Environment Horticulture Program Research Summaries

IR-4 Environmental Horticulture Program
Trinity (Triticonazole) Crop Safety

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Abstract

Triticonazole was registered as Trinity 2SC in the United States in 2007 as a turf fungicide. Trinity SC was expanded to diseases of environmental horticulture diseases in 2013. Because triticonazole is in the triazole class, it could cause symptoms similar to plant growth regulators and testing was warranted on additional herbaceous and woody perennial species. Between 2010 and 2017, the IR-4 Project completed 187 trials on 42 plant genera or species examining phytotoxicity related to foliar applications of Trinity 2SC. In this report, 32 species or genera exhibited minimal or no injury after foliar treatments of Trinity 2SC (triticonazole) at 6, 12 and 24 fl oz per 100gal; 20 of these are already on the label. We recommend that the following 12 species or genera be added to the current label: *Alyssum sp, Buxus sp., Chaemerops humilis, Cornus sp., Dahlia sp., Gaillardia x grandiflora*, *Hedera helix*, *Ilex sp., Lantana sp., Pseudotsuga menziesii, Osteospermum sp*. and *Salvia officinalis*.

Introduction

Triticonazole was registered as Trinity 2SC in the United States in 2007 as a turf fungicide. Trinity SC was expanded to diseases of environmental horticulture diseases in 2013. Because triticonazole is in the triazole class, it could cause symptoms similar to plant growth regulators and testing was warranted on additional herbaceous and woody perennial species. Between 2010 and 2017, the IR-4 Project completed 187 trials on 42 plant genera or species examining phytotoxicity related to foliar applications of Trinity 2SC.

Materials and Methods

Trinity 2SC was tested applied as foliar treatment typically thrice (3 times) at approximately 14 days intervals. The application rates during 2010 were 4, 8, and 16 fl oz per 100 gal, plus a water treated control. During 2011, application rates became 6, 12, and 24 fl oz per 100 gal, plus a water treated control. A minimum of six plants (replicate treatments) were required. Phytotoxicity was planned to be recorded on a scale of 0 to 10 (0 = No phytotoxicity; 10 = Complete kill), although one research used a 0 to 5 or a 1 to 10 scale instead. Phytotoxicity was rated 7 days after each application. For IR-4 testing, the following protocols were used: 10-015, 11-008, 12-010, 13-010, 14-003, 15-003 and 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.

Trinity 2SC was supplied to researchers (See list of researchers in Appendix 1) by BASF.

Results and Summary

Phytotoxicity

Based on the type and nature of injury seen with Trinity applications in the conducted research, tested plant species were placed into five 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 this product, and 4) variable responses were observed across trials, and 5) more data are needed to make informed recommendations.

Trinity exhibited no or minimal negative impact on 4 plant genera or species with drench applications (Table 1). For 15 genera/species, more information is needed because only 1 or 2 trials were conducted (Table 5). However, no injury was observed in these trials.

Please see Table 6 for a list of individual trial summaries for Trinity 2SC.

Table 1. List of Trinity 2SC treated crops with no or minimal transitory injury.

Acer sp. [1]
Alyssum sp. (See Davis 2011)
Antirrhinum majus [1]
Buxus sp.
Calibrachoa sp. [1]
Camellia sp. [1]
Chaemerops humilis
Chrysanthemum/Dendrathema sp. [1]
Cornus sp.
Dahlia sp.
Gaillardia x grandiflora
Hedera helix
Hemerocallis sp. [1]
Hydrangea sp.[1]
Ilex sp.
Lantana sp.
Liriope sp. [1]
Malus sp. [1]
Osteospermum sp. (See Williams 2013)
Pelargonium sp. [1]
Petunia sp. [1]
Pseudotsuga menziesii
Quercus sp. [1]
Rhododendron sp (azalea) [1]
Rhododendron sp. (rhododendron) [1]
Rosa sp. [1]
Salvia officinalis
Tagetes sp. [1]
Verbena sp. [1]
Viburnum sp. [1]
Viola sp. [1]
Zinnia sp.[1]

Table 2. List of Trinity 2SC 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 Trinity 2SC treated crops exhibiting significant injury.

None

Table 4. List of Trinity 2SC treated crops where more information is needed.

