



[Environment Horticulture Program Research Summaries](#)

## **IR-4 Environmental Horticulture Program Indaziflam Crop Safety**

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## 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 .....	24
Appendix 1: Contributing Researchers .....	25

## Table of Tables

Table 1.	List of Indaziflam 0.03%G treated crops with no or minimal transitory injury. ....	6
Table 2.	List of Indaziflam 0.03%G 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 Indaziflam 0.03%G treated crops exhibiting significant injury. ....	6
Table 4.	List of Indaziflam 0.03%G treated crops where more information is needed. ....	6
Table 5.	List of Marengo G treated crops with no or minimal transitory injury. ....	7
Table 6.	List of Marengo G treated crops with no or minimal transitory injury seen at the 1X rate, but the 2X or 4X rate did cause significant phytotoxicity. ....	7
Table 7.	List of Marengo G treated crops exhibiting significant injury. ....	7
Table 8.	List of Marengo G treated crops where more information is needed. ....	7
Table 9.	List of Marengo SC treated crops with no or minimal transitory injury. ....	7
Table 10.	List of Marengo SC treated crops with no or minimal transitory injury seen at the 1X rate, but the 2X or 4X rate did cause significant phytotoxicity. ....	7
Table 11.	List of Marengo SC treated crops exhibiting significant injury. ....	8
Table 12.	List of Marengo SC treated crops where more information is needed. ....	8
Table 13.	Detailed Summary of Crop Safety Testing with Indaziflam Granular and Liquid Formulations.....	9

## Abstract

From 2011 through 2021, IR-4 has completed 186 trials evaluating two granular and one liquid formulations of indaziflam for crop safety. The data contained in this report was generated to register the use of indaziflam on and around environmental horticulture plants with over-the-top applications. The rates tested were 0.045, 0.089 and 0.178 pounds active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. The indaziflam 0.03%G formulation was applied to 17 plant genera or species, the Marengo G formulation applied to 34 crops, and the Marengo 74SC liquid formulation applied to 36 genera or species. Of these crops, 9 exhibited no or minimal transient injury after application with the granular formulations at all three rates including *Aucuba japonica*, *Berberis sp.*, *Liriope sp.*, *Ophiopogon japonicus*, *Picea abies*, *Rhododendron sp.*, *Rosa sp.*, *Taxus media* and certain *Viburnum* species. The plants exhibiting no or minimal transient injury with Marengo 74C include: *Crocus sp.*, *Hyacinthus sp.*, *Juniperus chinensis*, *Juniperus horizontalis*, and *Picea abies*. The remaining crops evaluated have only been screened in 1 or two trials or exhibited minimal to significant injury. Further testing is required for additional plant species before a conclusion can be made confirming crop safety.

## Introduction

Control of annual grasses, sedges and broadleaf weeds in the production of woody and herbaceous perennials can be problematic because nurseries grow many different types of plants and not all genera or species are listed on labels. These weeds can also be difficult to control in landscape settings for the same reason. This summary covers the results of trials conducted from 2011 through 2021.

## Materials and Methods

In the crop safety protocols, two applications of Indaziflam 0.03%G, Marengo G or Marengo 74SC were made approximately 6 weeks apart. The application rates were 0.045, 0.089 and 0.178lb ai per acre, (150, 300 and 600 lb product/A) plus a water treated control. In some trials, Marengo 74SC was applied at rates of 0.0364, 0.0534, 0.0728 and 0.1457 lb ai per acre. A minimum of four plants per three blocks or ten plants per completely randomized design were required with many researchers exceeding this minimum. Phytotoxicity was recorded on a scale of 0 to 10 (0 = No phytotoxicity; 10 = Complete kill) at 1, 2, and 4 weeks after initial application. To view the more detailed materials and methods in these protocols (11-004, 12-014, 13-014, 14-009, 15-009, 16-010, 17-010, 18-010, 19-012, 20-013, 21-013), please see Please visit <https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-researcher-resources/#Protocols> to view and download these protocols.

Indaziflam 0.03%G, Marengo G and Marengo 74SC were supplied to researchers (See list of researchers in Appendix 1) by the Bayer Corporation and OHP.

## Results and Summary

### ***Phytotoxicity***

Based on the type and nature of injury seen with indaziflam 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.

Indaziflam 0.03%G exhibited no or minimal negative impact on 3 plant species (*Rhododendron* sp., *Rosa* sp. and *Taxus media*) with over the top, broadcast applications (Table 1). Some 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. In the research presented here, no plant species exhibited significant injury at higher rates consistently among the research site and no crops exhibited damage sufficient to recommend growers not utilize Indaziflam 0.03%G as an over-the-top treatment for pre-emergent weed control. For 14 genera/species, more information is needed because only 1 or 2 trials were conducted to date (Table 4).

Marengo G exhibited no or minimal negative impact on 5 plant species (*Aucuba japonica*,

*Berberis* sp., *Liriope* sp., *Ophiopogon* sp. and *Viburnum* sp.) with over the top, broadcast applications (Table 6). Some 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. In the research presented here, eight plant species exhibited significant injury at higher rates consistently among the research sites (Table 7) and six crops exhibited damage sufficient to recommend growers not utilize Marengo G as an over-the-top treatment for pre-emergent weed control (Table 8). For 15 genera/species, more information is needed because only 1 or 2 trials were conducted to date (Table 9).

Marengo 74SC exhibited no or minimal negative impact on 4 plant species (*Hyacinthus* sp., *Juniperus chinensis*, *Juniperus horizontalis*, *Picea abies*) with over the top, broadcast applications and 1 species (*Crocus* sp.) with preplant/crop preemergent soil applications (Table 9). Three species exhibited significant injury: *Echinaea purpurea*, *Phlox paniculata* and *Zinna* sp. (Table 11). For 27 genera/species, more information is needed because only 1 or 2 trials were conducted to date (Table 12) or because differential responses were observed.

**Table 1. List of Indaziflam 0.03%G treated crops with no or minimal transitory injury.**

<i>Rhododendron</i> sp. (azalea) <sup>1</sup>	<i>Taxus media</i> <sup>1,2</sup>
<i>Rosa</i> sp. <sup>1</sup>	

**Table 2. List of Indaziflam 0.03%G treated crops with no or minimal transitory injury seen at the 1X rate, but the 2X or 4X rate did cause significant phytotoxicity.**

None

**Table 3. List of Indaziflam 0.03%G treated crops exhibiting significant injury.**

None

**Table 4. List of Indaziflam 0.03%G treated crops where more information is needed.**

<i>Acer palmatum</i> <sup>1,3</sup>	<i>Nandina domestica</i> <sup>1,2</sup>
<i>Buxus sempervirens</i> <sup>2</sup>	<i>Picea pungens</i> <sup>2</sup>
<i>Carex comans</i> <sup>2</sup>	<i>Quercus</i> spp. <sup>2</sup>
<i>Chamaerops humilis</i> <sup>2</sup>	<i>Raphiolepis indica</i> <sup>1,2</sup>
<i>Gardenia radicans</i> <sup>3</sup>	<i>Spirea japonica</i> <sup>2</sup>
<i>Miscanthus sinensis</i>	<i>Syringa meyeri</i> <sup>2</sup>
<i>Muhlenbergia capillaris</i> <sup>7</sup>	<i>Syringa reticulata</i>

**Table 5. List of Marengo G treated crops with no or minimal transitory injury.**

<i>Aucuba japonica</i> <sup>1</sup>	<i>Ophiopogon japonicus</i> <sup>7</sup>
<i>Berberis</i> spp.	<i>Viburnum</i> sp.
<i>Liriope</i> sp. <sup>7</sup>	

**Table 6. List of Marengo G treated crops with no or minimal transitory injury seen at the 1X rate, but the 2X or 4X rate did cause significant phytotoxicity.**

<i>Chasmanthium</i> sp.	<i>Heuchera sanguinea</i>
<i>Delosperma</i> spp. <sup>5</sup>	<i>Pennisetum</i> sp. <sup>4,7</sup>
<i>Dryopteris</i> sp.	<i>Rudbeckia</i> sp. <sup>4</sup>
<i>Echinacea</i> sp.	<i>Sedum</i> sp. <sup>4</sup>

**Table 7. List of Marengo G treated crops exhibiting significant injury.**

<i>Agave</i> sp.	<i>Hydrangea</i> sp.
<i>Hemerocallis</i> sp. <sup>4</sup>	<i>Iberis</i> sp.
<i>Hosta</i> sp.	<i>Salvia sylvestris</i> <sup>7</sup>

