



[Environment Horticulture Program Research Summaries](#)

## **IR-4 Environmental Horticulture Program Flumioxazin + Prodiamine Crop Safety**

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Date: December 21, 2021**

**Acknowledgements  
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This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award numbers 2015-34383-23710, 2017-34383-27100, 2019-34383-29973 and 2020-34383-32455 with substantial cooperation and support from the State Agricultural Experiment Stations and USDA-ARS.

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## **Abstract**

Fuerte (flumioxazin + prodiamine) has been registered in the United States since 2018. Starting in 2020, the IR-4 Project has been screening additional crops for their tolerance to over the top applications. During 2018 to 2021, 31 crop safety trials on 20 environmental horticulture plant species or genera. In general, Fuerte exhibited no or minimal negative impact in these trials. Two plant species or genera fell into this category as did 13 additional crops so far with just 1 or 2 trials completed. For two crop species, there was no or little injury exhibited at the 1X or 2X rates, but significant phytotoxicity occurred at 4X.

## Introduction

Fuerte (flumioxazin + prodiamine) has been registered in the United States since 2018. Starting in 2020, the IR-4 Project has been screening additional crops for their tolerance to over the top applications. During 2018 to 2021, 31 crop safety trials on 20 environmental horticulture plant species or genera.

## Materials and Methods

Fuerte (flumioxazin + prodiamine) was applied as an over the top treatment twice at approximately 6 week intervals. The application rates were 100, 200, and 400 lb product per acre (2.75, 5.5 and 11.0 lb ai per acre), 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 8 weeks after initial application. For IR-4 testing, the following protocols were used: 20-013 and 21-013. 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.

Fuerte (flumioxazin + prodiamine) was supplied to researchers (See list of researchers in Appendix 1) by OHP.

## 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 SP3014, and 4) more data are needed to make informed recommendations.

### Phytotoxicity

In general, Fuerte exhibited no or minimal negative impact on a wide range of plant species or genera (**Error! Reference source not found.**, Table 4). Two plant species or genera fell into this category as did 13 additional crops so far with just 1 or 2 trials completed. For two crop species, there was no or little injury exhibited at the 1X or 2X rates, but significant phytotoxicity occurred at 4X (**Error! Reference source not found.**).

Please see Table 6 for a summary of the individual trial results.

**Table 1. List of flumioxazin + prodiamine treated crops with no or minimal transitory injury.**

*Abelia sp*  
*Buxus sp.*

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

*Liriope spicata*  
*Spiraea japonica*

**Table 3. List of flumioxazin + prodiamine treated crops with significant injury at 1X.**

None

**Table 4. List of flumioxazin + prodiamine treated crops where more information is needed.**

<i>Cercis canadensis</i> <sup>1</sup>	<i>Ilex verticillata</i> <sup>1</sup>	<i>Viburnum sp.</i> <sup>1</sup>
<i>Cornus alternifolia</i> <sup>1</sup>	<i>Myrica cerifera</i> <sup>1</sup>	<i>Vinca major</i> <sup>1</sup>
<i>Cornus kousa</i> <sup>1</sup>	<i>Picea glauca 'Conica'</i> <sup>1</sup>	<i>Vinca minor</i> <sup>2</sup>
<i>Cornus sericea</i> <sup>2</sup>	<i>Pinus nigra</i> <sup>1</sup>	
<i>Cotoneaster sp.</i> <sup>1</sup>	<i>Rosa sp.</i>	

<sup>1</sup> No injury in 1 trial  
<sup>2</sup> No injury in 2 trials

**Table 5. Average crop safety rating after over the top applications of flumioxazin + prodiamine**

Crop	Fuerte Rating with Over-the-top Applications
<i>Abelia sp.</i>	1.3 (1 - 2) n3
<i>Buxus sp.</i>	1.0 (1 - 1) n3
<i>Cercis canadensis</i>	1.0 (1 - 1) n1
<i>Cornus alternifolia</i>	1.0 (1 - 1) n1
<i>Cornus florida</i>	2.0 (2 - 2) n1
<i>Cornus kousa</i>	1.0 (1 - 1) n1
<i>Cornus sericea</i>	1.5 (1 - 2) n2
<i>Cotoneaster sp.</i>	1.0 (1 - 1) n1
<i>Ilex verticillata</i>	1.0 (1 - 1) n1
<i>Liriope spicata</i>	2.3 (1 - 3) n3
<i>Magnolia grandiflora</i>	1.0 (1 - 1) n1
<i>Myrica cerifera</i>	1.0 (1 - 1) n1
<i>Picea glauca 'Conica'</i>	1.0 (1 - 1) n1
<i>Pinus nigra</i>	1.0 (1 - 1) n1
<i>Pinus strobus</i>	1.0 (1 - 1) n2
<i>Rosa sp.</i>	3.0 (3 - 3) n1
<i>Spiraea japonica</i>	1.7 (1 - 3) n3
<i>Viburnum sp.</i>	1.0 (1 - 1) n1
<i>Vinca major</i>	1.0 (1 - 1) n1
<i>Vinca minor</i>	1.0 (1 - 1) n2

Average rating on a scale of 1 – 5 with 1 = 0 to about no injury and 5 = severe injury and mortality; minimum to maximum rating; number of trials. A rating of 3 or higher is considered commercially unacceptable.

