



Environment Horticulture Program Research Summaries

IR-4 Environmental Horticulture Program Isoxaben + Dithiopyr Crop Safety

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Abstract

Fortress (isoxaben + dithiopyr) was registered in 2018 for environmental horticulture crop uses. Between 2018 and 2020, IR-4 examined 17 crop species / genera to expand this label to other crops. Of these, 2 crop species (*Hydrangea macrophylla* and *H. paniculata*) exhibited no or transient injury. Eight crops exhibited significant injury in this research: *Digitalis grandiflora* and *D. purpurea*.

Introduction

Fortress (isoxaben + dithiopyr) was recently registered for environmental horticulture crop uses. Between 2018 and 2020, IR-4 examined 17 crop species / genera to expand this label to other crops.

Materials and Methods

Fortress at rates of 150, 300 and 600 lb per acre was applied over-the-top twice at 6 weeks intervals, with the first application within 7 days after potting. 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 each application. For IR-4 testing, the following protocols were used: 18-012 and 19-012 and 20-013. For more detailed materials and methods, please visit <https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-researcher-resources/#Protocols> to view and download these protocols.

Fiesta was supplied to researchers (See list of researchers in Appendix 1) by OHP.

Results and Summary

Phytotoxicity

Based on the type and nature of injury seen with isoxaben + dithiopyr applications in the research conducted between 2018 and 2020, 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 are needed to make informed recommendations.

In testing from 2018 and 2020, Fortress exhibited no or minimal negative impact on 3 plant species (Table 1). In this report no crop species was found to exhibit little or no injury at the 150 lb per acre rate, and with significant phytotoxicity at the 300 and 600 lb per acre rates (Tables 2). There were 2 crop species in the testing that exhibited damage sufficient to recommend growers not utilize Fortress as an over-the-top treatment for postemergent weed control (Table 3).

IR-4 has not generated sufficient information to categorize crop response to Fortress applications on 14 species / genera (Table 4). However, no injury was observed on all species / genera. Five of these 14 have already been placed on the label based upon other research.

Please see Table 5 for a list of research and the summary of the results received for research conducted with Fortress from 2018-2020.

Table 1. List of Fortress treated crops with no or minimal transitory injury.

Hydrangea macrophylla
Hydrangea paniculata

Hydrangea quercifolia

¹ Already registered

² Crop safety testing was conducted with 4 applications over 2 years.

Table 2. List of Fortress 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 Fortress treated crops exhibiting significant injury at 1X

Digitalis grandiflora

Digitalis. purpurea

Table 4. List of Fortress treated crops where more research is needed to clarify response

Achillea millefolium^{1,2}

Achillea sp.^{1,2}

*Chrysanthemum x rubellum*²

*Chrysanthemum sp.*²

*Coreopsis sp.*²

Dianthus gratianopolitanus 'Georgia Peach Pie'²

Liriope muscari^{1,2}

*Muhlenbergia capillaris*²

*Nassella tenuissima*²

Pennisetum setaceum^{1,2}

Perovskia atriplicifolia^{1,2}

*Salvia sp.*²

*Salvia sylvestris*²

¹ Already registered

² No injury in 1 or 2 trials conducted.

³ No injury in 3 trials conducted; in 1 of 3 trials, moderate growth reduction observed.

Table 5. Detailed Summary of Crop Safety Testing with Fortress.

Notes: Table entries are sorted by crop Latin name. Only those reports received by 4/8/2021 are included.

