



[Environment Horticulture Program Research Summaries](#)

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

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## **Abstract**

Picarbutrazox is a novel fungicide with a new mode of action being developed by Nisso America for the control of oomycete diseases such as *Bremia*, *Peronospora*, *Pseudoperonospora*, *Phytophthora*, *Pythium* and *Phytopythium*. The IR-4 Project completed 85 crop safety trials on 16 environmental horticulture plant species or genera between 2018 and 2023. In these trials, 15 of 16 species or genera exhibited no or minimal injury. Twelve species or genera exhibited no injury in at least 3 trials. One genera, *Rosa sp*, exhibited moderate injury in one trial after two consecutive biweekly foliar applications of Picarbutrazox SC. The remaining three species or genera exhibited no or minimal injury in the limited number of trials (one or two) for each crop.

## Introduction

Picarbutrazox is a novel fungicide with a new mode of action being developed by Nisso America for the control of oomycetes disease such as *Bremia*, *Peronospora*, *Pseudoperonospora*, *Phytophthora* and *Pythium*. The IR-4 Project completed 84 crop safety trials on 16 environmental horticulture plant species or genera between 2018 and 2023.

## Materials and Methods

Picarbutrazox as 2 formulations (20WG and SC) was tested with foliar treatments typically applied three times at approximately 14 day intervals. Picarbutrazox 20WG was applied at rates of 7.2, 14.4 and 28.8 oz per 100 gal, and Picarbutrazox SC at 13.6, 27.2 and 54.4 fl oz per 100 gal. A minimum of three plants (replicate treatments) were required with most researchers exceeding this minimum. Phytotoxicity was recorded on a scale of 0 to 10 (0 = no phytotoxicity; 10 = complete kill) one to four times from 1 to 6 weeks after initial application. For IR-4 testing, the following protocol was used: 18-006, 19-006, 20-011 and 21-011. 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 this protocol.

Picarbutrazox was supplied to researchers (See list of researchers in Appendix 1) by Nisso America.

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

Across all but one of the 16 crops tested, Picarbutrazox 20WG and SC exhibited no or minimal negative impact on all plant species or genera. Thirteen species or genera exhibited no or minimal injury in at least 3 trials; one crop general exhibited no injury but demonstrated moderate injury in a single trial (Table 1), and three species or genera exhibited no or minimal injury in the limited number of trials (one or two) for each crop (Table 5).

Please see Table 7 for a summary of the individual trial results.

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

<i>Antirrhinum majus</i>	<i>Rosa</i> sp. (see Saha 2021 for single report of moderate injury after multiple applications)
<i>Aster</i> sp.	<i>Rudbeckia hirta</i>
<i>Coleus</i> sp.	<i>Salvia nemorosa</i>
<i>Impatiens hawkeri</i>	<i>Salvia splendens</i>
<i>Impatiens walleriana</i>	<i>Viburnum</i> sp.
<i>Pelargonium x hortorum</i>	<i>Viola x wittrockiana</i>
<i>Potentilla</i> sp.	

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

None

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

None

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

**Table 5. List of Picarbutrazox treated crops with less than 3 trials.**

<i>Lavandula angustifolia</i>	<i>Petunia x hybrida</i> <sup>1</sup>
<i>Pelargonium x domesticum</i> <sup>1</sup>	

<sup>1</sup> For these plants, the one or two trials presented here indicate no phytotoxicity or slight, transient injury, but these findings need to be confirmed

