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IR-4 Ornamental Horticulture Program Botrytis Efficacy: A Literature Review

Botrytis cinerea
Botrytis elliptica
Botrytis paeoniae
Botrytis tulipae

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Abstract

At the IR-4 Ornamental Horticulture Program Workshop in 2011, Botrytis Efficacy was selected as a high priority project to expand the knowledge and list of fungicides available to growers for these diseases. In addition to research collected through the IR-4 Program, this summary includes a review of experiments conducted from 1998 to 2015 on ornamental horticulture crops. During this time period, numerous products representing 42 active ingredients were tested as foliar applications against several *Botrytis* species causing blight and gray mold on ornamentals. Most products are registered and commercially used. Almost all trials were conducted on *Botrytis cinerea*; other species tested were *B. elliptica*, *B. paeoniae* and *B. tulipae*. Although there were insufficient IR-4 data for definitive conclusions, four relatively new products that are included in this research project, Orkestra Intrinsic, Mural, NUP 09092, and S2200 looked effective, while Proud 3 and SP2770 looked ineffective. Data on other relatively new products (F9110, MBI-110, Regalia, SP2773, Torque, Tourney, Trinity, ZeroTol) were limited to provide some conclusions. Of the registered products, Daconil, Decree, Heritage, Insignia, Pageant and Palladium generally provided excellent efficacy; Chipco 26019 and Veranda O provided good efficacy and Disarm provided mediocre efficacy. ZeroTol, and the copper products (Badge X2, Camelot, Phyton 27, STBX-304) generally performed poorly.

Introduction

In 2011, IR-4 initiated a high priority project to determine efficacy of several fungicides on *Botrytis* species to obtain data supporting current and future registrations on ornamentals. This report includes the results of 22 experiments from 2001 to 2015 received from the IR-4 Ornamental Horticulture Program. We also reviewed 23 available ornamental trials published in Fungicide & Nematicide Tests and Plant Disease Management Reports to check efficacy of experimental and registered fungicides on *Botrytis* species; the source of report is included under each data table. This report is a brief summary of available data from these sources.

Materials and Methods

From 1998 to 2015, numerous products representing 42 active ingredients were tested as foliar applications against several *Botrytis* species causing blight and gray mold on ornamental horticulture crops. Treatments were generally applied either a few days or immediately before *Botrytis* inoculation. Researchers used a minimum of four replications. Disease severity and incidence were recorded at various intervals after initial application. Phytotoxicity or lack of it was generally noted in the reports. Ten researchers were involved in the testing (Appendix 1). Products were supplied by their respective manufacturers.

For IR-4 testing, the following protocols were used: 11-028,12-017, 13-017, 14-001 and 15-001. Please visit <http://ir4.rutgers.edu/ornamental/OrnamentalDrafts.cfm> to view and download these protocols.

For all research data tables, product names have been updated where manufacturers have established trade names, and tables have been rearranged by product alphanumeric order. Where both inoculated and non-inoculated checks were included in the experiment, the inoculated check appears last in the table with the non-inoculated check immediately preceding it.

Table 1. List of Products and Rates Tested on Ornamentals from 1998 to 2015.

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested		# Trials
Azoxystrobin	Heritage	Syngenta	Foliar	1 oz per 100 gal 2 oz per 100 gal 4 oz per 100 gal 8 oz per 100 gal	13
Azoxystrobin + Benzovindiflupyr	Mural	Syngenta	Foliar	7 oz per 100 gal	3
Azoxystrobin + Difenoconazole	Alibi Flora	Syngenta	Foliar	14 fl oz per 100 gal	1
<i>Bacillus</i> <i>amyloliquifaciens</i> strain F727	MBI-110	Marrone	Foliar	1 gal per 100 gal	2
<i>Bacillus subtilis</i>	QRD 713, Rhapsody	Agraquest	Foliar	4 qt per 100 gal 6 qt per 100 gal 8 qt per 100 gal	3
Boscalid	BAS 510	BASF	Foliar	4 oz per 100 gal 6.8 oz per 100 gal 8 oz per 100 gal 16 oz per 100 gal	4

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested		# Trials
Chlorothalonil	Daconil 2787 6F	Syngenta	Foliar	32 fl oz per 100 gal	3
	Daconil Ultrex			0.68 lb per 100 gal 1.0 lb per 100 gal 1.35 lb per 100 gal 2.5 lb per 100 gal	4
	Daconil Weatherstik			22 fl oz per 100 gal 32 fl oz per 100 gal	15
	Echo 90DF	19 oz per 100 gal		1	
	Echo 720 6F	22 fl oz per 100 gal			
Chlorothalonil + Thiophanate methyl	Spectro	Cleary	Foliar	16 oz per 100 gal	1
Copper hydroxide	Kocide	DuPont	Foliar	1 lb per 100 gal	1
Copper octanoate	Camelot	SePRO	Foliar	32 fl oz per 100 gal 48 fl oz per 100 gal	2
Copper oxychloride + Copper hydroxide	Badge X2	Gowan	Foliar	2 lb per 100 gal	1
Copper sulfate pentahydrate	Phyton 27	Phyton	Foliar	15 fl oz per 100 gal 20 fl oz per 100 gal	4
Cupric ammonium formate	STBX-304	Phyton	Foliar	20 oz per 100 gal	2
Cyprodinil	Vangard	Syngenta	Foliar	2 oz per 100 gal	1
Cyprodinil + Fludioxonil	Palladium	Syngenta	Foliar	2 oz per 100 gal 4 oz per 100 gal 6 oz per 100 gal 8 oz per 100 gal 12 oz per 100 gal	13
	Switch			3 oz per 100 gal 4 oz per 100 gal 6 oz per 100 gal 12 oz per 100 gal 14 oz per 100 gal	8
F9110	F9110	FMC	Foliar	24 fl oz per 100 gal	7
Fenhexamid	Decree	SePRO	Foliar	8 oz per 100 gal 12 oz per 100 gal 16 oz per 100 gal 24 oz per 100 gal 28 oz per 100 gal 32 oz per 100 gal	25
Fenpyrazamine	V-10135	Valent	Foliar	7 fl oz per 100 gal 9.6 fl oz per 100 gal 16 fl oz per 100 gal	6
Fluazinam	Omega	Syngenta	Foliar	8 fl oz per 100 gal	2
Fludioxonil	Medallion	Syngenta	Foliar	1 oz per 100 gal 2 oz per 100 gal 4 oz per 100 gal 8 oz per 100 gal	19
Fludioxonil	NUP 09092	NuFarm	Foliar	4 fl oz per 100 gal 8 fl oz per 100 gal	3
Fluoxastrobin	Disarm	Arysta, OHP	Foliar	3 fl oz per 100 gal 4 fl oz per 100 gal 6 fl oz per 100 gal 8 fl oz per 100 gal 21 fl oz per 100 gal	8