Begonia sp. [1] (see Davis 2011 and Wade 2012)
Impatiens hawkeri [1] (See Davis 2011)

[1]Injury observed was stunting; these crops are already listed on the label.

Table 5. List of Trinity 2SC treated crops with less than 3 trials.

Cortaderia sp.
Lobularia maritima [1]
Loropetalum sp.
Nandina domestica [1]
Pennisetum setaceum
Photinia sp.
Pseudotsuga menziesii
Pyrus callyerana
Raphiolepis indica
Raphiolepis umbellata
Tulipa sp.

Table 6. Detailed Summary of Crop Safety Testing with Triticonazole.

Note: Table entries are sorted by crop Latin name. Only those trials with research reports received by 11/2/2023 are listed below.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
29433	Maple (Acer sp.) Acer palmatum	Field Container	DeFrancesco	OR	2010	Foliar	No injury or growth reduction at 4, 8 and 16 fl oz per 100 gal applied 3 times.
29433	Maple (Acer sp.) 'October Glory'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29433	Maple (Acer sp.) 'Autumn Blaze'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29433	Maple (Acer sp.) 'Green Mountain'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29433	Maple (Acer sp.) 'October Glory'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29433	Maple (Acer sp.) 'Red Sunset'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29433	Maple (Acer sp.) Acer rubrum 'Franksred'	Field Container	Pscheidt	OR	2010	Foliar	No injury or growth reduction at 4, 8 and 16 fl oz per 100 gal.
31134	Madwort (Alyssum sp.) 'Wonderland Rose'	Field Container	Davis	MI	2011	Foliar	No injury or growth reduction with 4 and 8 fl oz per 100 gal applied three times; unacceptable flower injury at 16 fl oz.
31134	Madwort (Alyssum sp.) 'Clear Crystal Purple and 'Deep Purple'	Field Container	Freiberger	NJ	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
31134	Madwort (Alyssum sp.) A. saxitile 'Summit'	Field Container	Freiberger	NJ	2014	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
31134	Madwort (Alyssum sp.)	Field Container	Reding	OH	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
30392	Garden Snapdragon (Antirrhinum majus) 'Chimes Rose'	Field Container	Davis	MI	2011	Foliar	No injury or growth reduction with 4, 8 and 16 fl oz per 100 gal applied three times.
29448	Garden Snapdragon (Antirrhinum majus) 'Rocket Red'	Greenhouse	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29448	Garden Snapdragon (Antirrhinum majus) 'Sonnet Mix'	Greenhouse	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
30392	Garden Snapdragon (Antirrhinum majus) 'Peachey Dragon'	Field Container	Freiberger	NJ	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29448	Garden Snapdragon (Antirrhinum majus) 'Montego'	Greenhouse	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
30392	Garden Snapdragon (Antirrhinum majus) 'Montego Mix'	Field Container	Grunwald	OR	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
30392	Garden Snapdragon (Antirrhinum majus)	Field Container	Reding	OH	2012	Foliar	No injury and no significant difference in growth or marketability with 6, 12 and 24 fl oz per 100 gal applied 3 times.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
29445	Begonia (Begonia sp.) 'Red'	Greenhouse	Davis	MI	2011	Foliar	No injury with 4, 8 and 16 fl oz per 100 gal applied three times; unacceptable stunting at 2X and 4X.
29445	Begonia (Begonia sp.) 'Baby Wing Pink'	Greenhouse	Freiberger	NJ	2010	Foliar	No injury at 4, 8, and 16 fl oz per 100 gal after one application, slight at 4X after the 3rd application.
29445	Begonia (Begonia sp.) 'Whiskey Br Wh'	Greenhouse	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29445	Begonia (Begonia sp.) B. x tuberhybrida 'Mocca Mix'	Greenhouse	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29445	Begonia (Begonia sp.) Solenostemon scutellarioides 'Big Red Green Leaf'	Greenhouse	Hausbeck	MI	2010	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30368	Begonia (Begonia sp.) 'Super Olympia Red'	Field Container	Wade	SC	2012	Foliar	Unacceptable stunting and discoloration with 6, 12 and 24 fl oz per 100 gal applied 3 times.
31495	Boxwood (Buxus sp.) B. microphylla 'Winter Gem'	Field Container	Pscheidt	OR	2013	Foliar	No injury or growth reduction with 12 and 24 fl oz per 100 gal applied 3 times.
31495	Boxwood (Buxus sp.) B. microphylla 'Winter Gem'	Field Container	Pscheidt	OR	2013	Foliar	No injury or height reduction with 12 and 24 fl oz per 100 gal applied 3 times.
31495	Boxwood (Buxus sp.) B. sempervirens 'Suffruticosa'	Field Container	Pscheidt	OR	2013	Foliar	No injury or growth reduction with 12 and 24 fl oz per 100 gal applied 3 times.
31495	Boxwood (Buxus sp.) B. sempervirens 'Suffruticosa'	Field Container	Pscheidt	OR	2013	Foliar	No injury or height reduction with 12 and 24 fl oz per 100 gal applied 3 times.
