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**IR-4 Ornamental Horticulture Program
BAS 440i (Afidopyropen) Crop Safety**

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Date: January 13, 2017**

**Acknowledgements
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Abstract

BAS 440i (afidopyropen) is a new insecticide being developed by BASF for the control of piercing and sucking insect pests such as aphids, whiteflies, psyllids, scales and leafhoppers. The IR-4 Project completed 50 crop safety trials on 35 ornamental horticulture plant species or genera during 2015 and 2016. In these trials, two genera (*Hedera* sp. and *Zinnia* sp.) exhibited minimal or no injury after foliar applications in a minimum of 3 trials for each crop; these can be added to a list of tolerant plants in the new label for this active ingredient. All trials for thirty-three other species or genera exhibited minimal or no injury in the limited number of trials (one or two) for each crop; BASF can consider adding these to the label.

Introduction

BAS 440i (afidopyropen) is a new insecticide being developed by BASF for the control of piercing and sucking insect pests such as aphids, whiteflies, psyllids, scales and leafhoppers. The IR-4 Project completed 50 crop safety trials on 35 ornamental horticulture plant species or genera during 2015 and 2016.

Materials and Methods

BAS 440i was applied as foliar treatment mixed with NIS typically thrice (3 times) at approximately 14 days intervals. The application rates were at 7, 14 and 28 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: 15-008 and 16-008. 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.

BAS 440i was supplied to researchers (See list of researchers in Appendix 1) by BASF.

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 at the 1X rate sufficient to recommend growers not utilize afidopyropen, and 4) more data are needed to make informed recommendations.

Phytotoxicity

Across all crops tested, BAS 440i exhibited no or minimal negative impact on all plant species or genera. Two of these crops (*Hedera* sp. and *Zinnia* sp.) had the minimum number of 3 tests for definitive conclusion of crop safety (Table 1). No crop displayed significant injury with BAS 440i (Tables 2 and 3). There are 33 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 BAS 440i treated crops with no or minimal transitory injury.

Hedera sp.

Zinnia sp.

Table 2. List of BAS 440i treated crops with no injury at 1X but significant injury at 2X or 4X.

None

Table 3. List of BAS 440i treated crops with significant injury at 1X.

None

Table 4. List of BAS 440i treated crops where more information is needed.

*Angelonia angustifolia*²

*Astilbe simplicifolia*¹

*Begonia sp.*²

*Chrysanthemum/Dendranthema sp*¹

*Coleus sp.*¹

*Coreopsis grandiflora*¹

*Coreopsis verticillata*¹

*Cotoneaster sp.*²

*Dahlia sp.*¹

*Delphinium sp.*¹

*Dianthus sp.*²

*Digitalis purpurea*¹

*Echinacea sp.*¹

*Euonymus sp.*²

*Euphorbia pulcherrima*¹

*Gerbera sp.*²

*Helichrysum sp.*¹

*Hibiscus sp.*²

*Hydrangea sp.*²

*Lagerstroemia indica*²

*Leucanthemum x superbum*¹

*Ligustrum sp.*¹

*Monarda didyma*¹

*Nerium oleander*²

*Papaver orientale*¹

*Platanus sp.*¹

*Rhododendron sp.*²

*Rosa sp.*¹

*Salix caprea*¹

*Sedum sp.*¹

*Taxus media*¹

*Veronica longifolia*¹

*Viburnum sp.*¹

¹ No injury in 1 trial

² No injury in 2 trials

Table 5. Detailed Summary of Crop Safety Testing with BAS 440i (afidopyropen)

