



[Environmental Horticulture Program Research Summaries](#)

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

**Authors: Cristi L. Palmer and Ely Vea  
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**Amy Abate  
Susan Bierbrunner**

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## **Abstract**

Indemnify (fluopyram) is a new fungicide being developed by Bayer for the control of nematodes; the current product is only registered for turf uses. The IR-4 Project has completed 37 crop safety trials on 18 environmental horticulture plant species or genera. Two crops (begonia, petunia) exhibited differential responses between foliar and drench applications with no to slight injury observed with foliar sprays, but moderate to severe injury with soil drenches. Four additional crops also did not exhibit injury after foliar or soil applications. Additional data are needed for 12 other crops (including foliar application on petunia) are needed for a definitive conclusion on crop safety.

## Introduction

Indemnify (fluopyram) is a new fungicide being developed by Bayer for the control of nematodes; the current product is only registered for turf uses. The IR-4 Project completed 37 crop safety trials on 18 environmental horticulture plant species or genera in between 2016 and 2019.

## Materials and Methods

Fluopyram was applied as foliar treatment typically 3 times at approximately 14 days intervals. The application rates were 4.25, 8.5 and 17.1 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 protocol was used: 16-004. For more detailed materials and methods, including application rates for various products, please visit <https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-researcher-resources/#Protocols> to view and download these protocols.

Indemnify was supplied to researchers (See list of researchers in Appendix 1) by Bayer.

## Results and Summary

### Phytotoxicity

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

Across all crops tested with fluopyram, 5 crops exhibited no or minimal negative impact. One crop exhibited significant injury at higher rates even though little or no injury was observed at lower rates (Table 2). Two crops tested exhibited damage sufficient to recommend growers not utilize fluopyram drenches (Table 3); however, foliar applications did not impact either crop. There are 12 species or genera, including foliar applications to Petunia, 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 Fluopyram treated crops with no or minimal transitory injury.**

*Antirrhinum majus*  
*Chrysanthemum/Dendranthema sp.*  
*Leucanthemum x superbum*  
*Zinnia elegans*

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

*Begonia sp.* (foliar treatments)

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

*Begonia sp.* (drench treatments)  
*Petunia hybrida* (drench treatments)

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

*Abelia x grandiflora*<sup>2</sup>  
*Anthurium andraeanum*<sup>1</sup>  
*Chamaerops humilis*<sup>1</sup>  
*Coleus sp.*<sup>1</sup>  
*Coreopsis auriculata*<sup>2</sup>  
*Hibiscus sp.*<sup>1</sup>  
*Hosta sp.*<sup>1</sup>  
*Petunia hybrida*<sup>2</sup>  
*Phalaenopsis sp.*<sup>1</sup>  
*Plumeria sp.*<sup>1</sup>  
*Rhaphiolepis indica*<sup>1</sup>  
*Rhododendron sp.*<sup>2</sup>

<sup>1</sup> No or minimal injury in 1 trial.

<sup>2</sup> No or minimal injury in 2 trials.

**Table 5 Detailed Summary of Crop Safety Testing with Fluopyram.**

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 2/20/20 are listed below.