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested		# Trials
Fluxapyroxad + Pyraclostrobin	Orkestra Intrinsic	BASF	Foliar	4 fl oz per 100 gal 6 fl oz per 100 gal 8 fl oz per 100 gal	7
<i>Gliocladium catenulatum</i>	Prestop	Verdera	Foliar	0.5 % 4.2 lb per 100 gal	2
GWN-4550	GWN-4550		Foliar	10.0 oz per 100 gal 11.4 oz per 100 gal	1
Hydrogen dioxide + Peroxyacetic acid	ZeroTol	BioSafe	Foliar	30 fl oz per 100 gal 42 fl oz per 100 gal 4 qt per 100 gal	4
Iprodione	Chipco 26019	OHP	Foliar	0.5 lb per 100 gal 1 lb per 100 gal 2 lb per 100 gal 2.5 lb per 100 gal	13
	Chipco 26GT F	Bayer	Foliar	2.5 qt per 100 gal	1
Mancozeb	Fore	Dow	Foliar	1.5 lb per 100 gal	1
Mandestrobin	S2200	NuFarm	Foliar	7.5 fl oz per 100 gal 15 fl oz per 100 gal	6
Metconazole	Tourney	Valent	Foliar	4 oz per 100 gal	3
Polyoxin D	Affirm	NuFarm		8 oz per 100 gal	1
	Endorse	Arysta	Foliar	4 oz per 100 gal 8 oz per 100 gal 9 oz per 100 gal 12 oz per 100 gal 18 oz per 100 gal 28 oz per 100 gal 36 oz per 100 gal	10
	Veranda O	OHP		4 oz per 100 gal 8 oz per 100 gal	3
Potassium bicarbonate	Kaligreen		Foliar	2.5 lb per 100 gal	1
	Milstop	BioWorks		5 lb per 100 gal	2
Pyraclostrobin	BAS 500, Cabrio	BASF	Foliar	8 oz per 100 gal 16 oz per 100 gal 40 oz per 100 gal	2
	Insignia			4 oz per 100 gal 8 oz per 100 gal 12 oz per 100 gal 16 oz per 100 gal	6
Pyraclostrobin + Boscalid	BAS 516	BASF	Foliar	9.5 oz per 100 gal 18 oz per 100 gal	2
	Pageant			7 oz per 100 gal 9.5 oz per 100 gal 12.5 oz per 100 gal 14 oz per 100 gal 18 oz per 100 gal	14
<i>Reynoutria sachalinensis</i> extract	Regalia 50	Marrone	Foliar	4 fl oz per 100 gal	4
SP2770	SP2770	SePRO	Foliar	2.66 lb per 100 gal	6
SP2773	SP2773	SePRO	Foliar	1.66 lb per 100 gal 3.31 lb per 100 gal	6

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested		# Trials
STBX-013	STBX -013	Phyton	Foliar	6.4 fl oz per 100 gal 12.8 fl oz per 100 gal	1
<i>Streptomyces griseoviridis</i> Strain K 31	Mycostop	Verdera	Foliar	5 g per 13 gal	1
Tebuconazole	Torque	NuFarm	Foliar	8 fl oz per 100 gal	6
Thiophanate methyl	3336	Cleary	Foliar	16 oz per 100 gal	1
	Fungo	Scotts		12 oz per 100 gal 16 oz per 100 gal	1
	OHP 6672	OHP		20 fl oz per 100 gal	2
Thyme oil	Proud 3	BioHumanetics	Foliar	4 qt per 100 gal	10
Trifloxystrobin	Compass	Bayer	Foliar	0.5 oz per 100 gal 1 oz per 100 gal 2 oz per 100 gal 4 oz per 100 gal	7
Triflumizole	Terraguard	Chemtura	Foliar	4 oz per 100 gal 8 oz per 100 gal	1
Triticonazole	Trinity	BASF	Foliar	8 floz per 100 gal 12 fl oz per 100 gal	4

Results

Comparative Efficacy for Botrytis cinerea

From 1998 through 2015, 37 experiments were conducted by researchers throughout the US to examine the activity of new chemical and biologically-based tools for *Botrytis cinerea*. The following experiments are organized chronologically with each crop. The crops are organized first by those grown primarily in greenhouses and then those that are field grown; generally from herbaceous annuals to woody crops.

Begonia

In 2007, Buck conducted a greenhouse trial to determine efficacy of several fungicides for the control of Botrytis blight on begonia. Fungicides were applied as foliar sprays on Apr 5, 12 and 19; plants were sprayed with *B. cinerea* inoculum on Apr 4, 11 and 18. Significantly fewer leaves with Botrytis blight were observed for all fungicide treatments at each evaluation date (Table 2). Significantly less Botrytis blight was observed Apr 30 and May 10 with the 8.0 oz compared to the 2.0 oz rate of Palladium. No phytotoxicity was observed from any treatment.

Table 2.* Efficacy for Botrytis cinerea on Begonia (Begonia sp.) ‘Doublet Pink’, Buck, GA, 2007.

Treatment	Rate Per 100 Gal	Leaves with Botrytis blight (%) ^x		
		4/20/07	4/30/07	5/10/07
Chipco 26019 50WDG (iprodione)	2.5 lb	16.3 b	14.5 bc	15.7 bc
Medallion (fludioxonil)	2 oz	9.0 b	11.9 c	17.3 bc
Palladium 62.5WG (cyprodinil + fludioxonil)	2 oz	13.4 b	21.2 b	20.8 b
	4 oz	15.3 b	15.2 bc	17.8 bc
	8 oz	10.7 b	13.0 c	11.9 c
Untreated inoculated	-	30.1 a	31.0 a	32.2 a

* Not an IR-4 Experiment: Plant Disease Management Reports 3:OT019.

^x Means followed by same letter do not differ significantly based on Least Significant Difference Test (P=0.05).

Geranium

In 2000, Hausbeck conducted a series of greenhouse experiments to screen several fungicides for their control of Botrytis blight on geranium. No phytotoxicity was observed from any treatment, but efficacy varied as described for each experiment.

In the first experiment, fungicides were applied as foliar sprays on April 10, 17, and 26, and May 1; plants were sprayed with *B. cinerea* inoculum on April 18 and 27, and May 2. All treatments except GWN-4550, significantly decreased the percentage of blighted leaves with sporulation by the last observation date (Table 3). Daconil and Decree were more effective than the other fungicides in this experiment.

In the second greenhouse experiment, fungicides were applied as foliar sprays on Mar 22, and April 5 and 19 (14-day intervals) for Heritage, and on Mar 22 and 29, April 5, 12, 19 and 26 (7-day intervals) for the other products. Plants were sprayed with *B. cinerea* inoculum on Mar 29, and Apr 6, 13 and 20. At the last observation date (April 25), Chipco, Daconil, and Heritage (1, 2, and 8 oz/100 gal) significantly reduced sporulation (Table 4).

In Hausbeck's third greenhouse experiment, fungicides were applied once as foliar sprays on Mar 29; plants were sprayed with *B. cinerea* inoculum on Mar 30, and Apr 3. On April 3, disease was light and differences among treatments were not noted for the parameters measured. At the next observation (April 7), Compass at 2 oz, Heritage, and Decree all limited Botrytis blight compared to the untreated control, although differences in sporulation were not noted (Table 5). Disease did not progress in the latter portion of the study; however, the incidence of sporulation increased, especially by the last observation date (April 27). At the conclusion of the study, only Decree 50WDG limited sporulation compared to the untreated control.

In her fourth greenhouse experiment with geranium, fungicides were applied as foliar sprays on Nov 7, 14, 21, and 28, and Dec 5; plants were sprayed with *B. cinerea* inoculum on Nov 15 and 22. Disease pressure was severe throughout the duration of this experiment. On the last observation date (12/13), a number of products reduced the incidence of blighting and sporulation, including Compass, Heritage, Decree, and Daconil (Table 6). Switch did not significantly control leaf blight, but did limit sporulation.

Table 3. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Lavender', Hausbeck, MI, 2000.