**Table 8. List of Marengo G treated crops where more information is needed.**

<i>Aloe</i> sp.	<i>Hibiscus</i> sp. <sup>2</sup>
<i>Buxus</i> spp. <sup>2</sup>	<i>Hyacinthus orientalis</i> <sup>2,6</sup>
<i>Cornus kousa</i> <sup>2</sup>	<i>Ilex</i> sp. <sup>2</sup>
<i>Crocus</i> sp. <sup>2,6</sup>	<i>Lilium Asiatic Hybrids</i> <sup>2,6</sup>
<i>Erythronium americanum</i> <sup>2,6</sup>	<i>Paeonia</i> sp. <sup>2</sup>
<i>Euonymus alatus</i> <sup>2</sup>	<i>Rosa</i> sp. <sup>2</sup>
<i>Forsythia intermedia</i>	<i>Thuja</i> sp.
<i>Fritillaria meleagris</i> <sup>2,6</sup>	

**Table 9. List of Marengo SC treated crops with no or minimal transitory injury.**

<i>Crocus</i> sp. <sup>6</sup>	<i>Juniperus horizontalis</i> <sup>1</sup>
<i>Hyacinthus</i> sp. <sup>2,6</sup>	<i>Picea abies</i> <sup>1</sup>
<i>Juniperus chinensis</i> <sup>1</sup>	

**Table 10. List of Marengo SC treated crops with no or minimal transitory injury seen at the 1X rate, but the 2X or 4X rate did cause significant phytotoxicity.**

None

**Table 11. List of Marengo SC treated crops exhibiting significant injury.**

*Echinacea purpurea*  
*Phlox paniculata*

*Zinnia sp.*

**Table 12. List of Marengo SC treated crops where more information is needed.**

*Archontophoenix cunninghamiana*  
*Aster sp.*  
*Buxus sp.*<sup>4</sup>  
*Caladium sp.*<sup>4,6</sup>  
*Cedrus atlantica*  
*Chamaecyparis pisifera*  
*Cosmos sp.*  
*Cryptomeria japonica*<sup>1,2</sup>  
*Dahlia sp.*<sup>2,6</sup>  
*Erythronium americanum*<sup>2,6</sup>  
*Fritillaria meleagris*<sup>2,6</sup>  
*Gladiolus sp.*<sup>2,6</sup>  
*Ilex crenata*<sup>1,2</sup>  
*Ilex x meservae*<sup>1</sup>

*Juniperus communis*<sup>2</sup>  
*Juniperus x media*<sup>2</sup>  
*Lilium sp.*<sup>2,6</sup>  
*Narcissus sp.*<sup>2,6</sup>  
*Pinus nigra*<sup>1,2</sup>  
*Pinus strobus*<sup>1,2</sup>  
*Pinus sylvestris*  
*Rhododendron sp.*<sup>1,2</sup>  
*Solidago sp.*  
*Trachycarpus fortune*  
*Tsuga canadensis*<sup>1,2</sup>  
*Tulipa sp.*<sup>2,6</sup>  
*Washingtonia robusta*

<sup>1</sup> Already listed on the label.

<sup>2</sup> Little to no injury observed in one or two container trial(s).

<sup>3</sup> Slight crop injury decreasing with time.

<sup>4</sup> Variable response observed with some trial exhibiting little to no injury at 1X with others exhibiting moderate injury.

<sup>5</sup> Little visible injury, but significant growth reduction observed in 3 trials.

<sup>6</sup> SC formulation applied to dormant crop.

<sup>7</sup> Listed on the label as a crop where injury will occur.