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 1/3/2017 are listed below.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
32409	Angelonia (Angelonia angustifolia) 'Anbluim Angelface'	Field Container	Davis	MI	2016	Foliar	No injury with 7, 14 and 28 fl oz per 100 gal applied 3 times.
32409	Angelonia (Angelonia angustifolia) 'Serena Purple'	Field Container	Freiberger	NJ	2015	Foliar	No injury or growth reduction with 1.5, 3.5 and 14 fl oz per 100 gal applied 4 times.
32311	False Spirea (Astilbe sp.) A. simplicifolia 'Hennie Graafland'	Field Container	Davis	MI	2016	Foliar	No injury with 7, 14 and 28 fl oz per 100 gal applied 3 times.
32329	Begonia (Begonia sp.) 'Ambassador Pink'	Field Container	Freiberger	NJ	2015	Foliar	No injury or growth reduction with 1.5, 3.5 and 14 fl oz per 100 gal applied 4 times.
32329	Begonia (Begonia sp.) 'Super Olympia Mix'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32315	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) 'Regal Cheryl Purple'	Field Container	Freiberger	NJ	2015	Foliar	No injury or growth reduction with 1.5, 3.5 and 14 fl oz per 100 gal applied 4 times.
32327	Coleus, Flamenettle (Coleus sp.) 'Dark Chocolate'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32313	Tickseed, Golden (Coreopsis tinctoria) C. grandiflora 'Early Sunrise'	Field Container	Davis	MI	2016	Foliar	No injury with 7, 14 and 28 fl oz per 100 gal applied 3 times.
32313	Tickseed, Golden (Coreopsis tinctoria) C. verticillata 'Moonbeam'	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
32304	Cotoneaster (Cotoneaster sp.) C. adpressus 'Tom Thumb'	Field Container	Reding	OH	2016	Foliar	No injury with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; slight growth reduction; all plants marketable.
32304	Cotoneaster (Cotoneaster sp.) 'Coral Beauty'	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
32326	Dahlia (Dahlia sp.) 'Hypnotica Purple Bicolor'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32314	Larkspur (Delphinium sp.) 'Summer Morning'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32316	Pinks (Dianthus sp.) 'Amazon Rose Magic'	Field Container	Freiberger	NJ	2015	Foliar	No injury or growth reduction with 1.5, 3.5 and 14 fl oz per 100 gal applied 4 times.
32316	Pinks (Dianthus sp.) 'Super Trooper Velvet Red'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32317	Foxglove, Common (Digitalis purpurea) 'Camelot Rose'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32312	Purple Coneflower (Echinacea sp.) 'Pow Wow Wild Berry'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
32306	Euonymus (Euonymus sp.) E. fortunei 'Gold Splash'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32306	Euonymus (Euonymus sp.) 'Wintercreeper'	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
32331	Poinsettia (Euphorbia pulcherrima) 'Jubilee Red'	Greenhouse	Freiberger	NJ	2016	Foliar	No injury or growth or growth reduction with 7, 14 and 28 fl oz per 100 gal applied 3 times weekly.
32330	Transvaal Daisy (Gerbera sp.) 'Festival Grower Select Mix'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32330	Transvaal Daisy (Gerbera sp.) 'Royal Premium Mix'	Field Container	Freiberger	NJ	2015	Foliar	No injury or growth reduction with 1.5, 3.5 and 14 fl oz per 100 gal applied 3 times.
32303	Ivy (Hedera sp.)	Field Container	Davis	MI	2016	Foliar	No injury with 7, 14 and 28 fl oz per 100 gal applied 3 times.
32303	Ivy (Hedera sp.) English Ivy	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
32303	Ivy (Hedera sp.) H. helix	Field Container	Fraelich	GA	2016	Foliar	No injury or difference in plant growth and marketability with 7, 14 and 28 fl oz per 100 gal applied 3 times.
32318	Strawflower (Helichrysum sp.) 'Licorice'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32319	Rosemallow (Hibiscus sp.)	Field Container	Davis	MI	2016	Foliar	No injury with 7, 14 and 28 fl oz per 100 gal applied 3 times.
32319	Rosemallow (Hibiscus sp.) 'Brilliant Red'	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
32302	Hydrangea (Hydrangea sp.) 'Nikko Blue'	Field Container	Fraelich	GA	2016	Foliar	No injury with 7, 14 and 28 fl oz per 100 gal applied 3 times; moderate stunting at 4X; all plants marketable.
32302	Hydrangea (Hydrangea sp.) 'Nikko Blue'	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
32309	Crape Myrtle (Lagerstroemia indica)	Field Container	Koivunen	CA	2016	Foliar	No injury with 7, minor injury (brown interveinal spots) with complete recovery at 14 and 28, fl oz per 100 gal + Dyne-Amic applied 3 times biweekly; no growth reduction.
32309	Crape Myrtle (Lagerstroemia indica) 'Natchez'	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
33004	Leucanthemum x superbum (Leucanthemum x superbum) 'Snow Lady'	Field Container	Davis	MI	2016	Foliar	No injury with 7, 14 and 28 fl oz per 100 gal applied 3 times.
32307	Privet (Ligustrum sp.) Wax Privet	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
32323	Bee Balm (Monarda didyma) 'Balmy Purple'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32301	Oleander, Rosebay (Nerium oleander)	Field Container	Koivunen	CA	2016	Foliar	No injury with 7, minor injury on flower (browning at edges) with complete recovery at 14 and 28, fl oz per 100 gal + Dyne-Amic applied 3 times biweekly; no growth reduction.
32301	Oleander, Rosebay (Nerium oleander) 'Cardinal Red'	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
32322	Oriental Poppy (<i>Papaver orientale</i>) 'Pizzicato Mix'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32298	Plane Tree, Sycamore (<i>Platanus</i> sp.)	Field Container	Koivunen	CA	2016	Foliar	No significant injury with 7, minor to moderate injury (browning of youngest leaves) with complete recovery at 14 and 28, fl oz per 100 gal + Dyne-Amic applied 3 times biweekly; no growth reduction.
32293	Azalea (<i>Rhododendron</i> sp.)	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
32293	Azalea (<i>Rhododendron</i> sp.) 'Pink Gumpo'	Field Container	Fraelich	GA	2016	Foliar	No injury or difference in plant growth and marketability with 7, 14 and 28 fl oz per 100 gal applied 3 times.
32296	Rose (<i>Rosa</i> sp.) 'Oso Easy Fragrant Spreader'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32297	Willow (<i>Salix</i> sp.) <i>S. caprea</i> 'French Pussy'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32325	Stonecrop (<i>Sedum</i> sp.) 'Angelina'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32305	Yew (<i>Taxus</i> sp.) <i>T. media</i> 'Margarita'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32320	Speedwell, Brooklime (<i>Veronica</i> sp.) <i>V. longifolia</i> 'Candied Candle'	Field Container	Davis	MI	2016	Foliar	No injury with 7, 14 and 28 fl oz per 100 gal applied 3 times.
32300	Arrowwood (<i>Viburnum</i> sp.)	Field Container	Wade	SC	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + Ultra-Pure Oil applied 3 times; all plants marketable.
32410	Zinnia (<i>Zinnia</i> sp.) 'Magnificent Mix'	Field Container	Freiberger	NJ	2015	Foliar	No injury or growth reduction with 1.5, 3.5 and 14 fl oz per 100 gal applied 4 times.
32410	Zinnia (<i>Zinnia</i> sp.) 'Profusion 5 Color Mix'	Field Container	Reding	OH	2016	Foliar	No injury or growth reduction with 7, 14 and 28 fl oz per 100 gal + NIS applied 3 times biweekly; all plants marketable.
32410	Zinnia (<i>Zinnia</i> sp.) <i>Z. angustifolia</i>	Field Container	Fraelich	GA	2016	Foliar	No injury or difference in plant growth and marketability with 7, 14 and 28 fl oz per 100 gal applied 3 times.