Treatment	Rate Per 100 Gal	Leaves with Blight and Sporulation (%) ^x	
		5/5/00	5/12/00
3336 50WP (thiophanate methyl)	16.0 oz	10.6 b	16.6 b
Daconil 2787 6F (chlorothalonil)	32 fl oz	3.7 a	9.9 a
Decree 50WDG (fenhexamid)	2.0 lb	5.5 a	9.7 a
GWN-4550 70WP	11.4 oz	10.4 b	28.3 d
GWN-4500 80WDG	10.0 oz	9.7 b	22.7 c
Untreated inoculated	-	14.7 c	33.5 d

* Not an IR-4 Experiment: F&N Tests Vol 57: OT11.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

Table 4. * Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Lavender', Hausbeck, MI, 2000.

Treatment	Rate Per 100 Gal	Leaves with Blight and Sporulation (%) ^x			
		4/6/00	4/12/00	4/18/00	4/25/00
Chipco 26019 50W (iprodione)	16.0 oz	0.5 a	2.3 a	3.9 a	3.2 a
Daconil 2787 6F (chlorothalonil)	32 fl oz	1.1 a	4.6 ab	4.8 a	2.5 a
Heritage 50WG (azoxystrobin)	1 oz	2.6 a	4.9 ab	8.1 ab	3.6 a
Heritage 50WG (azoxystrobin)	2 oz	1.2 a	2.7 a	6.7 a	4.8 a
Heritage 50WG (azoxystrobin)	4 oz	4.6 a	9.6 abc	11.4 ab	7.5 ab
Heritage 50WG (azoxystrobin)	8 oz	1.8 a	3.9 ab	5.3 a	3.3 a
Mycostop (<i>Streptomyces griseoviridis</i>)	5 g/13 gal	12.0 c	10.7 abc	12.6 ab	11.5 ab
QRD 713 5AS	190 fl oz	1.7 a	6.1 ab	12.3 ab	9.0 ab
ZeroTol (hydrogen dioxide)	30 fl oz	8.2 b	9.1 abc	11.6 ab	10.7 ab
Untreated inoculated	-	4.8 ab	14.4 c	17.5 b	17.7 b
Untreated non-inoculated		1.8 a	6.8 abc	12.1 ab	13.6 ab

* Not an IR-4 Experiment: F&N Tests Vol 58: OT020. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

Table 5. * Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit Red', Hausbeck, MI, 2000.

Treatment	Rate per 100 gal	Disease Observations ^x				
		4/3/00	4/7/00	4/12/00	4/21/00	4/27/00
Non-sporulating diseased leaves (%)						
Chipco 26019 50W (iprodione)	32 oz	0.0 a	7.5 d	4.2 a	1.2 a	3.4 a
Compass 50W (trifloxystrobin)	1 oz	0.0 a	3.1 a-d	1.3 a	2.0 a	7.2 a
Compass 50W (trifloxystrobin)	2 oz	1.7 a	1.7 ab	0.0 a	2.7 a	4.8 a
Compass 50W (trifloxystrobin)	4 oz	0.8 a	2.3 abc	0.0 a	3.7 a	7.4 a
Daconil 2787 FL (chlorothalonil)	32 fl oz	0.0 a	5.2 a-d	1.3 a	3.7 a	2.9 a
Decree 50WDG (fenhexamid)	32 oz	1.3 a	0.0 a	0.8 a	5.2 a	8.9 a
Heritage 50WG (azoxystrobin)	2 oz	1.3 a	1.7 ab	2.8 a	6.1 a	4.7 a
Medallion 50W (fludioxonil)	2 oz	2.3 a	6.9 cd	2.8 a	7.2 a	7.8 a
Untreated inoculated	-	1.2 a	7.3 cd	2.3 a	2.9 a	2.4 a
Leaves with sporulating Botrytis (%) ^y						
Chipco 26019 50W (iprodione)	32 oz	0.0 a	2.8 a	13.5 de	13.3 d	23.6 c
Compass 50W (trifloxystrobin)	1 oz	2.4 a	1.2 a	1.2 a	5.7 ab	14.9 ab
Compass 50W (trifloxystrobin)	2 oz	1.9 a	3.7 a	2.4 ab	4.4 ab	18.1 bc
Compass 50W (trifloxystrobin)	4 oz	0.0 a	0.8 a	4.2 abc	2.0 a	17.8 bc
Daconil 2787 FL (chlorothalonil)	32 fl oz	0.0 a	0.0 a	9.0 b-e	11.2 cd	20.3 bc
Decree 50WDG (fenhexamid)	32 oz	1.0 a	1.7 a	9.9 cde	5.8 ab	8.1 a
Heritage 50WG (azoxystrobin)	2 oz	1.4 a	0.0 a	5.6 bcde	7.9 bc	18.5 bc
Medallion 50W (fludioxonil)	2 oz	0.0 a	4.4 a	3.1 abc	8.3 bcd	23.6 c
Untreated inoculated	-	2.6 a	7.0 a	13.5 e	13.4 d	18.4 bc

* Not an IR-4 Experiment: F&N Tests Vol 58: OT030. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Fisher's LSD Method (P=0.05).

^y Rating represents percentage of leaves sporulating out of total number of leaves.

Table 6. * Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit Red', Hausbeck, MI, 2000.

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) ^x			Leaves sporulating with <i>Botrytis</i> (%) ^y		
		11/28/00	12/5/00	12/13/00	11/28/00	12/5/00	12/13/00
Compass 50WDG (trifloxystrobin)	2 oz	14.7 ab	25.9 b	32.7 b	7.5 a	18.1 a	16.2 ab
Daconil 2787 6F (chlorothalonil)	32 fl oz	9.6 ab	23.6 b	32.2 b	5.2 a	8.8 a	13.6 ab
Decree 50WDG (fenhexamid)	24 oz	1.8 a	13.4 ab	25.9 b	0.9 a	1.5 a	2.4 a
Heritage 50WG (azoxystrobin)	2 oz	6.1 a	18.3 b	25.0 b	6.1 a	7.5 a	21.0 b
Medallion 50WP (fludioxonil)	2 oz	37.9 c	76.8 d	84.4 d	18.3 b	56.6 b	80.2 c
Switch 62.5WG (cyprodinil + fludioxonil)	4 oz	2.6 a	41.3 c	48.3 c	2.6 a	9.5 a	18.6 b
	6 oz	10.1 ab	44.0 c	54.2 c	6.9 a	9.6 a	11.9 ab
Untreated non-inoculated	-	1.0 a	2.8 a	1.4 a	0.0 a	2.8 a	1.4 a
Untreated inoculated	-	20.3 b	47.7 c	60.6 c	18.8 b	43.7 b	56.7 c

* Not an IR-4 Experiment: F&N Tests Vol 58: OT033. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rating represents percentage of leaves sporulating out of total number of leaves.

In 2001, Hausbeck conducted two greenhouse experiments to assess efficacy of several fungicides for the control of *Botrytis* blight on geranium 'Pinto Violet'.

In the first experiment, pyraclostrobin or fenhexamid were applied as foliar sprays at 14-day intervals on May 30, and Jun 13 and 27; plants were sprayed with *B. cinerea* inoculum on Jun 6 and 15. All treatments appeared to limit a high disease pressure, although the differences were not significant, compared to the untreated control, including the standard Decree and Cabrio, at the higher two rates (Table 7). However, significant differences were observed in the incidence of leaves with sporulating *B. cinerea*. All treatments were significantly better than the untreated control in reducing the ability of *B. cinerea* to sporulate on infected leaves. No phytotoxicity was observed from any treatment.