**Table 13. Detailed Summary of Crop Safety Testing with Indaziflam Granular and Liquid Formulations**

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 9/1/2022 are listed below.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
30004	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Maple, Japanese (Acer palmatum)	Field Container	Senesac	NY	2011	Broadcast	Slight crop injury decreasing with time with two applications at 0.045, 0.089, or 0.178 lb aia. All plants marketable.
30007	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Boxwood (Buxus sp.) B. microphylla 'Faulkner'	Field Container	Fraelich	GA	2012	Broadcast	No injury or significant difference in plant growth or marketability with 200, 400 and 800 lb per acre applied twice.
30007	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Boxwood (Buxus sp.) B. sempervirens 'Graham Blandy'	Field Container	Senesac	NY	2011	Broadcast	No crop injury with two applications at 0.045, 0.089, or 0.178 lb aia.
30031	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Sedge (Carex sp.) c. comans 'Red Rooster'	Field Container	Boydston	WA	2011	Broadcast	Two sequential applications of Indaziflam 0.03% G applied 6 weeks apart at 0.045 lb, 0.089, and 0.178 lb ai per acre rates did not injure or affect growth of carex plants.
30036	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Palm, Mediterranean Fan; Dwarf Fan Palm (Chamaerops humilis)	Field Container	Senesac	NY	2011	Broadcast	No crop injury with two applications at 0.045, 0.089, or 0.178 lb aia.
30013	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Gardenia (Gardenia sp.) G. radicans	Field Container	Derr	VA	2011	Broadcast	No phytotoxicity with 0.045, .09, or .18 lb ai per acre but the 2 and 4x rates reduced growth and stand. Indaziflam gave fair to good control of bittercress, chamberbitter, eclipta, phyllanthus, and common groundsel with lower control of spotted spurge and
30028	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Silver Grass (Miscanthus sp.) M. sinensis 'Gracillimus'	Field Container	Neal	NC	2011	Broadcast	Initial application at 0.113 and 0.226 lb ai per acre reduced growth and flower production increasing with second application. At 0.056 lb ai per acre exhibited significant injury in only one of nine rating dates.
30032	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Muhly, Hairysawn (Muhlenbergia capillaris) M. capillaris	Field Container	Gilliam	AL	2012	Broadcast	No injury with 50, 100 and 200 g ai per ha after 1st applic., slight injury only with 200 g ai after 2nd applic.; slight stunting at the 2 higher rates.
30032	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Muhly, Hairysawn (Muhlenbergia capillaris) M. capillaris	Field Container	Neal	NC	2011	Broadcast	Necrosis and reduced growth and flower production observed with two applications at 0.056, 0.113, and 0.226 lb ai per acre increasing with rate.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
30017	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Sacred Bamboo ( <i>Nandina domestica</i> ) N. 'Fire Power'	Field Container	Freiberger	NJ	2011	Broadcast	No crop injury or growth reduction with two applications at 50, 100, 200 g ai/ha.
31339	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Spruce, Colorado ( <i>Picea pungens</i> ) P. <i>pungens</i> .var. <i>glauca</i>	Field Container	Mathers (OSU)	OH	2011	Broadcast	Little to no crop injury with two sequential applications at 0.11, 0.22 and 0.44 lb ai per acre using 7 gallon pot-in-pot system.
30018	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Oak ( <i>Quercus</i> sp.) Q. <i>ellipsoidal</i>	Field Container	Freiberger	NJ	2011	Broadcast	Little to no crop injury or growth reduction with two applications at 50, 100, 200 g ai/ha. Some pots had fallen over and dried out over weekend.
30018	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Oak ( <i>Quercus</i> sp.)	Field Container	Reding	OH	2012	Broadcast	No injury and no significant difference in growth or marketability at 200, 400 and 800 lb per acre applied twice.
30015	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Indian Hawthorn ( <i>Rhaphiolepis indica</i> ) 'Minor'	Field Container	Fraelich	GA	2012	Broadcast	Very slight to slight injury with 200, 400 and 800 lb per acre applied twice, some recovery by 5 weeks after 2nd applic; no significant difference in plant growth or marketability.
30015	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Indian Hawthorn ( <i>Rhaphiolepis indica</i> ) R. 'Pink Lady'	Field Container	Uber	CA	2011	Broadcast	No crop injury or reduction in growth with 150, 300, and 600 lb ai per acre.
30005	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Azalea ( <i>Rhododendron</i> sp.) R. 'Haps Pink'	Field Container	Freiberger	NJ	2011	Broadcast	No crop injury or growth reduction with two applications at 50, 100, 200 g ai/ha.
30005	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Azalea ( <i>Rhododendron</i> sp.) R. 'Mother's Day'	Field Container	Freiberger	NJ	2011	Broadcast	No crop injury or growth reduction with two applications at 50, 100, 200 g ai/ha.
30005	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Azalea ( <i>Rhododendron</i> sp.) R. 'Red Ruffle'	Field Container	Gilliam	AL	2011	Broadcast	No crop injury or reduction in growth with 50, 100, 200 g/ha.
30019	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Rose ( <i>Rosa</i> sp.) R. 'Caramba'	Field Container	Boydston	WA	2011	Broadcast	Two sequential applications of Indaziflam 0.03% G applied 6 weeks apart at 0.045 lb, 0.089, and 0.178 lb ai per acre rates did not injure or affect growth or flowering of rose plants.
30019	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Rose ( <i>Rosa</i> sp.) R. 'Homerun'	Field Container	Freiberger	NJ	2011	Broadcast	No crop injury or growth reduction with two applications at 50, 100, 200 g ai/ha.
30019	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Rose ( <i>Rosa</i> sp.) R. 'Radrazz'	Field Container	Freiberger	NJ	2011	Broadcast	No crop injury or growth reduction with two applications at 50, 100, 200 g ai/ha.
30019	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Rose ( <i>Rosa</i> sp.) R. <i>simsii</i> 'Knockout'	Field Container	Gilliam	AL	2011	Broadcast	No crop injury or reduction in growth with 50, 100, 200 g/ha.
30020	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Bridal-Wreath ( <i>Spiraea</i> sp.) S. <i>japonica</i> 'Little Princess'	Field Container	Mickelbart	MI	2011	Broadcast	No crop injury with 50 and 100 g ai/ha, reduction in final width with 200 g ai/ha.
30016	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Lilac ( <i>Syringa</i> sp.) S. <i>vulgaris</i> 'President Grevy'	Field Container	Boydston	WA	2011	Broadcast	No injury or growth reduction with 200, 400 and 800 lb per acre applied twice; all treated plants saleable.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
30016	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Lilac (Syringa sp.) S. reticulata 'Ivory Silk'	Field Container	Mathers (OSU)	OH	2011	Broadcast	Slight yellowing of leaves in plant treated with 0.11 0.22 0.44 lb ai per acre but transplant shock confounded ratings. Resercher notes in a similar trial in MI plants (data not shown) in 4" pots were injured by 2x and 4x while no injury was evident in 1
30016	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Lilac (Syringa sp.) S. myeri 'Palibin'	Field Container	Mickelbart	MI	2011	Broadcast	No crop injury or reduction in growth at 50, 100, 200 g ai/A.
30022	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Yew (Taxus sp.) T. 'Runyon'	Field Container	Mathers (OSU)	OH	2011	Broadcast	Little to no crop injury with two sequential applications at 0.11 and 0.22 lb ai per acre but significant injury and growth reduction with 0.44 lb ai per acre.
30022	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Yew (Taxus sp.) T. x media 'Densiformis'	Field Container	Mickelbart	MI	2011	Broadcast	Minor crop injury observed among plants treated with 50, 100, 200 g ai/ha but all plants saleable.
30022	Indaziflam 0.03% G (Indaziflam)	WSSA 29	Yew (Taxus sp.) T. media	Field Container	Senesac	NY	2011	Broadcast	No crop injury with two applications at 0.045, 0.089, or 0.178 lb aia.
34052	Marengo 74SC (Indaziflam)	WSSA 29	Palm, King (Archontophoenix cunninghamiana)	Field Container	Marble	FL	2020	Over the top	Very slight transient injury with 0.046, 0.09, 0.18 lb ai per acre.
33490	Marengo 74SC (Indaziflam)	WSSA 29	Aster (Aster sp.) A. laevis 'Bluebird'	Field In-Ground	Cochran	MD	2020	Over the top	Severe injury with 9, 18 and 36 fl oz per acre applied twice.
33490	Marengo 74SC (Indaziflam)	WSSA 29	Aster (Aster sp.) 'Wood's Blue'	Field In-Ground	Marble	FL	2021	Over the top	Minor leaf injury after first and second application at all rates (3, 6, and 12 lbs ai per acre); plants marketable throughout.