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results
32581	Abelia, Glossy (Abelia x grandiflora)	Field Container	Fraelich	GA	2017	Drench	No injury or growth reduction with 8.5, 17.1 and 34.2 fl oz per 100 gal.
32581	Abelia, Glossy (Abelia x grandiflora)	Field Container	Fraelich	GA	2017	Foliar	No injury or growth reduction with 4.25, 8.5 and 17.1 fl oz per 100 gal applied 3 times.
33013	Flamingo Lily, Painters Palette (Anthurium andraeanum)	Field Container	Cheng	HI	2017	Foliar	No injury with 4.25, 8.5 and 17.1 fl oz per 100 gal applied twice.
32583	Garden Snapdragon (Antirrhinum majus) 'Candy Showers Purple'	Field Container	Freiberger	NJ	2019	Drench	No injury with 8.5, 17.1 and 34.2 fl oz per 100 gal applied twice.
33611	Garden Snapdragon (Antirrhinum majus) 'Montego Yellow'	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction with 8.5, 12.8 and 17.1 fl oz per 100 gal applied 3 times.
33611	Garden Snapdragon (Antirrhinum majus) 'Montego Yellow'	Greenhouse	Freiberger	NJ	2019	Drench	No injury or growth reduction with 8.5, 17.1 and 34.2 fl oz per 100 gal.
32591	Begonia (Begonia sp.) 'Ambassador White'	Greenhouse	Freiberger	NJ	2016	Drench	Moderate injury (leaves turning brown) with 4.25, 8.5 and 17.1 fl oz per 100 gal.
32591	Begonia (Begonia sp.) 'Ambassador White'	Greenhouse	Freiberger	NJ	2016	Foliar	Slight injury (browning at edges of leaves) with 4.25, 8.5 and 17.1 fl oz per 100 gal applied 3 times.
32591	Begonia (Begonia sp.) B. semperflorens 'Bada Bing'	Greenhouse	Hausbeck	MI	2016	Foliar	Slight injury (leaf and flower margin burn) with 4 and 8, moderate with 16 fl oz per 100 gal applied 3 times; no growth reduction.
32591	Begonia (Begonia sp.) 'Dragon Wing Red'	Greenhouse	Freiberger	NJ	2016	Drench	Moderate injury (leaf edges turning brown) with 4.25, 8.5 and 17.1 fl oz per 100 gal; slight to moderate growth reduction with 2X and 4X.
32591	Begonia (Begonia sp.) 'Dragon Wing Red'	Greenhouse	Freiberger	NJ	2016	Foliar	No injury with 4.25 and 8.5, slight (browning at edges of leaves) with 17.1 fl oz per 100 gal applied 3 times.
32591	Begonia (Begonia sp.) 'Illumination Apricot'	Greenhouse	Freiberger	NJ	2016	Drench	Slight to severe injury (chlorosis and stunting) increasing with rates (4.25, 8.5 and 17.1 oz per 100 gal).
33068	Palm, Mediterranean Fan; Dwarf Fan Palm (Chamaerops humilis)	Field Container	Palmateer (UF)	FL	2016	Foliar	No injury or growth reduction with 4.25, 8.5 and 17.1 fl oz per 100 gal applied 3 times.
32590	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) 'Daybreak Yellow'	Field Container	Hausbeck	MI	2019	Foliar	No injury or growth reduction with 8.5, 12.8 and 17.1 fl oz per 100 gal applied 3 times biweekly.
32590	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) 'Fancy Ursula Orange'	Field Container	Freiberger	NJ	2019	Drench	Trial 1: Soluble salt injury confounded initial trial and a second trial was started. However, no injury was observed with 8.5, 17.1 and 34.2 fl oz per 100 gal applied twice.
32590	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) 'Fancy Ursula Orange'	Field Container	Freiberger	NJ	2019	Drench	Trial 2: No injury with 8.5, 17.1 and 34.2 fl oz per 100 gal applied twice.