31495	Boxwood (Buxus sp.) 'Green Velvet'	Field Container	Pscheidt	OR	2013	Foliar	No injury or growth reduction with 12 and 24 fl oz per 100 gal applied 3 times.
31495	Boxwood (Buxus sp.) 'Green Velvet'	Field Container	Pscheidt	OR	2014	Foliar	No injury or height reduction with 12 and 24 fl oz per 100 gal applied 3 times.
30729	Calibrachoa (Calibrachoa sp.) 'Minifamous Red'	Greenhouse	Grunwald	OR	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
30729	Calibrachoa (Calibrachoa sp.) 'Mini-famous Orange'	Greenhouse	Grunwald	OR	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
30729	Calibrachoa (Calibrachoa sp.) C. x hybrida 'Cabaret Lavender'	Greenhouse	Hausbeck	MI	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30729	Calibrachoa (Calibrachoa sp.)	Greenhouse	Williams	IL	2013	Drench	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times at monthly intervals; moderate growth reduction.
30729	Calibrachoa (Calibrachoa sp.)	Greenhouse	Williams	IL	2013	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times at monthly intervals; moderate growth reduction.
30729	Calibrachoa (Calibrachoa sp.) 'Cabaret Purple'	Greenhouse	Williams-Woodward	GA	2013	Foliar	No significant injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29437	Camellia (Camellia sp.) C. japonica 'Nuccio's Pearl'	Field Container	DeFrancesco	OR	2011	Foliar	No injury or growth reduction with 6, 12, and 24 fl oz per 100 gal.
29437	Camellia (Camellia sp.) C. x hybrida 'Freedom Bell'	Field Container	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29437	Camellia (Camellia sp.) C. sinensis	Field Container	Wade	SC	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.; all plants marketable.
30056	Palm, Mediterranean Fan; Dwarf Fan Palm (Chamaerops humilis)	Field Container	Palmateer (UF)	FL	2016	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
30056	Palm, Mediterranean Fan; Dwarf Fan Palm (Chamaerops humilis)	Field Container	Uber	CA	2016	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30056	Palm, Mediterranean Fan; Dwarf Fan Palm (Chamaerops humilis)	Field Container	Wade	SC	2015	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
29483	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) 'Clara Curtis'	Field Container	Grunwald	OR	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29483	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) 'Clara Curtis'	Field Container	Grunwald	OR	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
29483	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.)	Field Container	Reding	OH	2012	Foliar	No injury and no significant difference in growth or marketability with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29483	Chrysanthemum, Garden (Chrysanthemum/Dendranthema sp.) Dendrathema sp.	Field Container	Wade	SC	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.; all plants marketable.
29431	Dogwood (Cornus sp.)	Field Container	Harvey	WA	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29431	Dogwood (Cornus sp.) 'Baileyi'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29431	Dogwood (Cornus sp.) Pink'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29431	Dogwood (Cornus sp.) 'Red'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30066	Pampas Grass (Cortaderia sp.)	Field Container	Harvey	WA	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30376	Dahlia (Dahlia sp.) 'Figaro Mix'	Field Container	Davis	MI	2011	Foliar	No injury or growth reduction with 4, 8 and 16 fl oz per 100 gal applied three times.
30376	Dahlia (Dahlia sp.) 'Figaro Mix'	Field Container	Freiberger	NJ	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30376	Dahlia (Dahlia sp.) 'Mystic Wonder'	Field Container	Koivunen	CA	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30319	Blanket Flower (Gaillardia x grandiflora) 'Golden Goblin'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
30319	Blanket Flower (Gaillardia x grandiflora) 'Goblin'	Field Container	Koivunen	CA	2016	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times biweekly.
30319	Blanket Flower (Gaillardia x grandiflora) 'Arizona Red Shades'	Field Container	Reding	OH	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
29440	Ivy, English (Hedera helix)	Field Container	Fraelich	GA	2015	Foliar	No injury or difference in plant growth and marketability with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29440	Ivy, English (Hedera helix)	Field Container	Harvey	WA	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29440	Ivy, English (Hedera helix)	Field Container	Reding	OH	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