30927	Marengo 74SC (Indaziflam)	WSSA 29	Boxwood (Buxus sp.) 'Green Mountain'	Field Container	Mathers	OH	2019	Over the top	Minor, acceptable injury and growth reduction with 0.044, 0.088 and 0.175 lb ai per acre applied twice.
30927	Marengo 74SC (Indaziflam)	WSSA 29	Boxwood (Buxus sp.) 'Franklin Gem'	Field Container	Persad	OH	2019	Over the top	Moderate injury and minor growth reduction with 9, 18 and 36 fl oz per acre applied twice.
30927	Marengo 74SC (Indaziflam)	WSSA 29	Boxwood (Buxus sp.) B. microphylla	Field Container	Uber	CA	2019	Over the top	No injury or growth reduction with 9, 18 and 36 fl oz per 100 gal applied 4 times.
32243	Marengo 74SC (Indaziflam)	WSSA 29	Elephant's-Ear, Angel-Wings (Caladium sp.) 'Elise'	Field In-Ground	Marble	FL	2020	Over the top	Minor to severe injury increasing with rate (0.046, 0.09, 0.18 lb ai per acre).
32243	Marengo 74SC (Indaziflam)	WSSA 29	Elephant's-Ear, Angel-Wings (Caladium sp.) 'White Christmas'	Field In-Ground	Miller	WA	2015	Pre plant soil spray	No injury with 7.5, 11.0, 15.0 and 30.0 fl oz per acre.
32243	Marengo 74SC (Indaziflam)	WSSA 29	Elephant's-Ear, Angel-Wings (Caladium sp.) 'White Christmas'	Field In-Ground	Miller	WA	2016	Pre plant soil spray	No injury with 7.5, 11.0, 15.0 and 30.0 fl oz per acre; excellent weed control.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
33218	Marengo 74SC (Indaziflam)	WSSA 29	Cedar, Atlas ( <i>Cedrus atlantica</i> ) 'Juniperus compacta'	Field Container	Witcher	TN	2019	Over the top	No injury or growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33214	Marengo 74SC (Indaziflam)	WSSA 29	Sawara-Cypress ( <i>Chamaecyparis pisifera</i> ) 'Gold Mop'	Field Container	Senesac	NY	2021	Over the top	No injury when applied twice, 6 weeks apart(0.044, 0.088, 0.175 lb ai/acre)
33491	Marengo 74SC (Indaziflam)	WSSA 29	Cosmos ( <i>Cosmos</i> sp.)	Field In-Ground	Derr	VA	2021	Over the top	Severe injury, reduction in growth and flowering when applied at 9, 18 and 36 fl oz per acre applied twice.
33491	Marengo 74SC (Indaziflam)	WSSA 29	Cosmos ( <i>Cosmos</i> sp.) 'Sonata White'	Field In-Ground	Senesac	NY	2020	Over the top	Severe injury at all rates (0.044, 0.088, and 0.175 lb ai per acre).
32244	Marengo 74SC (Indaziflam)	WSSA 29	Crocus ( <i>Crocus</i> sp.)	Field In-Ground	Miller	WA	2015	Pre plant soil spray	No injury or significant reduction of height, flower numbers and yield with 7.5, 11.0, 15.0 and 30.0 fl oz per acre.
32244	Marengo 74SC (Indaziflam)	WSSA 29	Crocus ( <i>Crocus</i> sp.)	Field In-Ground	Miller	WA	2016	Pre plant soil spray	No injury or height reduction with 7.5, 11.0, 15.0 and 30.0 fl oz per acre; bulb number and wt comparable to glyphosate; excellent weed control.
32244	Marengo 74SC (Indaziflam)	WSSA 29	Crocus ( <i>Crocus</i> sp.) <i>C. tommasinianus</i>	Field In-Ground	Senesac	NY	2015	Pre plant soil spray	No injury with 0.0364, 0.0534 and 0.0728, minor with 0.1457 lb ai per acre applied on Oct 2015 to dormant crop.
33217	Marengo 74SC (Indaziflam)	WSSA 29	Japanese Cedar ( <i>Cryptomeria japonica</i> ) 'Black Dragon'	Field Container	Neal	NC	2019	Over the top	Minor to moderate injury with 9, 18 and 36 fl oz per acre applied twice; effect on crop growth inconclusive.
33217	Marengo 74SC (Indaziflam)	WSSA 29	Japanese Cedar ( <i>Cryptomeria japonica</i> ) 'Black Dragon'	Field Container	Witcher	TN	2019	Over the top	No injury or growth reduction with 9, 18 and 36 fl oz per acre applied twice.
32245	Marengo 74SC (Indaziflam)	WSSA 29	Dahlia ( <i>Dahlia</i> sp.) 'Bride-To-Be' and 'Kyli-Bug'	Field In-Ground	Miller	WA	2015	Pre plant soil spray	No injury or height reduction with 7.5, 11.0, 15.0 and 30.0 fl oz per acre.
32245	Marengo 74SC (Indaziflam)	WSSA 29	Dahlia ( <i>Dahlia</i> sp.) 'Jabberbox'	Field In-Ground	Miller	WA	2016	Pre plant soil spray	No significant injury or height reduction with 7.5, 11.0, 15.0 and 30.0 fl oz per acre; excellent weed control.
33493	Marengo 74SC (Indaziflam)	WSSA 29	Eastern Purple Coneflower ( <i>Echinacea purpurea</i> )	Field In-Ground	Derr	VA	2021	Over the top	Severe injury, reduction in growth and flowering when applied at 9, 18 and 36 fl oz per acre applied twice.
33493	Marengo 74SC (Indaziflam)	WSSA 29	Eastern Purple Coneflower ( <i>Echinacea purpurea</i> )	Field In-Ground	Mathers	OH	2021	Over the top	Moderate to Severe injury after first application at all rates (0.044, 0.088, and 0.175 lb per acre); plant death after second application.
33011	Marengo 74SC (Indaziflam)	WSSA 29	Dogtooth Violet; Yellow Trout Lily ( <i>Erythronium americanum</i> ) 'Pagoda'	Field In-Ground	Derr	VA	2020	Over the top	No significant injury with 9 and 18, moderate with 36 fl oz per acre applied twice; significant flowering reduction.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
33011	Marengo 74SC (Indaziflam)	WSSA 29	Dogtooth Violet; Yellow Trout Lily ( <i>Erythronium americanum</i> )	Field In-Ground	Senesac	NY	2015	Pre plant soil spray	No injury with 0.0364 and 0.0534, minor with 0.0728 and 0.1457 lb ai per acre applied on Oct 2015 to dormant crop.
33012	Marengo 74SC (Indaziflam)	WSSA 29	Chequered Lily ( <i>Fritillaria meleagris</i> )	Field In-Ground	Derr	VA	2020	Over the top	Severe injury and flowering reduction with 9, 18 and 36 fl oz per acre applied twice.
33012	Marengo 74SC (Indaziflam)	WSSA 29	Chequered Lily ( <i>Fritillaria meleagris</i> )	Field In-Ground	Senesac	NY	2015	Pre plant soil spray	No injury with 0.0364, 0.0534 and 0.0728, minor with 0.1457 lb ai per acre applied on Oct 2015 to dormant crop.
32246	Marengo 74SC (Indaziflam)	WSSA 29	Gladiolus ( <i>Gladiolus</i> sp.) 'My Love'	Field In-Ground	Miller	WA	2015	Pre plant soil spray	No injury or height reduction with 7.5, 11.0, 15.0 and 30.0 fl oz per acre.
32246	Marengo 74SC (Indaziflam)	WSSA 29	Gladiolus ( <i>Gladiolus</i> sp.) 'My Love'	Field In-Ground	Miller	WA	2016	Pre plant soil spray	No injury or height reduction with 7.5, 11.0, 15.0 and 30.0 fl oz per acre; excellent weed control.
32247	Marengo 74SC (Indaziflam)	WSSA 29	Hyacinth ( <i>Hyacinthus</i> sp.)	Field In-Ground	Miller	WA	2015	Pre plant soil spray	No significant injury or reduction in height, flower numbers and yield with 7.5, 11.0, 15.0 and 30.0 fl oz per acre.
32247	Marengo 74SC (Indaziflam)	WSSA 29	Hyacinth ( <i>Hyacinthus</i> sp.)	Field In-Ground	Miller	WA	2016	Pre plant soil spray	No injury or height reduction with 7.5, 11.0, 15.0 and 30.0 fl oz per acre; bulb number and wt comparable to glyphosate; excellent weed control.
32247	Marengo 74SC (Indaziflam)	WSSA 29	Hyacinth ( <i>Hyacinthus</i> sp.) H. orientalis 'Gypsy Queen'	Field In-Ground	Senesac	NY	2015	Pre plant soil spray	No injury with 0.0364 and 0.0534, minor with 0.0728 and 0.1457 lb ai per acre applied on Oct 2015 to dormant crop.
30952	Marengo 74SC (Indaziflam)	WSSA 29	Holly ( <i>Ilex</i> sp.) <i>Ilex</i> x <i>meserveae</i> 'Berri-Magic'	Field Container	Mathers	OH	2019	Over the top	No injury with 0.044, moderate with 0.088 and 0.175 lb ai per acre applied twice; moderate to high growth reduction.
30952	Marengo 74SC (Indaziflam)	WSSA 29	Holly ( <i>Ilex</i> sp.) <i>Ilex</i> x <i>meserveae</i> 'Blue Girl'	Field Container	Moretti	OR	2020	Over the top	Moderate to high injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
30952	Marengo 74SC (Indaziflam)	WSSA 29	Holly ( <i>Ilex</i> sp.) <i>Ilex</i> crenata	Field Container	Persad	OH	2019	Over the top	No injury or significant growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33213	Marengo 74SC (Indaziflam)	WSSA 29	Juniper, Chinese Pyramid ( <i>Juniperus chinensis</i> )	Field Container	Aulakh	CT	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33213	Marengo 74SC (Indaziflam)	WSSA 29	Juniper, Chinese Pyramid ( <i>Juniperus chinensis</i> )	Field Container	Koivunen	CA	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33213	Marengo 74SC (Indaziflam)	WSSA 29	Juniper, Chinese Pyramid ( <i>Juniperus chinensis</i> ) 'Blue Pfitzer'	Field Container	Witcher	TN	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33212	Marengo 74SC (Indaziflam)	WSSA 29	Juniper, Common ( <i>Juniperus communis</i> ) Juniper sp. 'Wilonii'	Field Container	Uber	CA	2019	Over the top	No injury or growth reduction with 9, 18 and 36 fl oz per 100 gal applied 4 times.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
33178	Marengo 74SC (Indaziflam)	WSSA 29	Juniper, Creeping or Trailing ( <i>Juniperus horizontalis</i> )	Field Container	Koivunen	CA	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33178	Marengo 74SC (Indaziflam)	WSSA 29	Juniper, Creeping or Trailing ( <i>Juniperus horizontalis</i> ) 'Wiltonii'	Field Container	Mathers	OH	2019	Over the top	No injury or growth reduction with 0.044, 0.088 and 0.175 lb ai per acre applied twice.