**Table 6. Average Crop Safety Rating after Applications of Picarbutrazox Formulations**

Crop Latin Name	Picarbutrazox 20WG (Picarbutrazox)-		Picarbutrazox SC (NF-171) (Picarbutrazox)-	
	Drench	Foliar	Drench	Foliar
<i>Antirrhinum majus</i>	1.3 (1 - 2) n4	1.0 (1 - 1) n2	4.0 (4 - 4) n1	1.0 (1 - 1) n2
<i>Aster sp.</i>		1.0 (1 - 1) n2		1.0 (1 - 1) n1
<i>Coleus sp.</i>		1.0 (1 - 1) n2		1.0 (1 - 1) n3
<i>Impatiens hawkeri</i>		1.2 (1 - 2) n5		1.5 (1 - 2) n2
<i>Impatiens walleriana</i>		1.0 (1 - 1) n4		1.0 (1 - 1) n1
<i>Lavandula angustifolia</i>	1.0 (1 - 1) n1		1.0 (1 - 1) n1	
<i>Pelargonium x domesticum</i>		1.0 (1 - 1) n1		1.0 (1 - 1) n1
<i>Pelargonium x hortorum</i>		1.0 (1 - 1) n2		1.3 (1 - 2) n3
<i>Petunia x hybrida</i>	1.0 (1 - 1) n1		1.0 (1 - 1) n1	
<i>Potentilla sp.</i>		1.0 (1 - 1) n3		1.0 (1 - 1) n3
<i>Rosa sp.</i>		1.0 (1 - 1) n2		1.7 (1 - 3) n3
<i>Rudbeckia hirta</i>		1.3 (1 - 2) n3		1.0 (1 - 1) n3
<i>Salvia nemorosa</i>		1.0 (1 - 1) n3		1.0 (1 - 1) n3
<i>Salvia splendens</i>		1.0 (1 - 1) n3		1.0 (1 - 1) n3
<i>Viburnum sp.</i>		1.0 (1 - 1) n3		1.0 (1 - 1) n2
<i>Viola X wittrockiana</i>		1.0 (1 - 1) n2		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 7. Detailed Summary of Crop Safety Testing with Picarbutrazox.**

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 8/18/2023 are listed below.

PR#	Product (Active Ingredients)	Crop	Production Site	Researcher	State	Year	Application Type	Results
33289	Picarbutrazox 20WG (Picarbutrazox)	Garden Snapdragon (Antirrhinum majus)	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction, all plants flowered normally, with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33289	Picarbutrazox 20WG (Picarbutrazox)	Garden Snapdragon (Antirrhinum majus) 'Rocket Red'	Greenhouse	Grunwald	OR	2021	Foliar	No injury, growth or flowering reduction when applied at 7.2, 14.4, and 28.8 fl oz per 100 gal rates
33292	Picarbutrazox 20WG (Picarbutrazox)	Aster (Aster sp.) 'Pot and Patio Mix'	Field Container	Reding	OH	2018	Foliar	No injury or significant growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; all plants marketable.
33292	Picarbutrazox 20WG (Picarbutrazox)	Aster (Aster sp.)	Field Container	Wade	SC	2019	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; all plants marketable.
33300	Picarbutrazox 20WG (Picarbutrazox)	Coleus, Flamenettle (Coleus sp.)	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction, all plants flowered normally, with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33300	Picarbutrazox 20WG (Picarbutrazox)	Coleus, Flamenettle (Coleus sp.) 'Campfire'	Greenhouse	Grunwald	OR	2021	Foliar	No injury, growth or flowering reduction when applied at 7.2, 14.4, and 28.8 fl oz per 100 gal rates
33296	Picarbutrazox 20WG (Picarbutrazox)	Impatiens, New Guinea (Impatiens hawkeri)	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction, all plants flowered normally, with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33296	Picarbutrazox 20WG (Picarbutrazox)	Impatiens, New Guinea (Impatiens hawkeri) 'Hot pink'	Greenhouse	Grunwald	OR	2021	Foliar	No injury, growth or flowering reduction when applied at 7.2, 14.4, and 28.8 fl oz per 100 gal rates
33295	Picarbutrazox 20WG (Picarbutrazox)	Impatiens, New Guinea (Impatiens hawkeri) 'Harmony Snow'	Field Container	Gu	TX	2018	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33295	Picarbutrazox 20WG (Picarbutrazox)	Impatiens, New Guinea (Impatiens hawkeri) 'Sonic Salmon'	Field Container	Reding	OH	2018	Foliar	No injury or significant growth reduction with 7.2 and 14.4, suppressed growth and flowering with 28.8 oz per 100 gal after the 3rd applic.; all plants marketable.
33295	Picarbutrazox 20WG (Picarbutrazox)	Impatiens, New Guinea (Impatiens hawkeri) 'Coral Pink'	Field Container	Uber	CA	2019	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33294	Picarbutrazox 20WG (Picarbutrazox)	Impatiens, Common Garden; Buzzy Lizzy	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; plants flowered normally.