29442	Daylily (Hemerocallis sp.) 'Big Time Happy'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29442	Daylily (Hemerocallis sp.) 'Raspberry Pixie'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29442	Daylily (Hemerocallis sp.)	Field Container	Harvey	WA	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29442	Daylily (Hemerocallis sp.) 'Chicago Apache'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29442	Daylily (Hemerocallis sp.) 'Little Grapette'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29442	Daylily (Hemerocallis sp.) 'Mini Pearl'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29442	Daylily (Hemerocallis sp.) 'Siloam Double Classic'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29442	Daylily (Hemerocallis sp.) 'Stella de Oro'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29442	Daylily (Hemerocallis sp.) 'Strawberry Candy'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29435	Hydrangea (Hydrangea sp.) 'Glowing Ambers'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29435	Hydrangea (Hydrangea sp.) H. macrophylla 'Taube'	Field Container	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29435	Hydrangea (Hydrangea sp.)	Field Container	Harvey	WA	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29435	Hydrangea (Hydrangea sp.) 'Limelight'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29435	Hydrangea (Hydrangea sp.) 'Pinky Winky'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
30058	Holly (Ilex sp.) I. verticillata	Field Container	DeFrancesco	OR	2014	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30058	Holly (Ilex sp.) 'Emerald Collonade'	Field Container	Fraelich	GA	2014	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30058	Holly (Ilex sp.) Ilex x merserveae 'Castle Wall'	Field Container	Reding	OH	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
30369	Impatiens, New Guinea (Impatiens hawkeri) I. walleriana 'Stardust Red'	Field Container	Davis	MI	2011	Foliar	Moderate to severe stunting increasing with rate (4, 8, 16 fl oz per 100 gal).
29447	Impatiens, New Guinea (Impatiens hawkeri) 'Paradise Fuchia'	Greenhouse	Freiberger	NJ	2010	Foliar	Slight injury at 4, 8 and 16 fl oz per 100 gal.
29447	Impatiens, New Guinea (Impatiens hawkeri) 'Paradise Light Pink'	Greenhouse	Freiberger	NJ	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
30369	Impatiens, New Guinea (Impatiens hawkeri) 'Pure Beaty White'	Field Container	Freiberger	NJ	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29447	Impatiens, New Guinea (Impatiens hawkeri) 'Divine Orange'	Greenhouse	Hausbeck	MI	2015	Foliar	No significant injury with 6, moderate with 12 and 24, fl oz per 100 gal applied 3 times; no height reduction.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
30369	Impatiens, New Guinea (Impatiens hawkeri)	Field Container	Reding	OH	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
29441	Lantana (Lantana sp.) 'Chapel Hill Yellow'	Field Container	Fraelich	GA	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal; all plants marketable.
29441	Lantana (Lantana sp.) L. camara 'Confetti'	Field Container	Grunwald	OR	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29441	Lantana (Lantana sp.) 'Imagination'	Field Container	Kirk	MI	2011	Foliar	No injury or growth reduction with 4, 8 and 16 oz per 100 gal applied 5 times.
29441	Lantana (Lantana sp.)	Field Container	Reding	OH	2012	Foliar	No injury and no significant difference in growth or marketability with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29441	Lantana (Lantana sp.) L. montevidensis	Field Container	Uber	CA	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29443	Lilyturf (Liriope sp.) 'Variegata'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29443	Lilyturf (Liriope sp.)	Field Container	Harvey	WA	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29443	Lilyturf (Liriope sp.) 'Big Blue'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29443	Lilyturf (Liriope sp.) variegata	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
31603	Sweet Alyssum (Lobularia maritima) 'Clear Crystal White'	Field Container	DeFrancesco	OR	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30062	Loropetalum (Loropetalum sp.) 'Daruma Compact Ruby'	Field Container	Baysal-Gurel	TN	2017	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times biweekly.
30062	Loropetalum (Loropetalum sp.)	Field Container	Wade	SC	2015	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