33178	Marengo 74SC (Indaziflam)	WSSA 29	Juniper, Creeping or Trailing ( <i>Juniperus horizontalis</i> ) Blue Rug'	Field Container	Witcher	TN	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33190	Marengo 74SC (Indaziflam)	WSSA 29	Juniper, Chinese ( <i>Juniperus x media</i> )	Field Container	Aulakh	CT	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33010	Marengo 74SC (Indaziflam)	WSSA 29	Lilium Asiatic Hybrids (Lilium Asiatic Hybrids) 'Foxtrot'	Field In-Ground	Derr	VA	2020	Over the top	No significant injury and flowering reduction with 9, 18 and 36 fl oz per acre applied twice.
33010	Marengo 74SC (Indaziflam)	WSSA 29	Lilium Asiatic Hybrids (Lilium Asiatic Hybrids)	Field In-Ground	Senesac	NY	2015	Pre plant soil spray	No injury with 0.0364 and 0.0534, minor with 0.0728 and 0.1457 lb ai per acre applied on Oct 2015 to dormant crop.
32249	Marengo 74SC (Indaziflam)	WSSA 29	Daffodil ( <i>Narcissus</i> sp.) 'Flower Carpet'	Field In-Ground	Miller	WA	2015	Pre plant soil spray	No significant injury with 7.5, 11.0, 15.0 and 30.0 fl oz per acre; slight reduction of height at 11, 15 and 30 fl oz, and bulb number at 15 fl oz.
32249	Marengo 74SC (Indaziflam)	WSSA 29	Daffodil ( <i>Narcissus</i> sp.) 'Standard Value'	Field In-Ground	Miller	WA	2016	Pre plant soil spray	No injury or height reduction with 7.5, 11.0, 15.0 and 30.0 fl oz per acre; bulb number and wt comparable to glyphosate; excellent weed control.
33496	Marengo 74SC (Indaziflam)	WSSA 29	Phlox, Fall ( <i>Phlox paniculata</i> ) 'Fashionably Early Lavender Ice'	Field In-Ground	Mathers	OH	2021	Over the top	Severe injury after one application at all rates (0.044, 0.088, and 0.175 lb per acre); plant death occurred after two applications.
33183	Marengo 74SC (Indaziflam)	WSSA 29	Spruce, Norway ( <i>Picea abies</i> )	Field Container	Aulakh	CT	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33183	Marengo 74SC (Indaziflam)	WSSA 29	Spruce, Norway ( <i>Picea abies</i> ) 'Nidiformis'	Field Container	Mathers	OH	2019	Over the top	Minor, acceptable injury and growth reduction with 0.044, 0.088 and 0.175 lb ai per acre applied twice.
33183	Marengo 74SC (Indaziflam)	WSSA 29	Spruce, Norway ( <i>Picea abies</i> )	Field Container	Seefeldt	WA	2019	Over the top	No significant injury or growth reduction with 0.044, 0.088 and 0.175 lb ai per acre applied twice.
33184	Marengo 74SC (Indaziflam)	WSSA 29	Spruce, Dwarf Alberta ( <i>Picea glauca</i> 'Conica') 'Conica'	Field Container	Mathers	OH	2021	Over the top	No injury when applied at any rates (0.044, 0.088, and 0.175 lb per acre); two applications spaced 6 weeks apart.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
33182	Marengo 74SC (Indaziflam)	WSSA 29	Spruce, Serbian (Picea omorika)	Field Container	Mathers	OH	2021	Over the top	Minor to severe injury 4WAT for first application at all rates (0.044, 0.088, and 0.175 lb per acre); Severe injury and plant death after second application.
33188	Marengo 74SC (Indaziflam)	WSSA 29	Pine, Austrian (Pinus nigra)	Field Container	Mathers	OH	2019	Over the top	No injury or growth reduction with 0.044, 0.088 and 0.175 lb ai per acre applied twice.
33188	Marengo 74SC (Indaziflam)	WSSA 29	Pine, Austrian (Pinus nigra)	Field Container	Moretti	OR	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33185	Marengo 74SC (Indaziflam)	WSSA 29	Pine, Eastern White (Pinus strobus)	Field Container	Aulakh	CT	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33185	Marengo 74SC (Indaziflam)	WSSA 29	Pine, Eastern White (Pinus strobus)	Field Container	Moretti	OR	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33186	Marengo 74SC (Indaziflam)	WSSA 29	Pine, Scotch; Scots Pine (Pinus sylvestris) 'French Blue'	Field Container	Mathers	OH	2021	Over the top	No injury when applied at any rates (0.044, 0.088, and 0.175 lb per acre); two applications spaced 6 weeks apart.
33186	Marengo 74SC (Indaziflam)	WSSA 29	Pine, Scotch; Scots Pine (Pinus sylvestris)	Field Container	Seefeldt	WA	2020	Over the top	No injury with 0.044, 0.088 or 0.175 lb ai per acre.
33179	Marengo 74SC (Indaziflam)	WSSA 29	Azalea & Rhododendron (Rhododendron sp.) 'Formosa'	Field Container	Cochran	MD	2021	Over the top	Moderate injury when applied 2x, six weeks apart, at 9, 18, and 36 fl oz per acre (0.044 lb ai, 0.088 lb ai, and 0.175 lb ai)
33179	Marengo 74SC (Indaziflam)	WSSA 29	Azalea & Rhododendron (Rhododendron sp.)	Field Container	Persad	OH	2019	Over the top	No injury or growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33179	Marengo 74SC (Indaziflam)	WSSA 29	Azalea & Rhododendron (Rhododendron sp.) 'Red Bird'	Field Container	Uber	CA	2020	Over the top	Moderate to severe injury with 9, 18 and 36 fl oz per acre applied twice; treated plants not saleable.
33498	Marengo 74SC (Indaziflam)	WSSA 29	Goldenrod (Solidago sp.)	Field In-Ground	Marble	FL	2021	Over the top	Minor leaf injury after first and second application at all rates (3, 6, and 12 lbs ai per acre); plants marketable throughout.
34053	Marengo 74SC (Indaziflam)	WSSA 29	Palm, Chinese Windmill (Trachycarpus fortunei) 'Red Bird'	Field Container	Uber	CA	2020	Over the top	No injury or growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33215	Marengo 74SC (Indaziflam)	WSSA 29	Hemlock, Eastern (Tsuga canadensis)	Field Container	Aulakh	CT	2020	Over the top	No injury and growth reduction with 9, 18 and 36 fl oz per acre applied twice.
33215	Marengo 74SC (Indaziflam)	WSSA 29	Hemlock, Eastern (Tsuga canadensis)	Field Container	Mathers	OH	2021	Over the top	Minor to moderate injury with increasing rates when applied twice (0.044, 0.088, and 0.175 lb per acre); 1X and 2X were commercially acceptable 4WAT.
33215	Marengo 74SC (Indaziflam)	WSSA 29	Hemlock, Eastern (Tsuga canadensis)	Field Container	Seefeldt	WA	2020	Over the top	Moderate to severe injury with 0.044, 0.088 or 0.175 lb ai per acre, increasing with rate; 2x and 4x significantly reduced growth.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
32251	Marengo 74SC (Indaziflam)	WSSA 29	Tulip (Tulipa sp.) 'Ile de France'	Field In-Ground	Miller	WA	2015	Pre plant soil spray	Moderate to severe injury and reduction in height, flower numbers and yield with 7.5, 11.0, 15.0 and 30.0 fl oz per acre.
32251	Marengo 74SC (Indaziflam)	WSSA 29	Tulip (Tulipa sp.) 'Jumbo Pink'	Field In-Ground	Miller	WA	2016	Pre plant soil spray	No injury or significant height reduction with 7.5, 11.0, 15.0 and 30.0 fl oz per acre; bulb number and wt comparable to glyphosate; excellent weed control.
34055	Marengo 74SC (Indaziflam)	WSSA 29	Palm, Washington Fan (Washingtonia robusta)	Field Container	Marble	FL	2020	Over the top	Very slight transient injury with 0.046, 0.09, 0.18 lb ai per acre.
33499	Marengo 74SC (Indaziflam)	WSSA 29	Zinnia (Zinnia sp.)	Field In-Ground	Derr	VA	2021	Over the top	Severe injury, reduction in growth and flowering when applied at 9, 18 and 36 fl oz per acre applied twice.
31327	Marengo G (Indaziflam 0.0224%)	WSSA 29	Agave (Agave sp.) 'Blue Flame'	Field Container	Villavicencio	CA	2012	Broadcast	Severe chlorosis and necrosis with 200, 400 and 800 lb per acre applied twice; moderate discoloration at 2X and 4X; no growth reduction.
31327	Marengo G (Indaziflam 0.0224%)	WSSA 29	Agave (Agave sp.) A. attenuata x A. ocahui Blue Glow'	Field Container	Wilén	CA	2015	Broadcast	Slight to moderate, but acceptable, injury with 200, 400 and 800 lb per acre applied twice; moderate height reduction with 2X and 4X.
31326	Marengo G (Indaziflam 0.0224%)	WSSA 29	Aloe (Aloe sp.) Aloe vera var. chinensis	Field Container	Marble	FL	2015	Broadcast	No injury or growth reduction with 200 lb per acre, severe with 400 and 800 lb per acre, applied twice.
31326	Marengo G (Indaziflam 0.0224%)	WSSA 29	Aloe (Aloe sp.) 'Blue Elf'	Field Container	Villavicencio	CA	2012	Broadcast	Slight necrosis and spotting with 200, 400 and 800 lb per acre applied twice; moderate discoloration at 4X; no growth reduction.
30924	Marengo G (Indaziflam 0.0224%)	WSSA 29	Aucuba (Aucuba sp.) A. japonica 'Variegata'	Field Container	Gilliam	AL	2015	Broadcast	No injury or growth reduction with 200, 400 and 800 lb per acre applied twice.
30924	Marengo G (Indaziflam 0.0224%)	WSSA 29	Aucuba (Aucuba sp.) A. japonica 'Variegata'	Field Container	Pemberton	TX	2012	Broadcast	No injury or growth reduction with 150, 300 and 600 lb per acre applied twice.
30924	Marengo G (Indaziflam 0.0224%)	WSSA 29	Aucuba (Aucuba sp.) A. japonica 'Variegata'	Field Container	Uber	CA	2015	Broadcast	No injury or growth reduction with 0.0448, 0.0896 and 0.1792 lb ai per acre applied twice
30006	Marengo G (Indaziflam 0.0224%)	WSSA 29	Barberry (Berberis sp.) B. thunbergii atropurpurea 'Rosy Glow'	Field Container	Beste/Frank (ARS)	MD	2012	Broadcast	No injury, growth or marketability reduction with 200, 400 and 800 per acre applied twice.
30006	Marengo G (Indaziflam 0.0224%)	WSSA 29	Barberry (Berberis sp.) B. thunbergii 'Crimson Pigmy'	Field Container	Beste/Frank (ARS)	MD	2013	Broadcast	No injury or growth reduction with 200, 400 and 800 lb per acre applied twice; no reduction in marketability.



PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
30006	Marengo G (Indaziflam 0.0224%)	WSSA 29	Barberry (Berberis sp.) 'Crymson Pygmy'	Field Container	Mathers (OSU)	OH	2012	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice.
31315	Marengo G (Indaziflam 0.0224%)	WSSA 29	Boxwood (Buxus sp.) 'Green Mountain'	Field Container	Beste/Frank (ARS)	MD	2012	Broadcast	No significant injury observed at 0.045, 0.09, and 0.179 lb ai per acre.
31315	Marengo G (Indaziflam 0.0224%)	WSSA 29	Boxwood (Buxus sp.) 'Green Velvet'	Field Container	Mathers (OSU)	OH	2012	Broadcast	Virtually no injury with 200, 400 and 800 lb per acre applied twice.
31364	Marengo G (Indaziflam 0.0224%)	WSSA 29	Sedge (Carex sp.) 'Amazon Mist'	Field Container	Boydston	WA	2012	Broadcast	Minor injury increasing with rate (0.0446, 0.0892, 0.1784 lb ai per acre) after the first application, but moderate to severe injury observed after the second application.
31067	Marengo G (Indaziflam 0.0224%)	WSSA 29	Indian Woodoats (Chasmanthium latifolium)	Field Container	Cochran (IA)	IA	2014	Broadcast	Moderate injury with 0.0448, 0.0896 and 0.1792 lb ai per acre applied twice; no significant growth reduction.
31067	Marengo G (Indaziflam 0.0224%)	WSSA 29	Indian Woodoats (Chasmanthium latifolium)	Field Container	Hanson	CA	2013	Broadcast	No injury after 1st applic., slight to severe injury (leaf necrosis) with 50, 100 and 200 g ai per acre after 2nd applic.; slight to severe growth reduction.
31067	Marengo G (Indaziflam 0.0224%)	WSSA 29	Indian Woodoats (Chasmanthium latifolium)	Field Container	Senesac	NY	2014	Broadcast	Slight injury with 0.0448, 0.0896 and 0.1792 lb ai per acre applied twice.
31067	Marengo G (Indaziflam 0.0224%)	WSSA 29	Indian Woodoats (Chasmanthium latifolium)	Field Container	Wilen	CA	2014	Broadcast	Moderate to high injury increasing with rates (200, 400 and 800 lb per acre) applied twice; no growth reduction.
30011	Marengo G (Indaziflam 0.0224%)	WSSA 29	Dogwood (Cornus sp.) C. kousa	Field Container	Derr	VA	2011	Broadcast	No crop injury or growth reduction with 0.045, 0.09, 0.18 lb ai per acre. Indaziflam gave fair to good control of bittercress, chamberbitter, eclipta, phyllanthus, and common groundsel with lower control of spotted spurge and fragrant flatsedge, depending
30932	Marengo G (Indaziflam 0.0224%)	WSSA 29	Delosperma (Delosperma sp.) D. cooperi 'Purple Mountain'	Field Container	Boydston	WA	2014	Broadcast	No injury or growth reduction with 0.0446, 0.0892 and 0.1784 lb ai per acre applied twice; all treated plants marketable.
30932	Marengo G (Indaziflam 0.0224%)	WSSA 29	Delosperma (Delosperma sp.) D. cooperi	Field Container	Klett	CO	2012	Broadcast	No injury with 200 and 400 lb per acre applied twice, slight with 800 lb; slight growth reduction only at 2X.
30932	Marengo G (Indaziflam 0.0224%)	WSSA 29	Delosperma (Delosperma sp.) D. congestum 'White Nugget'	Field Container	Klett	CO	2014	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice; slight and moderate growth reduction with 2X and 4X.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
30932	Marengo G (Indaziflam 0.0224%)	WSSA 29	Delosperma (Delosperma sp.)	Field Container	Reding	OH	2012	Broadcast	No injury with 200 and 400, moderate with 800 lb per acre, applied twice; significant growth reduction at 2X and 4X; not marketable at 4X.
30932	Marengo G (Indaziflam 0.0224%)	WSSA 29	Delosperma (Delosperma sp.) D. nubigenum 'Basutoland'	Field Container	Senesac	NY	2014	Broadcast	Slight injury with 0.0448, 0.0896 and 0.1792 lb ai per acre applied twice.
30735	Marengo G (Indaziflam 0.0224%)	WSSA 29	Fern, Shaggy Shield (Dryopteris cycadina) D. wallichiana	Field Container	DeFrancesco	OR	2015	Broadcast	No injury with 0.0448, 0.0896 and 0.1792 lb ai per acre, but moderate growth reduction with 0.0896 and 0.1792 lb, applied twice.
30735	Marengo G (Indaziflam 0.0224%)	WSSA 29	Fern, Shaggy Shield (Dryopteris cycadina) D. cycadina	Field Container	Gilliam	AL	2015	Broadcast	No injury or growth reduction with 200 lb per acre applied twice; severe injury at 400 and 800 lb after 2nd application.
30736	Marengo G (Indaziflam 0.0224%)	WSSA 29	Purple Coneflower (Echinacea sp.) 'Magnus'	Field Container	Boydston	WA	2012	Broadcast	No injury with 200, 400 and 800 lb per acre after 1st application, slight to moderate injury and growth reduction after 2nd applic; all 1X, and 4 of 6 treated plants saleable.
30736	Marengo G (Indaziflam 0.0224%)	WSSA 29	Purple Coneflower (Echinacea sp.) 'Magnus'	Field Container	Boydston	WA	2013	Broadcast	Minor injury, no growth reduction with 0.0446 and 0.0892 lb ai per acre; severe with 0.1784 lb; 4X plants not saleable.
30736	Marengo G (Indaziflam 0.0224%)	WSSA 29	Purple Coneflower (Echinacea sp.)	Field Container	Harvey	WA	2012	Broadcast	Some injury with 200, moderate with 400 and 800 lb per acre applied twice; untreated Check also showed some injury.
30012	Marengo G (Indaziflam 0.0224%)	WSSA 29	Spindletree (Euonymus sp.) E. alatus 'Compactus'	Field Container	Boydston	WA	2013	Broadcast	No injury or growth reduction with 0.0446, 0.0892 and 0.1784 lb ai per acre applied twice; all plants saleable.
30012	Marengo G (Indaziflam 0.0224%)	WSSA 29	Spindletree (Euonymus sp.) E. alatus 'Compacta'	Field Container	Mathers (OSU)	OH	2012	Broadcast	Slight, acceptable injury with 200, 400 and 800 lb per acre applied twice; comparable to untreated check.
30937	Marengo G (Indaziflam 0.0224%)	WSSA 29	Forsythia (Forsythia sp.) F. intermedia 'Golden Bells'	Field Container	Beste/Frank (ARS)	MD	2013	Broadcast	Results inconclusive because 80 % of plants died due to water-logging; researcher suggested repeating trial.
30737	Marengo G (Indaziflam 0.0224%)	WSSA 29	Daylily (Hemerocallis sp.) 'Happy Returns' & 'Stella de Oro'	Field Container	Ahrens/Mervosh	CT	2012	Broadcast	Very slight injury with 200, 400, and 800 lb per acre applied twice.
30737	Marengo G (Indaziflam 0.0224%)	WSSA 29	Daylily (Hemerocallis sp.) 'Stella de Oro'	Field Container	Beste/Frank (ARS)	MD	2012	Broadcast	No significant injury, growth or marketability reduction with 200 lb per acre applied twice; reduction in marketability at 400 and 800 lb due to reduced growth and flowering.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
30737	Marengo G (Indaziflam 0.0224%)	WSSA 29	Daylily (Hemerocallis sp.) 'Stella de Oro'	Field Container	Boydston	WA	2012	Broadcast	Moderate injury with 0.0446, 0.0892 and 0.1784 lb ai per acre applied twice; some plants not saleable.
30737	Marengo G (Indaziflam 0.0224%)	WSSA 29	Daylily (Hemerocallis sp.)	Field Container	Harvey	WA	2012	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice.
30737	Marengo G (Indaziflam 0.0224%)	WSSA 29	Daylily (Hemerocallis sp.) 'Stella de Oro'	Field Container	Neal	NC	2012	Broadcast	Moderate injury (leaf chlorosis and tip necrosis, reduced growth) with 0.045, 0.09 and 0.18 lb ai per acre with 2 applic.
30738	Marengo G (Indaziflam 0.0224%)	WSSA 29	Coral Bells (Heuchera sanguinea) 'Ruby Bells'	Field Container	Beste/Frank (ARS)	MD	2012	Broadcast	No significant injury, growth or marketability reduction with 200 and 400 lb per acre applied twice; high injury and growth reduction at 4X.
30738	Marengo G (Indaziflam 0.0224%)	WSSA 29	Coral Bells (Heuchera sanguinea)	Field Container	Harvey	WA	2012	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice.
30738	Marengo G (Indaziflam 0.0224%)	WSSA 29	Coral Bells (Heuchera sanguinea)	Field Container	Reding	OH	2012	Broadcast	No injury and no significant difference in growth or marketability at 200, 400 and 800 lb per acre applied twice.
30027	Marengo G (Indaziflam 0.0224%)	WSSA 29	Rosemallow (Hibiscus sp.) H. moscheutos 'Luna White'	Field Container	Boydston	WA	2012	Broadcast	No injury or growth reduction with 0.0446, 0.0892 and 0.1784 lb ai per acre applied twice.
30027	Marengo G (Indaziflam 0.0224%)	WSSA 29	Rosemallow (Hibiscus sp.)	Field Container	Reding	OH	2012	Broadcast	No injury and no significant difference in growth or marketability at 200, 400 and 800 lb per acre applied twice.
30741	Marengo G (Indaziflam 0.0224%)	WSSA 29	Plantain Lily (Hosta sp.) H. fortunei 'Gold Standard'	Field Container	Ahrens/Mervosh	NY	2012	Broadcast	Slight injury with 200, 400, and 800 lb per acre applied twice.
30741	Marengo G (Indaziflam 0.0224%)	WSSA 29	Plantain Lily (Hosta sp.) 'Hadspen Blue'	Field Container	Boydston	WA	2012	Broadcast	Moderate injury but no growth reduction with 200, 400 and 800 lb per acre applied twice; some treated plants saleable.
30741	Marengo G (Indaziflam 0.0224%)	WSSA 29	Plantain Lily (Hosta sp.)	Field Container	Harvey	WA	2012	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice.
30741	Marengo G (Indaziflam 0.0224%)	WSSA 29	Plantain Lily (Hosta sp.) 'Pineapple Upside Down'	Field Container	Neal	NC	2012	Broadcast	Moderate injury (leaf spotting, reduced growth) with 0.045, 0.09 and 0.18 lb ai per acre with 2 applic.
30740	Marengo G (Indaziflam 0.0224%)	WSSA 29	Hydrangea (Hydrangea sp.) H. macrophylla 'Endless Summer'	Field Container	Ahrens/Mervosh	CT	2012	Broadcast	Severe injury with 200, 400, and 800 lb per acre applied twice.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
30740	Marengo G (Indaziflam 0.0224%)	WSSA 29	Hydrangea (Hydrangea sp.)	Field Container	Harvey	WA	2012	Broadcast	Severe injury with 200, 400 and 800 lb per acre applied twice.
30740	Marengo G (Indaziflam 0.0224%)	WSSA 29	Hydrangea (Hydrangea sp.) 'Endless Summer'	Field Container	Mathers (OSU)	OH	2012	Broadcast	Severe injury with 200, 400 and 800 lb per acre applied twice.
30740	Marengo G (Indaziflam 0.0224%)	WSSA 29	Hydrangea (Hydrangea sp.) 'Invincibelle'	Field Container	Mathers (OSU)	OH	2012	Broadcast	Moderate to severe injury with 200, 400 and 800 lb per acre applied twice.
30740	Marengo G (Indaziflam 0.0224%)	WSSA 29	Hydrangea (Hydrangea sp.) 'Limelight'	Field Container	Mathers (OSU)	OH	2012	Broadcast	Slight injury with complete recovery at 200 lb per acre applied twice; moderate and high injury with recovery to acceptable injury at 400 and 800 lb per acre.
31071	Marengo G (Indaziflam 0.0224%)	WSSA 29	Candytuft (Iberis sp.) 'Candytuft'	Field Container	Boydston	WA	2013	Broadcast	Moderate injury at 0.0446, severe at 0.0892 and 0.1784 lb ai per acre applied twice; plants not saleable.
31071	Marengo G (Indaziflam 0.0224%)	WSSA 29	Candytuft (Iberis sp.) I. sempervirens 'Snowflake'	Field Container	Senesac	NY	2015	Broadcast	Severe injury with 0.0448, 0.0896 and 0.1792 lb ai per acre applied twice.
30014	Marengo G (Indaziflam 0.0224%)	WSSA 29	Holly (Ilex sp.) I. vomitoria 'Stoke's Dwarf'	Field Container	Fraelich	GA	2012	Broadcast	No injury or significant difference in plant growth or marketability with 200, 400 and 800 lb per acre applied twice.
30014	Marengo G (Indaziflam 0.0224%)	WSSA 29	Holly (Ilex sp.)	Field Container	Reding	OH	2012	Broadcast	No injury and no significant difference in growth or marketability at 200, 400 and 800 lb per acre applied twice.
30954	Marengo G (Indaziflam 0.0224%)	WSSA 29	Lilyturf (Liriope sp.) L. muscari 'Big Blue'	Field Container	Czarnota	GA	2012	Broadcast	No injury with 200 and 400 lb per acre, slight with 800 lb, applied twice; no height reduction.
30954	Marengo G (Indaziflam 0.0224%)	WSSA 29	Lilyturf (Liriope sp.) L. muscari 'Aztec Grass'	Field Container	Fraelich	GA	2012	Broadcast	No injury or significant difference in plant growth or marketability with 200, 400 and 800 lb per acre applied twice.
30954	Marengo G (Indaziflam 0.0224%)	WSSA 29	Lilyturf (Liriope sp.) L. spicata	Field Container	Gilliam	AL	2012	Broadcast	No injury or growth reduction with 50, 100 and 200 g ai per ha applied twice.
30954	Marengo G (Indaziflam 0.0224%)	WSSA 29	Lilyturf (Liriope sp.) L. gigantea	Field Container	Uber	CA	2012	Broadcast	No injury or growth reduction with 200, unacceptable with 400 and 800 lb per acre applied twice.
30955	Marengo G (Indaziflam 0.0224%)	WSSA 29	Mondo Grass; Lilyturf; Ker-Gawl (Ophiopogon sp.) O. japonicas	Field Container	Czarnota	GA	2012	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice; no height reduction.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
30955	Marengo G (Indaziflam 0.0224%)	WSSA 29	Mondo Grass; Lilyturf; Ker-Gawl (Ophiopogon sp.) O. japonicus	Field Container	Gilliam	AL	2012	Broadcast	No injury or growth reduction with 50, 100 and 200 g ai per ha applied twice.
30955	Marengo G (Indaziflam 0.0224%)	WSSA 29	Mondo Grass; Lilyturf; Ker-Gawl (Ophiopogon sp.) O. japonica	Field Container	Uber	CA	2012	Broadcast	No injury with 200, moderate with 400 and 800 lb per acre, applied twice; moderate growth reduction at 2X and 4X.
31933	Marengo G (Indaziflam 0.0224%)	WSSA 29	Peony (Paeonia sp.) 'President Roosevelt'	Field In-Ground	Miller	WA	2015	Broadcast	No significant injury with 200, 400 and 800 lb per acre applied twice.
31933	Marengo G (Indaziflam 0.0224%)	WSSA 29	Peony (Paeonia sp.) 'President Roosevelt'	Field In-Ground	Miller	WA	2016	Broadcast	No significant injury with 200, 400 and 800 lb per acre applied twice; no reduction in flower numbers.
30029	Marengo G (Indaziflam 0.0224%)	WSSA 29	Fountain Grass (Pennisetum sp.) P. alopecuroides 'Hameln'	Field Container	Boydston	WA	2012	Broadcast	No injury with 200, slight with 400 and 800 lb per acre applied twice; all 1X and 2X plants, and 4 of 6 4X plants, saleable.
30029	Marengo G (Indaziflam 0.0224%)	WSSA 29	Fountain Grass (Pennisetum sp.) P. setaceum	Field Container	Gilliam	AL	2012	Broadcast	Minor injury at 50 and 100 g ai per ha, moderate at 200 ga ai after the first applic., moderate to severe injury after 2nd applic.
30029	Marengo G (Indaziflam 0.0224%)	WSSA 29	Fountain Grass (Pennisetum sp.)	Field Container	Harvey	WA	2012	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice.
30029	Marengo G (Indaziflam 0.0224%)	WSSA 29	Fountain Grass (Pennisetum sp.) P. villosum	Field Container	Senesac	NY	2012	Broadcast	Low injury with 0.045, 0.09 and 0.179 lb ai per acre after 1st application; severe injury (lack of vigor) after 2nd application.
31319	Marengo G (Indaziflam 0.0224%)	WSSA 29	Azalea (Rhododendron sp.) 'Delaware Valley White'	Field Container	Ahrens/Mervosh	CT	2012	Broadcast	Virtually no injury with 200 and 400, minor with 800 lb per acre applied twice.
31319	Marengo G (Indaziflam 0.0224%)	WSSA 29	Azalea (Rhododendron sp.)	Field Container	Harvey	WA	2012	Broadcast	Data from trial inconclusive because of severe injury in untreated Check.
31320	Marengo G (Indaziflam 0.0224%)	WSSA 29	Rose (Rosa sp.)	Field Container	Harvey	WA	2012	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice.
31320	Marengo G (Indaziflam 0.0224%)	WSSA 29	Rose (Rosa sp.) 'Knockout'	Field Container	Mathers (OSU)	OH	2012	Broadcast	No injury with 200 and 400 lb per acre applied twice; slight, acceptable injury with 800 lb.
30743	Marengo G (Indaziflam 0.0224%)	WSSA 29	Coneflower (Rudbeckia sp.) 'Goldsturm'	Field Container	Boydston	WA	2013	Broadcast	No to slight injury or growth reduction at 0.0446 and 0.0892 lb ai per acre applied twice, moderate at 0.1784 lb; 4X plants not saleable.