PR#	Product (Active Ingredients)	Crop	Production Site	Researcher	State	Year	Application Type	Results
		(Impatiens walleriana) 'Dazzler Orange'						
33293	Picarbutrazox 20WG (Picarbutrazox)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana) 'Compact Lilac'	Field Container	Grunwald	OR	2020	Foliar	No injury, growth or flowering reduction at 7.2, 14.4, and 28.8 fl oz per 100 gal rates
33293	Picarbutrazox 20WG (Picarbutrazox)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana) 'Rockapulco Purple'	Field Container	Gu	TX	2018	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33293	Picarbutrazox 20WG (Picarbutrazox)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana) 'Super Elfin XP Rose'	Field Container	Reding	OH	2018	Foliar	No injury or significant growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; all plants marketable.
33298	Picarbutrazox 20WG (Picarbutrazox)	Regal Geranium (Pelargonium x domesticum) 'Strawberry Cream'	Greenhouse	Weiland	OR	2023	Foliar	No injury or growth reduction with 7.2, 14.4 or 28.8 fl oz per 100 gal.
33299	Picarbutrazox 20WG (Picarbutrazox)	Geranium, Zonal (Pelargonium x hortorum) 'Ringo 2000 Deep Red'	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; plants flowered normally.
33299	Picarbutrazox 20WG (Picarbutrazox)	Geranium, Zonal (Pelargonium x hortorum) Cardinal red'	Greenhouse	Grunwald	OR	2021	Foliar	No injury, growth or flowering reduction when applied at 7.2, 14.4, and 28.8 fl oz per 100 gal rates
33290	Picarbutrazox 20WG (Picarbutrazox)	Cinquefoil; Potentilla (Potentilla sp.) 'Happy Face Yellow'	Field Container	Gu	TX	2018	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33290	Picarbutrazox 20WG (Picarbutrazox)	Cinquefoil; Potentilla (Potentilla sp.) P. neumanniana	Field Container	Koski	CO	2022	Foliar	None of the treatments (7.2, 14.4 & 28.8 oz per 100 gallons) caused phytotoxicity on the crop nor did any of the treatments adversely affect bloom and plant growth.
33290	Picarbutrazox 20WG (Picarbutrazox)	Cinquefoil; Potentilla (Potentilla sp.)	Field Container	Weiland	OR	2022	Foliar	No injury or impact on growth with 7.2, 14.4 and 28.8 oz per 100 gal.
33283	Picarbutrazox 20WG (Picarbutrazox)	Rose (Rosa sp.) 'Iceberg White'	Field Container	Uber	CA	2018	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33283	Picarbutrazox 20WG (Picarbutrazox)	Rose (Rosa sp.)	Field Container	Wade	SC	2019	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; all plants marketable.