Table 7. * Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Violet', Hausbeck, MI, 2001.

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) ^x			Leaves sporulating with <i>Botrytis</i> (%) ^y		
		6/20/01	6/26/01	7/2/01	6/20/01	6/26/01	7/2/01
Cabrio 20WG (pyraclostrobin)	8 oz	16.8 a	35.5 a	48.2 b	10.6 a	23.0 abc	5.1 a
	16 oz	28.3 ab	31.1 a	28.2 a	15.7 a	17.0 ab	6.3 a
	40 oz	17.2 a	33.4 a	33.0 ab	17.2 a	18.0 ab	9.7 a
Decree 50WDG (fenhexamid)	24 oz	23.3 ab	33.1 a	28.2 a	11.6 a	11.1 a	16.1 a
Decree SC (fenhexamid)	1.5 pt	24.2 ab	27.3 a	29.0 a	15.5 a	18.3 ab	16.0 a
Untreated inoculated	-	31.4 b	38.5 a	43.5 ab	26.2 a	32.3 bc	42.1 b

* Not an IR-4 Experiment: F&N Tests Vol 58: OT027.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rating represents percentage of leaves sporulating out of total number of leaves.

In Hausbeck's second greenhouse experiment, fungicides were applied as foliar sprays at 14-day intervals on May 30, and Jun 13 and 27; plants were sprayed with *B. cinerea* inoculum on Jun 6 and 15. Decree and Heritage 2 oz effectively limited high infection of leaves compared with the untreated non-inoculated control plants by the last observation date of Jul 2 (Table 8). Decree, Heritage (2 oz), and Daconil

Weather Stik significantly decreased the number of leaves with sporulating *B. cinerea* compared with the untreated non-inoculated control plants. Daconil Weather Stik was the only product that significantly reduced disease compared to both untreated controls. Severe phytotoxicity was observed from Switch and Medallion treatments.

Table 8. * Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Violet', Hausbeck, MI, 2001.

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) ^x			Leaves sporulating with <i>Botrytis</i> (%) ^y		
		6/20/01	6/26/01	7/2/01	6/20/01	6/26/01	7/2/01
Compass 50WDG (trifloxystrobin)	2 oz	33.1 bcd	49.2ab	45.3 b	20.0ab	36.4abc	30.5 bc
Daconil Weather Stik (chlorothalonil)	1.375 pt	37.7 cd	52.0ab	52.0 b	12.7a	19.6 a	8.3a
Decree 50WDG (fenhexamid)	32 oz	23.3ab	33.2a	30.2 a	15.4ab	28.9ab	19.6ab
Heritage 50WG (azoxystrobin)	2 oz	24.7ab	34.2a	29.2 a	13.7a	24.5ab	21.8ab
	4 oz	33.8 bcd	45.2ab	46.9 b	29.1 bc	35.0abc	33.9 bc
Medallion 50WP (fludioxonil)	2 oz	42.8 d	63.8b	—	38.0 c	44.3 bc	—
Switch 62.5WG (cyprodinil + fludioxonil)	4 oz	19.1a	59.2 b	—	19.1ab	41.1 bc	—
	6 oz	26.6abc	64.5 b	—	26.6ab	49.2 c	—
Untreated non-inoculated	-	26.6abc	46.9ab	44.2 b	23.2ab	41.1 bc	41.3 c
Untreated inoculated	-	27.0abc	45.9ab	31.7 a	20.0ab	42.7 bc	31.2 bc

* Not an IR-4 Experiment: F&N Tests Vol 58: OT032.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rating represents percentage of leaves sporulating out of total number of leaves.

In 2002, Hausbeck conducted a series of greenhouse trials to study fungicide reduction of *B. cinerea* on three geranium cultivars. No phytotoxicity was observed from any treatment.

In the first experiment, fungicides were applied as foliar sprays at 14-day intervals on May 10 and 24, and Jun 6 to geranium 'Pinto Violet'; plants were sprayed with *B. cinerea* inoculum on May 10 and 17. Decree, Daconil Weather Stik, Spectro, and Endorse at 2.2 lb were especially effective at reducing the amount of foliar infection and sporulation (Table 9). All treatments significantly limited sporulation compared to the untreated inoculated control plants.

In the second greenhouse experiment, foliar fungicide sprays were applied at 14-day intervals on May 17 and 31, and Jun 16 to geranium 'Orbit Red'; plants were sprayed with *B. cinerea* inoculum on May 17 and 31. Differences in foliar infection occurred, but no consistent trends were apparent. The two highest rates of BAS 510 (8.0 and 16.0 oz/100 gal) and Compass (2.0 and 4.0 oz/100 gal) significantly decreased sporulation of *Botrytis* compared with the untreated inoculated plants (Table 10). Other treatments that limited sporulation included BAS 510 (4.0 oz/100 gal), Switch (3.0 oz/100 gal), Decree (24.0 oz/100 gal), and Endorse (1.1 and 1.75 lb/100 gal).

In the third greenhouse experiment, fungicides were applied as foliar sprays at 14-day intervals on March 8 and 22 to geranium 'Red II'; plants were sprayed with *B. cinerea* inoculum on March 8, 15 and 22. Disease pressure was heavy. Daconil Weather Stik and Decree were especially effective in reducing the amount of foliar infection and sporulation (Table 11). Chipco 26GT, Compass and Echo 720 were also effective in limiting sporulation. Increasing rates did not seem helpful in enhancing disease control with Fungo and Terraguard.

Table 9.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Violet', Hausbeck, MI, 2002.

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) ^x				Leaves sporulating with Botrytis (%) ^y			
		5/17/02	5/24/02	5/31/02	6/5/02	5/17/02	5/24/02	5/31/02	6/5/02
Daconil Weather Stik (chlorothalonil)	1.375 pt	1.0 a	4.6 a	11.9 a	13.5 a	1.0 a	0.8 a	0.8 a	3.1 a
Decree 50WDG (fenhexamid)	2.0 lb	1.1 a	4.9 a	6.8 a	10.5 a	1.1 a	0.8 a	1.7 a	1.6 a
Endorse 2.5WP (polyoxin D)	0.55 lb	3.4 a	13.2 a	10.3 a	21.0 abc	2.2 a	6.6 a	2.9 a	4.2 a
	1.1 lb	1.0 a	11.8 a	9.6 a	25.5 bc	1.0 a	8.6 a	1.8 a	7.9 a
	2.2 lb	0.0 a	10.0 a	7.4 a	14.2 a	0.0 a	3.0 a	1.1 a	2.0 a
Spectro 90WDG (chlorothalonil + thiophanate methyl)	1.0 lb	1.1 a	10.7 a	9.5 a	17.3 ab	1.1 a	4.6 a	1.5 a	4.5 a
Untreated non-inoculated	-	3.3 a	7.1 a	11.5 a	11.8 a	3.3 a	2.6 a	2.8 a	3.6 a
Untreated inoculated	-	15.0 b	23.3 b	26.3 b	29.6 c	15.0 b	18.7 b	13.0 b	14.2 b

* Not an IR-4 Experiment: F&N Tests Vol 58: OT028.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rating represents percentage of leaves sporulating out of total number of leaves.

Table 10. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit Red', Hausbeck, MI, 2002.