PR #	Crop	Production Site	Researcher	State	Year	Application Type	Results
32590	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) 'Fancy Ursula Orange-E-SY'	Field Container	Freiberger	NJ	2019	Foliar	No injury or growth reduction with 8.5, 12.8 and 17.1 fl oz per 100 gal applied 3 times biweekly.
32594	Coleus, Flamenettle (Coleus sp.) 'Exhibition Magma'	Greenhouse	Freiberger	NJ	2016	Drench	No injury or growth reduction with 4.25, 8.5 and 17.1 oz per 100 gal.
32588	Tickseed, Largeflower (Coreopsis grandiflora) C. auriculata 'Nana'	Field Container	Fraelich	GA	2017	Drench	No injury or growth reduction with 8.5, 17.1 and 34.2 fl oz per 100 gal.
32588	Tickseed, Largeflower (Coreopsis grandiflora) C. auriculata 'Nana'	Field Container	Fraelich	GA	2017	Foliar	No injury or growth reduction with 4.25, 8.5 and 17.1 fl oz per 100 gal applied 3 times.
33015	Rosemallow (Hibiscus sp.)	Field Container	Cheng	HI	2017	Foliar	No injury with 4.25, 8.5 and 17.1 fl oz per 100 gal applied twice.
32589	Plantain Lily (Hosta sp.)	Field Container	Beckerman	IN	2018	Foliar	No injury or growth reduction with 4.25, 8.5 and 17.1 fl oz per 100 gal applied 3 times.
32587	Daisy (Leucanthemum x superbum) 'Ooh La Lacrosse'	Field Container	Hausbeck	MI	2019	Foliar	No injury or growth reduction with 8.5, 12.8 and 17.1 fl oz per 100 gal applied 3 times biweekly.
32587	Daisy (Leucanthemum x superbum) 'Snowcap'	Field Container	Klett	CO	2016	Drench	No injury or growth reduction with 4.25, 8.5 and 17.1 oz per 100 gal.
32587	Daisy (Leucanthemum x superbum) 'Snowcap'	Field Container	Klett	CO	2016	Foliar	No injury with 4, 7 and 14 oz per 100 gal applied 3 times (7/13, 8/9, 8/23); moderate growth reduction.
32585	Petunia (Petunia hybrida) 'Pretty Flora Red'	Greenhouse	Hausbeck	MI	2019	Foliar	No injury or growth reduction with 8.5, 12.8 and 17.1 fl oz per 100 gal applied 3 times biweekly.
32585	Petunia (Petunia hybrida) 'Pretty Grand Purple'	Greenhouse	Vafaie	TX	2018	Drench	Moderate injury and growth reduction with 8.5, 17.1 and 34.2 fl oz per 100 gal.
32585	Petunia (Petunia hybrida) 'Shockwave Denim'	Greenhouse	Freiberger	NJ	2016	Drench	Moderate injury (leaves turning whitish brown) with 4.25, 8.5 and 17.1 fl oz per 100 gal; slight to moderate growth reduction.
32585	Petunia (Petunia hybrida) 'Shockwave Denim'	Greenhouse	Freiberger	NJ	2016	Foliar	No injury with 4.25 and 8.5, slight (leaf spotting that became less visible and covered by new leaves) with 17.1 fl oz per 100 gal applied 3 times.
33014	Orchid, Moth (Phalaenopsis sp.)	Field Container	Cheng	HI	2017	Foliar	No injury with 4.25, 8.5 and 17.1 fl oz per 100 gal applied twice.
33016	Plumeria (Plumeria sp.)	Field Container	Cheng	HI	2017	Foliar	No injury with 4.25, 8.5 and 17.1 fl oz per 100 gal applied twice.
33017	Indian Hawthorn (Raphiolepis indica)	Field Container	Cheng	HI	2017	Foliar	No injury with 4.25, 8.5 and 17.1 fl oz per 100 gal applied twice.
32592	Azalea (Rhododendron sp.) 'Girard Crimson'	Field Container	Fraelich	GA	2017	Drench	No injury or growth reduction with 8.5, 17.1 and 34.2 fl oz per 100 gal.
32592	Azalea (Rhododendron sp.) 'Girard Crimson'	Field Container	Fraelich	GA	2017	Foliar	No injury or growth reduction with 4.25, 8.5 and 17.1 fl oz per 100 gal applied 3 times.
32586	Zinna, Elegant (Zinnia elegans)	Greenhouse	Nansen	CA	2017	Drench	No injury or growth reduction with 4.25, 8.5 and 17.1 fl oz per 100 gal applied once.
32586	Zinna, Elegant (Zinnia elegans) 'Dreamland Yellow'	Greenhouse	Freiberger	NJ	2016	Drench	No injury or growth reduction with 4.25, 8.5 and 17.1 oz per 100 gal.
32586	Zinna, Elegant (Zinnia elegans) 'Magellan Pink'	Greenhouse	Hand	OH	2016	Foliar	No injury with 4.25, 8.5 and 17.1 fl oz per 100 gal applied 3 times; increased plant width.



## Appendix 1: Contributing Researchers

Dr. Janna Beckerman	Purdue University Lilly Hall Rm 1-321 West Lafayette, IN 47907
Dr. Zhiqiang Cheng	University of Hawai'i Gilmore Hall 609A Honolulu, HI 96822
Mr. Tom Freiberger Mr. Dave Bodine	Rutgers University Cream Ridge Experiment Station 283 Rt. 539 Cream Ridge, NJ 08514
Mr. Ben Fraelich	USDA-ARS 2316 Rainwater Rd. Tifton, GA 31793
Dr. Francesca Hand	Ohio State University Department of Plant Pathology 475C Kottman Hall Columbus, OH 43210
Dr. Mary Hausbeck	Michigan State University Department of Plant Pathology 140 Plant Pathology Building East Lansing, MI 48824
Dr. Jim Klett Ms. Ronda Koski	Colorado State University Department of Horticulture and Landscape Architecture Fort Collins, CO 80423
Dr. Christian Nansen	University of California Department of Entomology and Nematology One Shields Ave Davis, CA 95616
Dr. Aaron Palmateer	University of Florida Tropical Research & Education Center 18905 SW 280 Street Homestead, FL 33031
Mr. Erfan Vafaie	Texas Agrilife Extension Service Overton, TX 75684