PR#	Product (Active Ingredients)	Crop	Production Site	Researcher	State	Year	Application Type	Results
33285	Picarbutrazox 20WG (Picarbutrazox)	Black-Eyed Susan (Rudbeckia hirta) 'Goldsturm'	Field Container	Fraelich	GA	2020	Foliar	No injury or significant growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times; all treated plants marketable.
33285	Picarbutrazox 20WG (Picarbutrazox)	Black-Eyed Susan (Rudbeckia hirta) 'Toto Gold'	Field Container	Freiberger	NJ	2019	Foliar	No injury or growth reduction with 7.4, 18.8 and 28.8 oz per 100 gal applied 3 times biweekly.
33285	Picarbutrazox 20WG (Picarbutrazox)	Black-Eyed Susan (Rudbeckia hirta) 'Denver Daisy'	Field Container	Reding	OH	2018	Foliar	No injury or significant growth reduction with 7.2 and 14.4, suppressed growth and flowering with 28.8 oz per 100 gal after the 3rd applic.; all plants marketable.
33288	Picarbutrazox 20WG (Picarbutrazox)	Woodland Sage (Salvia nemorosa) 'Blue Hill'	Field Container	Grunwald	OR	2021	Foliar	No injury, growth or flowering reduction at 7.2, 14.4, and 28.8 fl oz per 100 gal rates
33288	Picarbutrazox 20WG (Picarbutrazox)	Woodland Sage (Salvia nemorosa) 'Maynight'	Field Container	Gu	TX	2018	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33288	Picarbutrazox 20WG (Picarbutrazox)	Woodland Sage (Salvia nemorosa) 'Blue Marvel'	Field Container	Reding	OH	2018	Foliar	No injury or significant growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; all plants marketable.
33286	Picarbutrazox 20WG (Picarbutrazox)	Scarlet Sage (Salvia splendens) 'Red Hot Sally'	Field Container	Grunwald	OR	2020	Foliar	No injury, growth or flowering reduction at 7.2, 14.4, and 28.8 fl oz per 100 gal rates
33286	Picarbutrazox 20WG (Picarbutrazox)	Scarlet Sage (Salvia splendens) 'Vista Purple'	Field Container	Gu	TX	2018	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.
33286	Picarbutrazox 20WG (Picarbutrazox)	Scarlet Sage (Salvia splendens) 'Vista Red'	Field Container	Reding	OH	2018	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; all plants marketable.
33284	Picarbutrazox 20WG (Picarbutrazox)	Arrowwood (Viburnum sp.) V. ovatum 'Everleaf'	Field Container	Doohan	OH	2021	Foliar	No injury or impact on growth at 7.2, 14.4 or 28.8 oz per 100 gal applied 3 times at biweekly intervals.
33284	Picarbutrazox 20WG (Picarbutrazox)	Arrowwood (Viburnum sp.)	Field Container	Grunwald	OR	2021	Foliar	No injury, growth or flowering reduction at 7.2, 14.4, and 28.8 fl oz per 100 gal rates
33284	Picarbutrazox 20WG (Picarbutrazox)	Arrowwood (Viburnum sp.)	Field Container	Wade	SC	2019	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; all plants marketable.
33291	Picarbutrazox 20WG (Picarbutrazox)	Pansy, Large Flowering; Wittrock's Violet (Viola X wittrockiana) 'Matrix White Blotch'	Greenhouse	Bodine	NJ	2020	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly.

PR#	Product (Active Ingredients)	Crop	Production Site	Researcher	State	Year	Application Type	Results
33291	Picarbutrazox 20WG (Picarbutrazox)	Pansy, Large Flowering; Wittrock's Violet (Viola X wittrockiana) 'Mix'	Greenhouse	Weiland	OR	2023	Foliar	Picarbutrazox 20 WG at 7.2, 14.4, & 28.8 fl. oz/100 gal applied at 14 day RTI did not cause phytotoxicity.
33228	Picarbutrazox SC (NF-171) (Picarbutrazox)	Garden Snapdragon (Antirrhinum majus)	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction, all plants flowered normally, with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33228	Picarbutrazox SC (NF-171) (Picarbutrazox)	Garden Snapdragon (Antirrhinum majus) 'Rocket Red'	Greenhouse	Grunwald	OR	2021	Foliar	No injury, growth or flowering reduction when applied at 13.6, 27.2, and 54.4 fl oz per 100 gal rates
33225	Picarbutrazox SC (NF-171) (Picarbutrazox)	Aster (Aster sp.) 'Wood's Purple'	Field Container	Wade	SC	2018	Foliar	No injury with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly; all plants marketable.
33219	Picarbutrazox SC (NF-171) (Picarbutrazox)	Coleus, Flamenettle (Coleus sp.)	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction, all plants flowered normally, with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33219	Picarbutrazox SC (NF-171) (Picarbutrazox)	Coleus, Flamenettle (Coleus sp.) 'Burgundy Wedding Train'	Greenhouse	Hand	OH	2020	Foliar	No injury or impact on growth at 13.6, 27.2 or 54.4 fl oz per 100 gal.
33219	Picarbutrazox SC (NF-171) (Picarbutrazox)	Coleus, Flamenettle (Coleus sp.) 'River Walk'	Greenhouse	Koski	CO	2021	Foliar	None of the treatments (13.6, 27.2 & 54.4 fl. oz per 100 gallons) caused phytotoxicity. However, 27.2 and 54.4 fl. oz rates caused slight reduction in plant growth.
33220	Picarbutrazox SC (NF-171) (Picarbutrazox)	Impatiens, New Guinea (Impatiens hawkeri)	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction, all plants flowered normally, with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33220	Picarbutrazox SC (NF-171) (Picarbutrazox)	Impatiens, New Guinea (Impatiens hawkeri) 'Clockwork Purple'	Greenhouse	Hand	OH	2020	Foliar	No injury at 13.6, 27.2 or 54.4 fl oz per 100 gal, but plants treated with the lowest rate were shorter than nontreated or those plants treated with the higher rates.
33224	Picarbutrazox SC (NF-171) (Picarbutrazox)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana) 'Dazzler Orange'	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly; plants flowered normally.
33222	Picarbutrazox SC (NF-171) (Picarbutrazox)	Regal Geranium (Pelargonium x domesticum) 'Strawberry Cream'	Greenhouse	Weiland	OR	2023	Foliar	No injury or growth reduction with 13.6, 27.2, and 54.4 fl oz per 100 gal.
33221	Picarbutrazox SC (NF-171) (Picarbutrazox)	Geranium, Zonal (Pelargonium x hortorum) 'Ringo 2000 Deep Red'	Greenhouse	Freiberger	NJ	2018	Foliar	No injury or growth reduction with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly; plants flowered normally.