**Table 6. Detailed Summary of Crop Safety Testing with flumioxazin + prodiamine.**

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 11/20/2021 are listed below.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
33657	Abelia (Abelia sp.) A. grandiflora 'Lucky Lots'	Field Container	Moretti	OR	2020	Over the top	No injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33657	Abelia (Abelia sp.) A. x grandiflora 'Radiance'	Field Container	Senesac	NY	2021	Over the top	Minor transient injury increasing with rate (2.75, 5.5, 11.0 lb ai per acre).
33657	Abelia (Abelia sp.) 'Rose Creek'	Field Container	Witcher	TN	2020	Over the top	No injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33651	Boxwood (Buxus sp.) Buxus microphylla var. japonica 'Winter Gem'	Field Container	Fraelich	GA	2020	Over the top	No injury or significant growth reduction with 100, 200 and 400 lb per acre applied twice; all treated plants marketable.
33651	Boxwood (Buxus sp.) B. microphylla japonica 'Green Beauty'	Field Container	Koivunen	CA	2020	Over the top	No injury and significant growth reduction with 100, 200 and 400 lb per acre applied twice.
33651	Boxwood (Buxus sp.) B. sempervirens 'Petite Pillar'	Field Container	Moretti	OR	2020	Over the top	No injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33668	American Redbud, Eastern Redbud (Cercis canadensis) Cercis occidentalis	Field Container	Moretti	OR	2021	Over the top	No significant injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
33654	Dogwood, Pagoda (Cornus alternifolia)	Field Container	Moretti	OR	2021	Over the top	No significant injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
33652	Dogwood, Flowering (Cornus florida)	Field Container	Senesac	NY	2021	Over the top	No to minor transient injury dissipating by 4 WAT increasing with rate (2.75, 5.5, 11.0 lb ai per acre).
33653	Dogwood, Kousa (Cornus kousa)	Field Container	Moretti	OR	2021	Over the top	No significant injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
33655	Dogwood, Red Osier (Cornus sericea)	Field Container	Moretti	OR	2021	Over the top	No significant injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
33655	Dogwood, Red Osier (Cornus sericea)	Field Container	Senesac	NY	2021	Over the top	No injury with 2.75 and 5.5 lb ai per acre; minor injury observed only 1 WAT with 11.0 lb ai per acre.
33665	Cotoneaster (Cotoneaster sp.) C. dammeri 'Streib's Findling'	Field Container	Moretti	OR	2020	Over the top	No injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33663	Common Winterberry (Ilex verticillata) 'Berry Poppins'	Field Container	Moretti	OR	2021	Over the top	No significant injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
33666	Liriope, Creeping (Liriope spicata)	Field Container	Moretti	OR	2021	Over the top	Minor injury and growth reduction with 100 and 200, moderate with 400 lb per acre applied twice.
33666	Liriope, Creeping (Liriope spicata)	Field Container	Senesac	NY	2020	Over the top	Minor to moderate injury increasing with rate (2.75, 5.5, 11.0 lb ai per acre)
33666	Liriope, Creeping (Liriope spicata)	Field Container	Witcher	TN	2020	Over the top	No injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33667	Magnolia, Southern (Magnolia grandiflora)	Field Container	Senesac	NY	2021	Over the top	No injury with 2.75, 5.5 and 11.0 lb ai per acre.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
33664	Wax Myrtle ( <i>Myrica cerifera</i> )	Field Container	Witcher	TN	2020	Over the top	No injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33660	Spruce, Dwarf Alberta ( <i>Picea glauca</i> 'Conica')	Field Container	Moretti	OR	2021	Over the top	No significant injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
33658	Pine, Austrian ( <i>Pinus nigra</i> )	Field Container	Moretti	OR	2020	Over the top	No injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33659	Pine, Eastern White ( <i>Pinus strobus</i> )	Field Container	Seefeldt	WA	2020	Over the top	No injury and no impact on growth at 100, 200, 400 lb product per acre.
33659	Pine, Eastern White ( <i>Pinus strobus</i> )	Field Container	Senesac	NY	2021	Over the top	No injury with 2.75, 5.5 and 11.0 lb ai per acre.
33662	Rose ( <i>Rosa</i> sp.) 'Grace and Grit'	Field Container	Moretti	OR	2020	Over the top	No significant injury with 100 and 200, moderate initial injury with 400 lb per acre with complete recovery.
33650	Japanese Meadowsweet ( <i>Spiraea japonica</i> ) 'Double Play Red'	Field Container	Derr	VA	2020	Over the top	No significant injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33650	Japanese Meadowsweet ( <i>Spiraea japonica</i> ) 'Lil Sizzle'	Field Container	Moretti	OR	2020	Over the top	No injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33650	Japanese Meadowsweet ( <i>Spiraea japonica</i> ) 'Little Princess'	Field Container	Neal	NC	2020	Over the top	No significant injury with 100 and 200 lb per acre applied twice, minor to moderate with 400 lb per acre.
33661	Arrowwood ( <i>Viburnum</i> sp.) <i>V. dentatum</i> 'Sparkler'	Field Container	Moretti	OR	2020	Over the top	No injury and growth reduction with 100, 200 and 400 lb per acre applied twice.
33670	Periwinkle, Big ( <i>Vinca major</i> ) 'Variegata'	Field Container	Moretti	OR	2021	Over the top	No significant injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
33671	Periwinkle, Common ( <i>Vinca minor</i> ) 'Bowles'	Field Container	Aulakh	CT	2020	Over the top	No injury or growth reduction with 100, 200 and 400 lb per acre applied twice.
33671	Periwinkle, Common ( <i>Vinca minor</i> ) 'Bowles Blue'	Field Container	Koivunen	CA	2020	Over the top	No injury and significant growth reduction with 100, 200 and 400 lb per acre applied twice.



## **Label Suggestions**

Based on the current data available, no label changes are recommended at this time.

## Appendix 1: Contributing Researchers

Dr. Jatinder S Aulakh	Connecticut Agricultural Experiment Station Valley Laboratory 143 Cook Hill Road, P.O. Box 228 Windsor, CT
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