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) ^x			Leaves sporulating with <i>Botrytis</i> (%) ^y	
		5/31/02	6/14/02	6/28/02	6/14/02	6/28/02
BAS 510 70WG (boscalid)	4 oz	4.4 a	5.5 a	18.2 ab	9.9 ab	11.6 a-d
	8 oz	5.8 b	3.9 a	8.8 a	7.8 a	6.3 abc
	16 oz	6.6 b	9.4 abc	25.5 ab	16.3 a-d	5.1 ab
Compass 50WDG (trifloxystrobin)	1 oz	9.6 b	8.1 abc	27.3 ab	21.6 a-e	14.7 a-e
	2 oz	6.0 b	9.3 abc	19.5 ab	12.5 abc	6.2 ab
	4 oz	9.9 b	12.5 ab	34.6 b	22.2 a-e	1.0 a
Daconil 54EC (chlorothalonil)	1 qt	15.4 b	5.7 ab	13.5 a	25.6 b-f	25.1 b-e
Decree 50WDG (fenhexamid)	32 oz	9.8 b	5.8 ab	18.2 ab	20.4 a-e	12.5 a-e
Endorse 2.5WP (polyoxin D)	0.55 lb	17.0 b	11.3 abc	12.4 a	31.8 d-g	18.8 a-e
	1.10 lb	11.9 b	8.8 abc	28.6 ab	31.8 d-g	11.4 a-e
	1.75 lb	13.4 b	14.8 abc	17.4 ab	24.0 b-f	9.8 a-d
Medallion 50WP (fludioxonil)	2 oz	18.4 b	9.1 abc	9.6 a	40.8 g	29.3 cde
	4 oz	14.6 b	13.8 abc	21.1 ab	39.2 fg	17.4 a-e
	8 oz	14.0 b	12.4 abc	27.5 ab	34.3 efg	21.9 b-e
Switch 62.5WG (cyprodinil + fludioxonil)	3 oz	7.1 b	25.4 c	21.4 ab	25.0 b-f	12.4 a-e
	6 oz	13.1 b	23.7 bc	24.0 ab	24.0 b-f	18.4 a-e
	12 oz	9.3 b	16.7 abc	17.1 ab	26.0 c-f	48.1 e
Untreated non-inoculated	-	8.3 b	5.3 a	11.7 a	24.6 b-f	28.0 b-e
Untreated inoculated	-	7.1 b	8.0 abc	11.1 a	28.0 c-g	33.9 de

* Series of IR-4 Trials, also published as F&N Tests Vol 58: OT029.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rating represents percentage of leaves sporulating out of total number of leaves.

Table 11.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Red II', Hausbeck, MI, 2002.

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) ^x		Leaves sporulating with <i>Botrytis</i> (%) ^y	
		3/29/02	4/5/02	3/29/02	4/5/02
Chipco 26GT F (iprodione)	2.5 qt	35.9 a-e	51.7 b	10.4 ab	6.0 a
Compass 50WDG (trifloxystrobin)	2 oz	31.8 abc	57.3 bc	13.6 abc	31.5 cde
Compass 50WDG + Latron B-1956	2 oz + 2 fl oz	52.7 cde	77.0 cd	12.6 ab	19.3 bc
Daconil Weatherstik 6F (chlorothalonil)	1.4 pt	35.0 a-e	29.4 a	9.9 ab	8.5 ab
Decree 50WDG (fenhexamid)	12 oz	18.7 a	16.1 a	1.6 a	1.2 a
Echo 90DF (chlorothalonil)	1.2 lb	39.5 b-e	69.1 bcd	16.7 bc	25.3 cd
Echo 720 6F (chlorothalonil)	1.4 pt	46.7 b-e	69.4 bcd	11.9 ab	10.1 ab
Fungo 50WSB (thiophanate methyl)	12 oz	54.8 def	76.9 cd	38.4 d	46.4 f
	16 oz	72.0 fg	82.4 d	59.4 e	47.2 f
Terraguard 50W (triflumizole)	4 oz	56.2 ef	61.3 bcd	26.4 cd	38.6 def
	8 oz	52.4 cde	62.9 bcd	36.2 d	43.4 ef
Untreated non-inoculated	-	27.9 ab	49.0 b	15.8 abc	25.1 cd
Untreated inoculated	-	34.2 a-e	50.3 b	26.6 cd	36.7 def

* Not an IR-4 Experiment: F&N Tests Vol 58: OT031. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rating represents percentage of leaves sporulating out of total number of leaves.

2003

In 2003, Hausbeck conducted two greenhouse experiments to determine efficacy of several fungicides for the control of *Botrytis* blight on geranium. No phytotoxicity was observed from any treatment.

In the first, fungicides were applied as foliar sprays on April 17 and 24, and May 1, 8 and 15 to geranium 'Orbit White'; plants were sprayed with *B. cinerea* inoculum on April 17 and 24, and May 1. Disease pressure was severe. Daconil at 14-day interval, Insignia at 7-day interval, and Endorse at 1.1 lb, 7-day interval significantly reduced foliar infection, sporulation and disease severity (Table 12). Decree significantly reduced sporulation and disease severity.

In the second experiment, the same fungicide treatments were applied to two cultivars of geranium as seven day treatments on Jan 9, 16, and 23, and fourteen day treatments on Jan 9 and 23; plants were sprayed with *B. cinerea* inoculum on Jan 9. Disease pressure was significant in this trial, especially for the cultivar 'Sonora White.' For cultivar 'Freedom White,' only Decree and Daconil Weather Stik reduced disease severity significantly by the last assessment (Table 13). For cultivar 'Sonora White,' the Endorse, Decree, Daconil Weather Stik, and Chipco 26019 treatments all significantly reduced disease severity on the last rating (Table 14). Only Decree and Daconil Weather Stik significantly reduced the number of leaves with sporulating *B. cinerea*.

Table 12.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit White', Hausbeck, MI, 2003.

Treatment ^z	Rate Per 100 Gal	Leaves with Infection (%) ^x			Leaves with Sporulation (%)			Disease Severity ^y	
		5/1/03	5/8/03	5/15/03	5/1/03	5/8/03	5/15/03	5/8/03	5/22/03
Daconil Weather Stik (chlorothalonil)	32 fl oz	2.5 a	3.4 a	9.2 a	1.5 a	2.2 a	6.1	2.0 a	3.2 a
Decree 50WDG (fenhexamid)	2.0 lb	8.3 ab	8.1 abc	16.2 ab	1.5 a	2.0 a	11.4	2.3 a	5.0 ab
Endorse 2.5WP (polyoxin D)	0.55 lb	11.7 ab	18.1 a-e	17.9 ab	5.9 ab	13.8 a-d	14.4	5.0 ab	4.2 ab
	1.1 lb	8.1 ab	8.8 a-d	11.8 a	2.3 a	4.6 ab	7.1	2.5 a	3.2 a
	2.2 lb	11.8 ab	12.0 a-e	22.1 ab	1.6 a	5.4 ab	15.2	3.7 ab	4.7 ab
Insignia 20WG (pyraclostrobin)	4 oz	6.1 ab	9.2 a-d	10.8 a	4.0 ab	7.7 ab	8.4	3.8 ab	4.2 ab
	8 oz	5.1 ab	6.0 ab	18.1 ab	0.5 a	2.8 ab	12.7	2.7 a	4.0 ab
Untreated inoculated	-	16.3 b	24.2 de	27.1 ab	7.1 ab	20.9 cd	22.9	6.0 b	5.8 ab

* Not an IR-4 Experiment: F&N Tests Vol 59: OT006. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rated on a scale of 1 to 10, where 1=no lesions to 10=plant death.