PR#	Product	Crop	Production Site	Researcher	State	Year	Application Type	Results
33649	Fortress (OHP1701B) (isoxaben + dithiopyr)	Yarrow (Achillea sp.) A. millefolium 'New Vintage Rose'	Field Container	Mathers	OH	2019	Over the top	Minor injury with 1.125, moderate with 2.25 and 4.5 lb ai per acre applied twice; moderate growth reduction at 4X.
33649	Fortress (OHP1701B) (isoxaben + dithiopyr)	Yarrow (Achillea sp.) 'Desert Eve Deep Rose'	Field Container	Witcher	TN	2019	Over the top	No injury or growth reduction with 150, 300 and 600 lb per acre applied twice.
33454	Fortress (OHP1701B) (isoxaben + dithiopyr)	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.)	Field Container	Seefeldt	WA	2019	Over the top	No injury or growth reduction with 1.12, 2.25 and 4.5 lb ai per acre applied twice.
33454	Fortress (OHP1701B) (isoxaben + dithiopyr)	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) C. x rubellum 'Clara Curtis'	Field Container	Senesac	NY	2019	Over the top	No injury or stunting with 150, 300 and 600 lb per acre applied twice.
33454	Fortress (OHP1701B) (isoxaben + dithiopyr)	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) 'Fancy Ursula Orange'	Field Container	Witcher	TN	2019	Over the top	No injury or growth reduction with 150, 300 and 600 lb per acre applied twice.
33449	Fortress (OHP1701B) (isoxaben + dithiopyr)	Tickseed (Coreopsis sp.) 'Ladybird'	Field Container	Mathers	OH	2019	Over the top	Minor, acceptable injury and growth reduction with 1.125, 2.25 and 4.5 lb ai per acre applied twice.
33449	Fortress (OHP1701B) (isoxaben + dithiopyr)	Tickseed (Coreopsis sp.) 'Jethro Tull'	Field Container	Witcher	TN	2019	Over the top	No injury or growth reduction with 150, 300 and 600 lb per acre applied twice.
33648	Fortress (OHP1701B) (isoxaben + dithiopyr)	Cheddar Pink (Dianthus gratianopolitanus) 'Georgia Peach Pie'	Field Container	Klett	CO	2020	Over the top	No injury or significant growth reduction, and no effect on flower production or bloom time, with 150, 300 and 600 lb per acre applied twice.
33455	Fortress (OHP1701B) (isoxaben + dithiopyr)	Foxglove, Yellow (Digitalis grandiflora) D. purpurea 'Pam's Choice'	Field Container	Mathers	OH	2019	Over the top	Severe injury with 1.125, 2.25 and 4.5 lb ai per acre applied once.
33455	Fortress (OHP1701B) (isoxaben + dithiopyr)	Foxglove, Yellow (Digitalis grandiflora)	Field Container	Senesac	NY	2019	Over the top	Severe injury with 150, 300 and 600 lb per acre applied twice.
33460	Fortress (OHP1701B) (isoxaben + dithiopyr)	Blue Fescue (Festuca cinerea) Festuca glauca	Field Container	Koivunen	CA	2020	Over the top	No injury and significant growth reduction with 150, 300 and 600 lb per acre applied twice.
33645	Fortress (OHP1701B) (isoxaben + dithiopyr)	Bigleaf Hydrangea (Hydrangea macrophylla) 'Lets Dance Rave'	Field Container	Derr	VA	2020	Over the top	No to minor injury and growth reduction with 150, 300 and 600 lb per acre applied twice.
33645	Fortress (OHP1701B) (isoxaben + dithiopyr)	Bigleaf Hydrangea (Hydrangea macrophylla)	Field Container	Nackley	OR	2019	Over the top	No significant injury with 150, 300 and 600 lb per acre applied twice.
33645	Fortress (OHP1701B) (isoxaben + dithiopyr)	Bigleaf Hydrangea (Hydrangea macrophylla) 'Paraplu'	Field Container	Senesac	NY	2019	Over the top	No injury with 150, 300 and 600 lb per acre applied twice.