PR#	Product	MOA Class	Crop	Production Site	Researcher	State	Year	Application Type	Results
30743	Marengo G (Indaziflam 0.0224%)	WSSA 29	Coneflower (Rudbeckia sp.) 'Goldsturm'	Field Container	Boydston	WA	2014	Broadcast	No injury with 0.0446, slight and moderate with 0.0892 and 0.1784 lb ai per acre applied twice; all 1X- and most 2X-treated plants marketable.
30743	Marengo G (Indaziflam 0.0224%)	WSSA 29	Coneflower (Rudbeckia sp.)	Field Container	Gilliam	AL	2013	Broadcast	Unacceptable injury with 200, 400 and 800 lb per acre applied twice.
30743	Marengo G (Indaziflam 0.0224%)	WSSA 29	Coneflower (Rudbeckia sp.) 'Tiger Eye Gold'	Field Container	Senesac	NY	2014	Broadcast	Slight injury with 0.0448, 0.0896 and 0.1792 lb ai per acre applied twice.
30744	Marengo G (Indaziflam 0.0224%)	WSSA 29	Woodland Sage (Salvia nemorosa) 'Caradonna'	Field Container	Beste/Frank (ARS)	MD	2012	Broadcast	Severe injury with 200, 400 and 800 lb per acre after one application.
30744	Marengo G (Indaziflam 0.0224%)	WSSA 29	Woodland Sage (Salvia nemorosa) 'May Night'	Field Container	Boydston	WA	2012	Broadcast	Slight injury but no growth reduction with 0.0446, 0.0892 and 0.1784 lb ai per acre applied twice; all plants saleable.
30744	Marengo G (Indaziflam 0.0224%)	WSSA 29	Woodland Sage (Salvia nemorosa) 'May Night'	Field Container	Derr	VA	2012	Broadcast	Unacceptable injury with 0.045, 0.089 and 0.178 lb ai per acre applied twice.
30745	Marengo G (Indaziflam 0.0224%)	WSSA 29	Stonecrop (Sedum sp.) 'Kamschaticum'	Field Container	Boydston	WA	2012	Broadcast	No injury or growth reduction with 0.0446 and 0.0892 lb ai per acre applied twice; all plants saleable.
30745	Marengo G (Indaziflam 0.0224%)	WSSA 29	Stonecrop (Sedum sp.) 'Matrona'	Field Container	Boydston	WA	2012	Broadcast	No injury or growth reduction with 200, 400 and 800 lb per acre applied twice; all treated plants saleable.
30745	Marengo G (Indaziflam 0.0224%)	WSSA 29	Stonecrop (Sedum sp.) S. spurium 'Dragon's Blood'	Field Container	Klett	CO	2012	Broadcast	No injury with 200 lb per acre applied twice, slight with 400 and severe with 800; moderate and severe growth reduction at 2X and 4X.
30745	Marengo G (Indaziflam 0.0224%)	WSSA 29	Stonecrop (Sedum sp.)	Field Container	Reding	OH	2012	Broadcast	No injury and no significant difference in growth or marketability at 200, 400 and 800 lb per acre applied twice.
30745	Marengo G (Indaziflam 0.0224%)	WSSA 29	Stonecrop (Sedum sp.) S. ternatum 'Larinem Park'	Field Container	Senesac	NY	2012	Broadcast	Low injury with 0.045, 0.09 and 0.179 lb ai per acre after 1st application; severe injury (lack of vigor and necrosis) after 2nd application.
31440	Marengo G (Indaziflam 0.0224%)	WSSA 29	Red Cedar, Arborvitae (Thuja sp.) T. nigra	Field Container	Mathers (OSU)	OH	2012	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice.
30021	Marengo G (Indaziflam 0.0224%)	WSSA 29	Arrowwood (Viburnum sp.)	Field Container	Harvey	WA	2012	Broadcast	No injury with 200, 400 and 800 lb per acre applied twice.