^z Treatments applied at 7-day intervals except Daconil, Decree and Endorse at 2.2 lb/100 gal applied at 14-day intervals.

Table 13.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Freedom White', Hausbeck, MI, 2003.

Treatment	Rate Per 100 Gal	Spray Schedule (Days)	Leaves with Sporulation (%) ^x			Disease Severity ^y		
			1/16/03	1/23/03	1/30/03	1/16/03	1/23/03	1/30/03
Camelot 58EC (copper octanoate)	32 fl oz	7	2.5 ab	7.7 ab	12.5	3.0 a	5.3 ab	6.0 ab
	32 fl oz	14	6.0 c	9.2 b	13.7	5.3 b	5.8 b	7.3 b
	48 fl oz	14	2.8 ab	6.0 ab	12.5	2.8 a	4.5 ab	6.0 ab
Chipco 26019 50WDG (iprodione)	2.5 lb	14	1.8 ab	4.8 ab	10.5	3.0 a	4.3 ab	5.7 ab
Daconil Weather Stik (chlorothalonil)	32 fl oz	14	0.8 ab	3.0 a	6.2	2.0 a	2.2 a	2.8 a
Decree 50WDG (fenhexamid)	24 oz	14	1.5 ab	3.7 ab	8.7	2.2 a	2.5 ab	3.8 a
Endorse 2.5WP (polyoxin D)	2.2 lb	14	2.5 ab	5.8 ab	7.3	3.3 a	5.2 ab	5.2 ab
Phyton 27 (copper sulfate pentahydrate)	20 fl oz	7	2.8 ab	8.3 ab	10.7	3.2 a	4.8 ab	5.7 ab
Untreated inoculated	-	-	4.2 bc	9.0 b	13.3	4.0 a	5.8 b	7.7 b

* Not an IR-4 Experiment: F&N Tests Vol 59: OT008.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rated on a scale of 1 to 10, where 1=no lesions to 10=plant death.

Table 14.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Sonora White', Hausbeck, MI, 2003.

Treatment	Rate Per 100 Gal	Spray Schedule (Days)	Leaves with Sporulation (%) ^x		Disease Severity ^y	
			1/16/03	1/23/03	1/16/03	1/23/03
Camelot 58EC (copper octanoate)	32 fl oz	7	5.7 bc	29.5 b	3.8 bc	8.5 c
	32 fl oz	14	7.0 c	34.0 b	4.2 bc	8.3 c
	48 fl oz	14	5.3 abc	30.5 b	4.0 bc	8.7 c
Chipco 26019 50WDG (iprodione)	2.5 lb	14	2.2 ab	30.5 b	2.3 ab	7.0 b
Daconil Weather Stik (chlorothalonil)	32 fl oz	14	1.5 ab	12.7 a	1.7 a	3.7 a
Decree 50WDG (fenhexamid)	24 oz	14	1.2 a	10.5 a	1.7 a	3.7 a
Endorse 2.5WP (polyoxin D)	2.2 lb	14	4.0 abc	15.3 b	2.7 abc	4.5 a
Phyton 27 (copper sulfate pentahydrate)	20 fl oz	7	2.8 abc	32.0 b	2.8 abc	8.5 c
Untreated inoculated	-	-	6.5 c	36.5 b	4.5 c	8.8 c

* Not an IR-4 Experiment: F&N Tests Vol 59: OT008.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rated on a scale of 1 to 10, where 1=no lesions to 10=plant death.

During 2004, Hausbeck conducted two greenhouse experiments to determine efficacy of several fungicides for the control of *Botrytis* blight on geranium.

In the first experiment, fungicides were applied as foliar sprays on Aug 25 and 31, and Sep 8 on geranium 'Orbit White'; plants were sprayed with *B. cinerea* inoculum on Aug 25 and 31, and Sep 8. BAS 510, Omega, Captan and Daconil Weather Stik all significantly reduced severe disease infection on the last rating date (Table 15). STBX-013 and ZeroTol did not significantly reduce infection on all rating dates. Although Captan and Omega effectively limited infection, plants treated with these two fungicides showed leaf burning and chlorosis on all three rating dates.

In the second experiment Hausbeck applied fungicides as foliar sprays on Aug 24 and 31, and Sep 7 and 14 to Geranium 'Emperor'; plants were sprayed with *B. cinerea* inoculum 4 hours after each fungicide treatment. All products significantly limited development of a moderate disease pressure (Table 16). Significant differences among treatments were not observed. No phytotoxicity was observed from any treatment.

Table 15.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit White', Hausbeck, MI, 2004.

Treatment	Rate Per 100 Gal	Leaves with Sporulation (%) ^x			Plant Health ^y		
		8/31/04	9/7/04	9/15/04	8/31/04	9/7/04	9/15/04
BAS 510 70WG (boscalid)	6.8 oz	0.4 a	7.3 ab	1.4 a	1.2 a	2.2 a	2.2 a
Captan 80WDG (captan)	2.5 lb	1.3 a	4.7 ab	3.1 a	1.3 a	1.8 a	3.0 a
Daconil Weather Stik (chlorothalonil)	1.4 pt	0.5 a	1.4 a	0.4 a	1.2 a	1.5 a	1.2 a
Omega 500F (fluazinam)	8 fl oz	0.4 a	1.1 a	0.0 a	1.2 a	1.3 a	1.5 a
STBX-013	6.4 fl oz	6.3 ab	31.9 bc	23.2 b	3.3 b	5.0 b	6.0 b
	12.8 fl oz	6.5 ab	30.7 bc	22.9 b	3.2 b	5.2 b	5.3 b
ZeroTol 27% (hydrogen dioxide)	42.2 fl oz	5.1 ab	29.7 bc	41.7 c	2.7 ab	5.2 b	6.3 b
Untreated inoculated	-	10.9 b	35.2 c	32.5 bc	4.3 b	4.7 b	6.2 b

* Not an IR-4 Experiment: F&N Tests Vol 60: OT005. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

^y Rated on a scale of 1 to 10, where 1=no lesions to 10=plant death.

Table 16.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x domesticum*) 'Emperor', Hausbeck, MI, 2004.

Treatment	Rate Per 100 Gal	Number of Lesions ^x	Number of Sporulating Lesions	Disease Severity ^y
BAS 510 70WG (boscalid)	4.5 oz	7.0 a	4.7 a	3.0 a
Daconil Weatherstik 6F (chlorothalonil)	1.4 pt	2.2 a	1.7 a	1.7 a
Decree 50WDG (fenhexamid)	12 oz	2.2 a	2.0 a	2.0 a
Endorse 2.5WP (polyoxin D)	2.2 lb	1.5 a	1.2 a	1.7 a
Heritage 50WG (azoxystrobin)	8 oz	5.3 a	3.3 a	2.7 a
Insignia 20WDG (pyraclostrobin)	8 oz	3.8 a	2.5 a	2.3 a
Rhapsody 1.34% AS (<i>Bacillus subtilis</i> QST 713 strain)	8 qt	3.0 a	2.3 a	2.2 a
Untreated inoculated	-	21.5 b	19.0 b	6.3 b

* Not an IR-4 Experiment: F&N Tests Vol 60: OT009. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Tukey's Studentized Range Test (P=0.05).

^y Severity was rated on a scale of 1 to 10; where 1=healthy, 2 to 8=varying degrees of blighting, and 10=dead.