29432	Apple, Non-bearing (Malus sp.) 'Golden Delicious' (apple)	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29432	Apple, Non-bearing (Malus sp.) 'Honey Crisp' (apple)	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29432	Apple, Non-bearing (Malus sp.) 'Lancelot' (crabapple)	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29432	Apple, Non-bearing (Malus sp.) 'Sargent' (crabapple)	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29432	Apple, Non-bearing (Malus sp.) 'Coralburst Crab' (crabapple)	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29432	Apple, Non-bearing (Malus sp.) 'McIntosh' (apple)	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29432	Apple, Non-bearing (Malus sp.) 'Mutsu' (apple)	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29432	Apple, Non-bearing (Malus sp.) 'Praire Fire Crab' (crabapple)	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
29432	Apple, Non-bearing (Malus sp.) 'Winesap' (apple)	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29438	Sacred Bamboo (Nandina domestica) 'Fire Power'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
30816	Daisybush (Osteospermum sp.) O. ecklonis 'Summertime Blueberry'	Greenhouse	DeFrancesco	OR	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30816	Daisybush (Osteospermum sp.) 'Margarita White Spoon'	Greenhouse	Freiberger	NJ	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30816	Daisybush (Osteospermum sp.) 'Copper Purple'	Greenhouse	Grunwald	OR	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
30816	Daisybush (Osteospermum sp.) 'Akila Purple'	Greenhouse	Hausbeck	MI	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30816	Daisybush (Osteospermum sp.)	Greenhouse	Williams	IL	2013	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times at monthly intervals; moderate growth reduction.
30377	Geranium (Pelargonium sp.) P. x hortorum 'Orbit Pink Seed'	Field Container	Davis	MI	2011	Foliar	No injury or growth reduction with 4, 8 and 16 fl oz per 100 gal applied three times.
29451	Geranium (Pelargonium sp.) 'Maestro Lav Blue'	Greenhouse	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29451	Geranium (Pelargonium sp.) 'Maestro Pac Lav Par'	Greenhouse	Freiberger	NJ	2010	Foliar	No significant injury at 4 and 8, slight at 16 fl oz per 100 gal.
30377	Geranium (Pelargonium sp.) P. peltatum 'Red Blizzard'	Field Container	Grunwald	OR	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29451	Geranium (Pelargonium sp.) P. x hortorum 'Orbit White'	Greenhouse	Hausbeck	MI	2010	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30377	Geranium (Pelargonium sp.)	Field Container	Reding	OH	2012	Foliar	No injury and no significant difference in growth or marketability with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30065	Crimson Fountain Grass (Pennisetum setaceum)	Field Container	Harvey	WA	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30393	Petunia (Petunia sp.) 'Dreams White'	Field Container	Davis	MI	2011	Foliar	No injury or growth reduction with 4, 8 and 16 fl oz per 100 gal applied three times.
30393	Petunia (Petunia sp.) 'Single Wave Purple'	Field Container	Grunwald	OR	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
30393	Petunia (Petunia sp.)	Field Container	Reding	OH	2012	Foliar	No injury and no significant difference in growth or marketability with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30393	Petunia (Petunia sp.) 'Mambo Purple'	Field Container	Wade	SC	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
30393	Petunia (Petunia sp.) 'SGL Mambo Pink'	Field Container	Wade	SC	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
29434	Chokeberry (Photinia sp.) P. fraseri	Field Container	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29434	Chokeberry (Photinia sp.) P. x fraseri 'Pink Marble'	Field Container	Reding	OH	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
30817	Fir, Douglas (Pseudotsuga menziesii)	Greenhouse	DeFrancesco	OR	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30817	Fir, Douglas (Pseudotsuga menziesii)	Greenhouse	Grunwald	OR	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
30817	Fir, Douglas (Pseudotsuga menziesii)	Greenhouse	Grunwald	OR	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
29428	Callery Pear (Pyrus calleryana) 'Autumn Blaze'	Field Container	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29427	Oak (Quercus sp.) Q. rubra	Field Container	DeFrancesco	OR	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29427	Oak (Quercus sp.) 'Northern Pin Oak'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29427	Oak (Quercus sp.)	Field Container	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29427	Oak (Quercus sp.) 'Northern Red'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29427	Oak (Quercus sp.) 'Pin Oak'	Field Container	Hausbeck	MI	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29439	Indian Hawthorn (Rhaphiolepis indica) R. umbellata 'Southern Moon Yedda'	Field Container	Fraelich	GA	2014	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29439	Indian Hawthorn (Rhaphiolepis indica)	Field Container	Uber	CA	2016	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29429	Rhododendron (Rhododendron sp.) 'Cunningham's White'	Field Container	DeFrancesco	OR	2010	Foliar	No injury or growth reduction at 4, 8 and 16 fl oz per 100 gal applied 3 times.