Label Suggestions

In this report, two genera exhibited no or minimal injury after foliar treatments of BAS 440i (afidopyren) at 7, 14 and 28 fl oz per 100 gal. These can be included in a future label: *Hedera* sp. and *Zinnia* sp.

Given the lack of phytotoxicity across so many different plant species and genera, it is suggested that all the 33 plants in Table 4 (listed below) that showed no injury be placed on the BAS 440i label if BASF have 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. BAS 440i 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 BAS 440i to that crop’.

Angelonia angustifolia
Astilbe simplicifolia
Begonia sp.
Chrysanthemum/Dendranthema sp
Coleus sp.
Coreopsis grandiflora
Coreopsis verticillata
Cotoneaster sp.
Dahlia sp.
Delphinium sp.
Dianthus sp.
Digitalis purpurea
Echinacea sp.
Euonymus sp.
Euphorbia pulcherrima
Gerbera sp.
Helichrysum sp.
Hibiscus sp.
Hydrangea sp.
Lagerstroemia indica
Leucanthemum x superbum
Ligustrum sp.
Monarda didyma
Nerium oleander
Papaver orientale
Platanus sp.
Rhododendron sp.
Rosa sp.
Salix caprea
Sedum sp.
Taxus media
Veronica longifolia
Viburnum sp.

Appendix 1: Contributing Researchers

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