In 2008, Hausbeck screened several fungicides for efficacy against *Botrytis* blight on geranium 'Orbit Pink'. Fungicides were applied as foliar sprays on Jun 20 and 27. Two hours after the initial fungicide application, plants were inoculated with the *B. cinerea* conidial suspension. All treatments significantly reduced a high disease pressure, with Daconil Weather Stik and Palladium at 4 oz having the lowest disease severity on both rating dates (Table 17). Plants treated with Palladium at the 4 oz rate had the lowest percent infected leaves. However, the two rates of Palladium were the only treatments resulting in phytotoxicity. Plants showing phytotoxicity symptoms had chlorotic leaves with some necrosis.

Table 17.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit Pink', Hausbeck, MI, 2008.

Treatment	Rate Per 100 Gal	Infected Leaves (%) ^x		Disease Severity ^y		Phytotoxicity ^z
		6/27/08	7/2/08	6/27/08	7/2/08	
Daconil Weather Stik (chlorothalonil)	1.4 pt	11.0 ab	12.8 a	1.8 a	2.3 a	1.0 a
Endorse 2.5WP (polyoxin D)	2.2 lb	11.7 ab	30.2 ab	2.2 ab	3.0 ab	1.0 a
Palladium 62.5WG (cyprodinil + fludioxonil)	4 oz	8.1 a	12.5 a	2.0 ab	2.3 a	6.3 b
	6 oz	13.7 ab	25.3 a	2.0 ab	3.0 ab	5.8 b
V-10135 (fenpyrazamine)	7 fl oz	23.0 bc	32.6 ab	2.6 ab	3.4 ab	1.0 a
Untreated inoculated	-	38.0 d	65.0 c	3.8 c	5.8 d	1.0 a

* Not an IR-4 Experiment: Plant Disease Management Reports 3:OT002. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Fisher's Protected LSD Test (P=0.05).

^yDisease severity rated on a scale of 1 to 10, where 1=healthy/no disease, 2=few/small necrotic areas, 3=few/moderate necrotic areas, 4=few/moderate sized necrotic areas throughout foliage, 5=moderate necrotic areas/1-9% defoliation, 6=large necrotic areas/10-29% defoliation, 7=large necrotic areas/30-59% defoliation, 8=60-79% defoliation, 9=80-99% defoliation, 10=100% defoliated/plant death.

^zPhytotoxicity was rated on a scale of 1 to 10, where 1=healthy, 2-9=varying degrees of chlorosis/necrosis, and 10=plant death.

In 2009, Hausbeck conducted a greenhouse experiment to determine efficacy of several fungicides for the control of *Botrytis* blight on geranium 'Orbit Red'. Fungicides were applied as foliar sprays on Apr 26 and May 6. After the Apr 26 application, plants were inoculated by spraying with the *B. cinerea* conidial solution after fungicide application. All treatments significantly a reduced severe disease pressure, and statistical differences were observed among treatments (Table 18). Fluazinam completely prevented infection, and the industry standard Daconil Weather Stick and Palladium were very effective also. A rate response was not observed with Disarm O or the biopesticide Veranda O treatments. Phytotoxicity in the form of chlorosis and necrotic leaf margins was observed on plants treated with Palladium.

Table 18.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit Red', Hausbeck, MI, 2009.

Treatment	Rate Per 100 Gal	Sporulating Leaves (%) ^x		Disease Severity ^y	
		5/6/09	5/12/09	5/6/09	5/12/09
Daconil Weather Stik (chlorothalonil)	1.4 pt	0.3 ab	1.3 a	1.5 ab	1.8 ab
Decree 50WG (fenhexamid)	1.5 lb	2.5 abc	9.0 b	2.3 bcd	4.0 cd
Disarm O 480SC (fluoxastrobin)	3 fl oz	2.0 abc	9.5 bc	2.8 cd	4.3 de
	6 fl oz	4.5 cd	12.8 cd	3.0 de	5.0 de
Fluazinam 500F (fluazinam)	8 fl oz	0.0 a	0.0 a	1.0 a	1.0 a
OHP 6672 (thiophanate methyl)	20 fl oz	5.8 d	13.3 d	4.0 e	5.5 e
Pageant 38WG (pyraclostrobin + boscalid)	12.5 oz	0.8 ab	3.3 a	1.8 abc	2.3 ab
Palladium 62.5WG (cyprodinil + fludioxonil)	8 oz	0.0 a	0.8 a	1.0 a	1.5 ab
V-10135 4SC (fenpyrazamine)	9.6 fl oz	3.0 bcd	9.0 b	2.3 bcd	3.8 cd
Veranda O 11.3WDG (polyoxin D)	4 oz	0.5 ab	3.5 a	2.0 abc	2.8 bc
	8 oz	0.0 a	2.3 a	1.0 a	1.5 ab
Untreated inoculated	-	12.5 e	26.0 e	6.3 f	8.0 f

* Not an IR-4 Experiment: Plant Disease Management Reports 4:OT011. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Fisher's Protected LSD Test (P=0.05).

^yRated on a scale of 1-10, where 1=healthy, 2=small, isolated lesions, 3=moderate-sized, isolated lesions, 4=numerous moderate-sized lesions, 5=large necrotic areas, 6=large necrotic areas with 30-50% defoliation, 7=large necrotic areas with 51-70% defoliation, 8= large necrotic areas with 71-90% defoliation, 9=>91% defoliation, 10=plant death.

In 2010, Hausbeck conducted a greenhouse experiment to determine efficacy of several fungicides for the control of *Botrytis* blight on geranium. Fungicides were applied as foliar sprays on Jan 6, 14 and 21. On Jan 6 and 15, plants were inoculated by spraying with the *B. cinerea* conidial solution after fungicide application. The number of leaves with *B. cinerea* lesions, the number of leaves with sporulating lesions, and diseaseseverity ratings were recorded on Jan 28. Disease pressure was severe in this trial with the untreated control plants averaging 12.8 sporulating leaves per plant. All treatments significantly reduced the number of leaves with sporulating lesions (Table 19). Pageant did not limit infection based on the presence of leaf lesions; however, the infected leaves did not sporulate at any time during the trial. No phytotoxicity was observed from any treatment.

Table 19.* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit White', Hausbeck, MI, 2010.

Treatment	Rate Per 100 Gal	No. Leaves with Sporulating Lesions ^x	Total Number of Leaves with Lesions	Disease Severity ^y
Daconil Weatherstik 6F (chlorothalonil)	1.4 pt	0.5 a	4.8 ab	2.0 a
Decree 50WG (fenhexamid)	4 oz	0.8 a	5.5 ab	2.3 a
	8 oz	0.0 a	3.5 a	2.0 a
Pageant 38WG (pyraclostrobin + boscalid)	12.5 oz	0.0 a	10.8 c	2.8 b
Veranda O 11.3WDG (polyoxin D)	8 oz	0.0 a	4.5 ab	2.0 a
Untreated inoculated	-	12.8 c	13.8 c	3.8 c

* Not an IR-4 Experiment: Plant Disease Management Reports 5:OT017. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Fisher's Protected LSD Test (P=0.05).

^y Rated on a scale of 1-5, where 1=healthy; 2=small isolated lesions; 3=large lesions, minimal defoliation; 4=numerous large lesions, moderate defoliation; 5=severe defoliation.