PR#	Product (Active Ingredients)	Crop	Production Site	Researcher	State	Year	Application Type	Results
33221	Picarbutrazox SC (NF-171) (Picarbutrazox)	Geranium, Zonal (Pelargonium x hortorum)	Greenhouse	Grunwald	OR	2019	Foliar	No injury, growth or flowering reduction when applied at 13.6, 27.2 and 54.4 fl oz per 100 gal rates
33221	Picarbutrazox SC (NF-171) (Picarbutrazox)	Geranium, Zonal (Pelargonium x hortorum)	Greenhouse	Saha	MI	2021	Foliar	Minor injury with 13.6, 27.2 and 54.4 fl oz per 100 gal. No significant growth reduction.
33227	Picarbutrazox SC (NF-171) (Picarbutrazox)	Cinquefoil; Potentilla (Potentilla sp.) 'Happy Face Yellow'	Field Container	Gu	TX	2018	Foliar	No injury or growth reduction with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33227	Picarbutrazox SC (NF-171) (Picarbutrazox)	Cinquefoil; Potentilla (Potentilla sp.) P. neumanniana	Field Container	Koski	CO	2022	Foliar	None of the treatments (13.6, 27.2 & 54.4 fl. oz per 100 gallons) caused phytotoxicity on the crop nor did any of the treatments adversely affect bloom and plant growth.
33227	Picarbutrazox SC (NF-171) (Picarbutrazox)	Cinquefoil; Potentilla (Potentilla sp.)	Field Container	Weiland	OR	2022	Foliar	No injury or impact on growth with 13.6, 27.2 and 54.4 fl oz per 100 gal.
33233	Picarbutrazox SC (NF-171) (Picarbutrazox)	Rose (Rosa sp.) 'Oso Easy® Double Red'	Field Container	Gu	TX	2018	Foliar	No injury or growth reduction with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33233	Picarbutrazox SC (NF-171) (Picarbutrazox)	Rose (Rosa sp.)	Field Container	Saha	MI	2021	Foliar	Moderate injury with 13.6, 27.2 and 54.4 fl oz per 100 gal after second consecutive application. Minor growth reduction.
33233	Picarbutrazox SC (NF-171) (Picarbutrazox)	Rose (Rosa sp.) 'Iceberg White'	Field Container	Uber	CA	2018	Foliar	No injury or growth reduction with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33231	Picarbutrazox SC (NF-171) (Picarbutrazox)	Black-Eyed Susan (Rudbeckia hirta) 'Goldsturm'	Field Container	Fraelich	GA	2020	Foliar	No injury or significant growth reduction with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times; all treated plants marketable.
33231	Picarbutrazox SC (NF-171) (Picarbutrazox)	Black-Eyed Susan (Rudbeckia hirta) 'Toto Gold'	Field Container	Freiberger	NJ	2019	Foliar	No injury or growth reduction with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33231	Picarbutrazox SC (NF-171) (Picarbutrazox)	Black-Eyed Susan (Rudbeckia hirta) 'Denver Daisy'	Field Container	Klett	CO	2020	Foliar	No injury or growth reduction, and no effect on flower production or bloom time, with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33229	Picarbutrazox SC (NF-171) (Picarbutrazox)	Woodland Sage (Salvia nemorosa) 'Haeumanarc'	Field Container	Fraelich	GA	2019	Foliar	No significant injury or growth reduction with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly; treated plants marketable.
33229	Picarbutrazox SC (NF-171) (Picarbutrazox)	Woodland Sage (Salvia nemorosa) 'Blue Hill'	Field Container	Grunwald	OR	2021	Foliar	No injury, growth or flowering reduction at 13.6, 27.2, and 54.4 fl oz per 100 gal rates

