Dr. Mary Hausbeck  
Michigan State University

Mr. Blair Harlan  
Dept. of Plant Pathology  
140 Plant Pathology Building  
East Lansing, MI 48824  
517-355-4534

Dr. Jim Klett  
Colorado State University  
Department of Horticulture and Landscape Architecture  
Fort Collins, CO 80423

Dr. Aaron Palmateer  
University of Florida  
Tropical Research & Education Center  
18905 SW 280 Street  
Homestead, FL 33031

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