29430	Azalea (Rhododendron sp.) 'Hino Crimson'	Field Container	DeFrancesco	OR	2010	Foliar	No injury or growth reduction at 4, 8 and 16 fl oz per 100 gal applied 3 times.
29429	Rhododendron (Rhododendron sp.) 'PJM'	Field Container	DeFrancesco	OR	2011	Foliar	No injury or growth reduction with 6, 12, and 24 fl oz per 100 gal.
29430	Azalea (Rhododendron sp.) 'Dawn's Chorus'	Field Container	DeFrancesco	OR	2011	Foliar	No injury or growth reduction with 6, 12, and 24 fl oz per 100 gal.
29429	Rhododendron (Rhododendron sp.) 'Boursault'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29429	Rhododendron (Rhododendron sp.) 'Nova Zembla'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29430	Azalea (Rhododendron sp.) 'Mothers Day' & 'Haps Pink'	Field Container	Freiberger	NJ	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29429	Rhododendron (Rhododendron sp.)	Field Container	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29430	Azalea (Rhododendron sp.)	Field Container	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29429	Rhododendron (Rhododendron sp.) 'English'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29429	Rhododendron (Rhododendron sp.) 'PJM compact'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
29430	Azalea (Rhododendron sp.) 'Northern Hi-Lights'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29430	Azalea (Rhododendron sp.) 'Orchid Lights'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29429	Rhododendron (Rhododendron sp.) 'Roseum elegans'	Field Container	Pscheidt	OR	2010	Foliar	No injury or growth reduction at 4, 8 and 16 fl oz per 100 gal.
29430	Azalea (Rhododendron sp.) 'Mandarin Lights'	Field Container	Pscheidt	OR	2010	Foliar	No injury or growth reduction at 4, 8 and 16 fl oz per 100 gal.
29426	Rose (Rosa sp.) 'Nearly Wild'	Field Container	DeFrancesco	OR	2010	Foliar	No injury or growth reduction at 4, 8 and 16 fl oz per 100 gal applied 3 times.
29426	Rose (Rosa sp.) 'Home Run'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29426	Rose (Rosa sp.) 'Radrazz'	Field Container	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29426	Rose (Rosa sp.)	Field Container	Harvey	WA	2011	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29426	Rose (Rosa sp.) 'Rainbow Knockout'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29426	Rose (Rosa sp.) 'Sunny Knockout'	Field Container	Hausbeck	MI	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29426	Rose (Rosa sp.) 'Meidomonac Bonica'	Field Container	Pscheidt	OR	2010	Foliar	No injury or growth reduction at 4, 8 and 16 fl oz per 100 gal; good black spot control.
29446	Common Sage (Salvia officinalis) 'Berrgarten'	Greenhouse	DeFrancesco	OR	2011	Foliar	No injury or growth reduction with 6, 12, and 24 fl oz per 100 gal.
29446	Common Sage (Salvia officinalis)	Greenhouse	Freiberger	NJ	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29446	Common Sage (Salvia officinalis) 'Berrgarten'	Greenhouse	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29446	Common Sage (Salvia officinalis)	Greenhouse	Meador	CA	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; comparable to Heritage.
30394	Marigold (Tagetes sp.) T. patula 'Bonanza Yellow'	Field Container	Davis	MI	2011	Foliar	No injury or growth reduction with 4, 8 and 16 fl oz per 100 gal applied three times.
30394	Marigold (Tagetes sp.) T. patula 'Durango Outback Mix'	Field Container	DeFrancesco	OR	2013	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times; slight growth reduction at 2X.
29449	Marigold (Tagetes sp.) 'Aurora Gold'	Greenhouse	Freiberger	NJ	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29449	Marigold (Tagetes sp.) 'Capriccio'	Greenhouse	Freiberger	NJ	2010	Foliar	No injury at 4, 8 and 16 fl oz per 100 gal.
29449	Marigold (Tagetes sp.) 'Bonanza'	Greenhouse	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29449	Marigold (Tagetes sp.) T. erecta ‘African Perfect Yellow’	Greenhouse	Hausbeck	MI	2010	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29449	Marigold (Tagetes sp.) T. erecta ‘African Perfect Yellow’	Greenhouse	Hausbeck	MI	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30819	Tulip (Tulipa sp.) 'Oxford'	Greenhouse	Freiberger	NJ	2013	Foliar	Virtually no injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.