PR#	Product (Active Ingredients)	Crop	Production Site	Researcher	State	Year	Application Type	Results
33229	Picarbutrazox SC (NF-171) (Picarbutrazox)	Woodland Sage (Salvia nemorosa) 'Marcus'	Field Container	Klett	CO	2020	Foliar	No injury or growth reduction, and no effect on flower production or bloom time, with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33230	Picarbutrazox SC (NF-171) (Picarbutrazox)	Scarlet Sage (Salvia splendens) 'Red Hot Sally'	Field Container	Grunwald	OR	2019	Foliar	No injury, growth or flowering reduction when applied at 13.6, 27.2 and 54.4 fl oz per 100 gal rates
33230	Picarbutrazox SC (NF-171) (Picarbutrazox)	Scarlet Sage (Salvia splendens) 'Grandstand Purple'	Field Container	Klett	CO	2020	Foliar	No injury or growth reduction, and no effect on flower production or bloom time, with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33230	Picarbutrazox SC (NF-171) (Picarbutrazox)	Scarlet Sage (Salvia splendens)	Field Container	Wade	SC	2019	Foliar	No injury or growth reduction with 7.2, 14.4 and 28.8 oz per 100 gal applied 3 times biweekly; all plants marketable.
33232	Picarbutrazox SC (NF-171) (Picarbutrazox)	Arrowwood (Viburnum sp.) V. ovatum 'Everleaf'	Field Container	Doohan	OH	2021	Foliar	No injury or impact on growth at 13.6, 27.2 or 54.4 fl oz per 100 gal applied 3 times at biweekly intervals.
33232	Picarbutrazox SC (NF-171) (Picarbutrazox)	Arrowwood (Viburnum sp.) 'Sweet Viburnum'	Field Container	Wade	SC	2018	Foliar	No injury with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly; all plants marketable.
33226	Picarbutrazox SC (NF-171) (Picarbutrazox)	Pansy, Large Flowering; Wittrock's Violet (Viola X wittrockiana) 'Matrix White Blotch'	Greenhouse	Bodine	NJ	2020	Foliar	No injury or growth reduction with 13.6, 27.2 and 54.4 fl oz per 100 gal applied 3 times biweekly.
33226	Picarbutrazox SC (NF-171) (Picarbutrazox)	Pansy, Large Flowering; Wittrock's Violet (Viola X wittrockiana) 'Mix'	Greenhouse	Weiland	OR	2023	Foliar	Picarbutrazox SC at 13.6, 27.2 & 54.4 fl. oz/100 gal applied at 14 day RTI did not cause phytotoxicity.

## **Label Suggestions**

In this report, 15 of the 16 crops tested exhibited no or minimal injury after foliar treatments of Picarbutrazox 20WG was applied at rates of 7.2, 14.4 and 28.8 oz per 100 gal or Picarbutrazox SC at 13.6, 27.2 and 54.4 fl oz per 100 gal. In one trial with *Rosa* sp, moderate spotting on foliage was observed after two and three consecutive applications. Further research is warranted to screen additional rose cultivars. These results suggest that this active ingredient will generally not harm environmental horticulture crops.

Given the lack of phytotoxicity across many different plant species and genera, it is suggested that the 16 plants tested demonstrating no injury be placed on the Picarbutrazox label if Nisso America has similar results on these crops. Or a general statement can be placed on the label such as ‘has not been demonstrated to cause damage on various ornamental plant species when used according to labeled use instructions. Picarbutrazox may be used on a wide number of crops but must be tested on a limited portion of the crop prior to applying to the whole crop if the grower has no previous experience applying Picarbutrazox to that crop’.

## Appendix 1: Contributing Researchers

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