33646	Fortress (OHP1701B) (isoxaben + dithiopyr)	Panicle Hydrangea (<i>Hydrangea paniculata</i>) 'Fire Light'	Field Container	Derr	VA	2020	Over the top	No to minor injury and growth reduction with 150, 300 and 600 lb per acre applied twice.
33646	Fortress (OHP1701B) (isoxaben + dithiopyr)	Panicle Hydrangea (<i>Hydrangea paniculata</i>) 'Pinky Winky'	Field Container	Mathers	OH	2019	Over the top	Moderate initial injury, with complete recovery, with 1.125, 2.25 and 4.5 lb ai per acre applied twice; no significant growth reduction.
33646	Fortress (OHP1701B) (isoxaben + dithiopyr)	Panicle Hydrangea (<i>Hydrangea paniculata</i>)	Field Container	Nackley	OR	2019	Over the top	No significant injury with 150, 300 and 600 lb per acre applied twice.
33647	Fortress (OHP1701B) (isoxaben + dithiopyr)	Hydrangea, Oakleaf (<i>Hydrangea quercifolia</i>)	Field Container	Derr	VA	2020	Over the top	No significant injury and growth reduction with 150, 300 and 600 lb per acre applied twice.
33647	Fortress (OHP1701B) (isoxaben + dithiopyr)	Hydrangea, Oakleaf (<i>Hydrangea quercifolia</i>) 'Jetstream'	Field Container	Mathers	OH	2019	Over the top	Minor, acceptable injury with 1.125, 2.25 and 4.5 lb ai per acre applied twice; moderate growth reduction at 4X.
33647	Fortress (OHP1701B) (isoxaben + dithiopyr)	Hydrangea, Oakleaf (<i>Hydrangea quercifolia</i>)	Field Container	Nackley	OR	2019	Over the top	No significant injury with 150, 300 and 600 lb per acre applied twice.
33457	Fortress (OHP1701B) (isoxaben + dithiopyr)	Lilyturf, Big Blue (<i>Liriope muscari</i>) 'Big Blue'	Field Container	Marble	FL	2019	Over the top	No injury or growth reduction with 150, 300 and 600 lb per acre applied twice.
33457	Fortress (OHP1701B) (isoxaben + dithiopyr)	Lilyturf, Big Blue (<i>Liriope muscari</i>) 'Superblue'	Field Container	Senesac	NY	2019	Over the top	Minor to moderate injury with 150, 300 and 600 lb per acre applied twice; no stunting.
33457	Fortress (OHP1701B) (isoxaben + dithiopyr)	Lilyturf, Big Blue (<i>Liriope muscari</i>) 'Big Blue'	Field Container	Witcher	TN	2018	Over the top	No injury or growth reduction with 150, 300 and 600 lb per acre applied twice.
33459	Fortress (OHP1701B) (isoxaben + dithiopyr)	Muhly, Hairyawn (<i>Muhlenbergia capillaris</i>)	Field Container	Senesac	NY	2019	Over the top	No injury or stunting with 150, 300 and 600 lb per acre applied twice.
33459	Fortress (OHP1701B) (isoxaben + dithiopyr)	Muhly, Hairyawn (<i>Muhlenbergia capillaris</i>)	Field Container	Witcher	TN	2018	Over the top	No injury or growth reduction with 150, 300 and 600 lb per acre applied twice.
33462	Fortress (OHP1701B) (isoxaben + dithiopyr)	Finestem Needlegrass (<i>Nassella tenuissima</i>)	Field Container	Senesac	NY	2019	Over the top	No injury or stunting with 150, 300 and 600 lb per acre applied twice.
33458	Fortress (OHP1701B) (isoxaben + dithiopyr)	Crimson Fountain Grass (<i>Pennisetum setaceum</i>) 'Fireworks'	Field Container	Senesac	NY	2019	Over the top	No injury with 150 and 300, very minor with 600 lb per acre applied twice; no stunting.
33458	Fortress (OHP1701B) (isoxaben + dithiopyr)	Crimson Fountain Grass (<i>Pennisetum setaceum</i>)	Field Container	Witcher	TN	2018	Over the top	No injury or growth reduction with 150, 300 and 600 lb per acre applied twice.
33450	Fortress (OHP1701B) (isoxaben + dithiopyr)	Sage, Russian (<i>Perovskia atriplicifolia</i>) 'Crazy Blue'	Field Container	Mathers	OH	2019	Over the top	Minor injury with 1.125, moderate with 2.25 and 4.5 lb ai per acre applied twice; minor growth reduction at all rates.
33450	Fortress (OHP1701B) (isoxaben + dithiopyr)	Sage, Russian (<i>Perovskia atriplicifolia</i>) 'Filigran'	Field Container	Senesac	NY	2019	Over the top	No injury or stunting with 150, 300 and 600 lb per acre applied twice.
33448	Fortress (OHP1701B) (isoxaben + dithiopyr)	Sage (<i>Salvia</i> sp.) <i>S. sylvestris</i> 'May Night'	Field Container	Mathers	OH	2019	Over the top	Minor injury with 1.125, moderate with 2.25 and 4.5 lb ai per acre applied twice; moderate growth reduction at all rates.
33448	Fortress (OHP1701B) (isoxaben + dithiopyr)	Sage (<i>Salvia</i> sp.) 'May Night'	Field Container	Witcher	TN	2018	Over the top	No injury or growth reduction with 150, 300 and 600 lb per acre applied twice.

Label Suggestions

For Fortress, it is suggested that the following three crop species exhibiting no injury in the testing with over-the-top applications of Fortress be placed on the label.

Hydrangea macrophylla

Hydrangea paniculata

Hydrangea quercifolia

We also suggest that the 2 plant species exhibiting significant injury with over-the-top applications be added to the sensitive species list.

Digitalis grandiflora

Digitalis purpurea

Given the lack of phytotoxicity across virtually all plant species and genera, it is suggested that all the 8 plants in Table 4 (listed below) that showed no injury be added to the Fortress label if OHP possesses similar results on these crops:

*Chrysanthemum x rubellum*²

Chrysanthemum sp.²

Coreopsis sp.²

Dianthus gratianopolitanus 'Georgia Peach Pie'²

*Muhlenbergia capillaris*²

*Nassella tenuissima*²

Salvia sp.²

*Salvia sylvestris*²

Appendix 1: Contributing Researchers

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