PR#	Crop	Production Site	Researcher	State	Year	Application Type	Results
30353	Vervain (Verbena sp.) V. canadensis 'Homestead Purple'	Field Container	Fraelich	GA	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal; all plants marketable.
30353	Vervain (Verbena sp.) 'Costa del Sol Magenta'	Field Container	Freiberger	NJ	2013	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30353	Vervain (Verbena sp.)	Field Container	Reding	OH	2012	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
30353	Vervain (Verbena sp.) 'Red Obsession'	Field Container	Wade	SC	2012	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30059	Arrowwood (Viburnum sp.) V. plicatum 'Popcorn'	Field Container	Fraelich	GA	2016	Foliar	No injury with 6, 12 and 24 fl oz per 100 gal applied 3 times; slight stunting at 2X and 4X; all plants marketable.
30059	Arrowwood (Viburnum sp.)	Field Container	Grunwald	OR	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30059	Arrowwood (Viburnum sp.)	Field Container	Harvey	WA	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
30059	Arrowwood (Viburnum sp.) V. dilatum 'Cardinal Candy'	Field Container	Reding	OH	2015	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants marketable.
29452	Violet (Viola sp.) 'Daffodil Mix'	Greenhouse	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29452	Violet (Viola sp.) 'Delta Cotton Candy'	Greenhouse	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29452	Violet (Viola sp.) V. x hybrida 'Columbine'	Greenhouse	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29452	Violet (Viola sp.) V. tricolor ‘Matrix Rose’	Greenhouse	Hausbeck	MI	2010	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29452	Violet (Viola sp.) V. tricolor 'Matrix Rose'	Greenhouse	Hausbeck	MI	2011	Foliar	No injury but moderate growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29450	Zinnia (Zinnia sp.) 'Angustafolia Crystal White'	Greenhouse	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29450	Zinnia (Zinnia sp.) 'Red Spider'	Greenhouse	Freiberger	NJ	2010	Foliar	No significant injury at 4, 8 and 16 fl oz per 100 gal.
29450	Zinnia (Zinnia sp.) Z. elegans 'Binary Mix'	Greenhouse	Grunwald	OR	2011	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times; all plants saleable.
29450	Zinnia (Zinnia sp.) Z. marylandica ‘Zahara Fire’	Greenhouse	Hausbeck	MI	2010	Foliar	No injury or growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.
29450	Zinnia (Zinnia sp.) Z. marylandica ‘Zahara Fire’	Greenhouse	Hausbeck	MI	2011	Foliar	No injury but slight growth reduction with 6, 12 and 24 fl oz per 100 gal applied 3 times.

Label Suggestions

In this report, 32 species or genera exhibited minimal or no injury after foliar treatments of Trinity 2SC (triticonazole) at 6, 12 and 24 fl oz per 100gal; 20 of these are already on the label. We recommend that the following 12 species or genera be added to the current label: *Alyssum sp, Buxus sp., Chaemerops humilis, Cornus sp., Dahlia sp., Gaillardia x grandiflora, Hedera helix, Ilex sp., Lantana sp., Pseudotsuga menziesii, Osteospermum sp*. and *Salvia officinalis*.

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