<b>PR#</b>	<b>Product</b>	<b>MOA Class</b>	<b>Crop</b>	<b>Production Site</b>	<b>Researcher</b>	<b>State</b>	<b>Year</b>	<b>Application Type</b>	<b>Results</b>
30021	Marengo G (Indaziflam 0.0224%)	WSSA 29	Arrowwood (Viburnum sp.) 'Jeddi'	Field Container	Mathers (OSU)	OH	2012	Broadcast	Slight, acceptable injury with 200, 400 and 800 lb per acre applied twice.
30021	Marengo G (Indaziflam 0.0224%)	WSSA 29	Arrowwood (Viburnum sp.) 'St. Veverne'	Field Container	Mathers (OSU)	OH	2012	Broadcast	Moderate injury with 200, 400 and 800 lb per acre applied twice; comparable to untreated check.

## Label Suggestions

It is suggested that the following crops be added to the Marengo G label under the section **'ORNAMENTALS AND THEIR CULTIVARS TOLERANT TO MARENGO G'**:

*Berberis* spp.

*Viburnum* sp.

For Marengo G, it is suggested that several crop species exhibiting moderate to severe injury in testing be placed on the label under the section **'Do not use MARENGO G on any of these plants or their cultivars; injury will occur'**.

*Agave* sp.

*Chasmanthium* sp.

*Delosperma* spp. (stunting)

*Dryopteris* sp.

*Echinacea* sp.

*Hemerocallis* sp.

*Heuchera sanguinea*

*Hosta* sp.

*Iberis* sp.

*Rudbeckia* sp.

*Sedum* sp.



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