In 2015, Hausbeck conducted a greenhouse experiment to determine efficacy of several fungicides for the control of *Botrytis* blight on geranium. Fungicides were applied as foliar sprays on Jun 19 and reapplied at intervals shown in the table below. Plants were inoculated by spraying with *B. cinerea* conidial solution after fungicide application. The standard Affirm, BAS 703, NUP 09092 and Tourney provided highly effective control of a severe disease pressure (Table 20). Mural and S2200 provided moderate control, while the biological control products Proud 3, MBI-110, and F9110 were ineffective. No phytotoxicity was observed from any treatment.

Table 20. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Red', Hausbeck, MI, 2015.

Treatment	Rate Per 100 Gal	Applic. Interval (days)	Disease Severity ^x		Sporulating Leaves (%)	
			6/24	7/6	6/24	7/6
Affirm WDG (polyoxin D)	8 oz	7	1.2 a	2.4 a	7.0 ab	11.2 a
Orkestra (fluxapyroxad + pyraclostrobin)	6 fl oz	14	1.4 ab	4.6 cd	7.5 ab	27.4 ab
	8 fl oz	14	1.6 ab	3.2 ab	7.3 ab	19.2 a
F9110 (extract of <i>Lupinus</i>)	24 fl oz	7	4.2 g-i	7.4 e-h	31.6 cd	71.8 d-f
MBI-110 (<i>Bacillus amyloliquifaciens</i> strain F727)	1 gal	7	4.4 hi	7.8 gh	29.2 b-d	77.6 f
Mural (azoxystrobin + benzovindiflupyr)	7 oz	14	2.6 c-e	6.0 d-f	5.6 a	46.4 bc
NUP 09092 (fludioxonil)	4 fl oz	14	2.2 b-d	4.2 bc	7.5 ab	26.6 ab
	8 fl oz	14	1.4 ab	2.4 a	3.5 a	8.6 a
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	14	3.0 d-f	5.8 c-e	17.2 a-c	46.4 bc
Proud 3 (thyme oil)	3-4 qt	7	3.6 f-h	7.6 f-h	20.6 a-c	76.6 ef
S2200 (mandestrobin)	7.5 fl oz	14	3.2 ef	6.2 d-g	19.2 a-c	55.6 c-e
	15 fl oz	14	3.4 e-g	6.2 d-g	15.0 a-c	53.6 cd
Tourney 50WDG (metconazole)	4 oz	1 applic.	1.8 a-c	4.0 ab	9.0 ab	13.8 a
Untreated	-	-	4.8 i	8.6 h	39.4 d	76.6 ef

^x Rated on a scale of 1-10, where 1=healthy, 2=small, isolated lesions, 3=moderate-sized, isolated lesions, 4=numerous moderate-sized lesions, 5=large necrotic areas, 6=large necrotic areas with 30-50% defoliation, 7=large necrotic areas with 51-70% defoliation, 8= large necrotic areas with 71-90% defoliation, 9=>91% defoliation, 10=plant death. Means followed by same letter do not differ significantly based on Fisher's Protected LSD Test (P=0.05).

Lisianthus

In 2004, Wegulo studied the efficacy of several fungicides for the control of Botrytis blight on lisianthus grown in a greenhouse. Fungicides were applied as foliar sprays at 10-day intervals starting on Feb 17. All products significantly reduced a low disease incidence on the final rating date (Table 21). Significant differences among treatments were not observed. No phytotoxicity was observed from any treatment.

Table 21.* Efficacy for *Botrytis cinerea* on Lisianthus (*Eustoma grandiflorum*) ‘Avila Purple’, Wegulo, CA, 2004.

Treatment	Rate Per100 Gal	Disease Incidence (%) ^x		
		4/9/04	4/20/04	4/30/04
BAS 500 (pyraclostrobin)	8 oz	5.4 ab	5.7 ab	7.0 b
BAS 510 70WG (boscalid)	8 oz	5.2 ab	4.9 b	5.2 b
Daconil Ultrex (chlorothalonil)	1.4 lb	1.0 b	1.8 b	2.8 b
Decree 50WDG (fenhexamid)	12 oz	4.1 b	4.6 b	4.9 b
Fore (mancozeb)	1.5 lb	0.8 b	2.3 b	3.1 b
Heritage 50WG (azoxystrobin)	2 oz	1.0 b	1.0 b	4.9 b
Kaligreen (potassium bicarbonate)	2.5 lb	1.3 b	1.0 b	3.1 b
Medallion (fludioxonil)	2 oz	3.4 b	4.1 b	5.4 b
Rhapsody (<i>Bacillus subtilis</i> QST 713 strain)	4 qt	3.4 b	3.6 b	6.4 b
	6 qt	2.6 b	1.0 b	2.3 b
Untreated	-	11.6 a	12.9 a	14.7 a

* Not an IR-4 Experiment: F&N Tests Vol 61: OT030. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Least Significant Difference Test (P=0.05).

Pansy

In 2013, Benson examined the efficacy of several fungicides for the control of Botrytis blight on pansy. Fungicides were applied as foliar sprays at 7- or 14-day intervals starting on Nov 5 to Dec 10. Plants were inoculated with *B. cinerea* on Nov 7, 12 and 20. On the last three rating dates, there was no significant difference between the treatments even though a moderate amount of Botrytis blight was present on many plants at the final evaluation 41 days after the first inoculation (Table 22). Please note that the Regalia rate in the protocol was lower than the lowest labeled rate of 2 quarts per 100 gal. No phytotoxicity was observed from any treatment except Torque (stunting, smaller and cupped leaves).

Table 22. Efficacy for *Botrytis cinerea* on Pansy (*Viola x wittrockiana*), ‘Delta Premium Pure White’, Benson, NC, 2013.

Treatment	Rate Per 100 Gal	Application Interval	Severity Rating ^{z,y}			
			11/12/13	11/19/13	12/3/13	12/17/13
Decree (fenhexamid)	1.5 lb	14 Days	1.8 abc	2.1 a	1.8 a	3.5 a
Disarm (fluoxastrobin)	8 fl oz	14 Days	1.5 abc	1.9 a	1.6 a	3.4 a
F9110	24 fl oz	7 Days	1.8 ab	1.8 a	1.9 a	4.9 a
Medallion (fludioxonil)	8 oz	14 Days	1.4 bc	1.6 a	1.8 a	4.0 a
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	14 Days	1.1 c	1.5 a	2.0 a	2.9 a
Palladium (cyprodinil + fludioxonil)	6 oz	7 Days	1.5 abc	1.5 a	1.9 a	3.8 a
Proud 3 (thyme oil)	128 fl oz	7 Days	1.5 abc	2.6 a	2.3 a	4.3 a
Regalia 50 (extract of <i>Reynoutria sachalinensis</i>) ^x	4 fl oz	7 Days	1.5 abc	2.1 a	2.5 a	2.8 a
SP2770	2.66 lb	7 Days	1.6 abc	2.0 a	2.5 a	5.0 a
SP2773	1.66 lb	7 Days	1.3 bc	1.6 a	1.6 a	3.3 a
Torque (tebuconazole)	8 fl oz	14 Days	1.5 abc	1.5 a	2.3 a	5.1 a
V-10135 (fenpyrazamine)	16 fl oz	7 Days	1.9 ab	1.6 a	2.8 a	4.4 a
Untreated non-inoculated	-	-	1.6 abc	1.8 a	2.1 a	3.3 a
Untreated inoculated	-	-	2.1 a	1.6 a	2.0 a	3.9 a

^z Means followed by same letter do not differ significantly based on Waller-Duncan k-ratio, t-test (P=0.05).

^y Severity rating: scale of 1-10, where 1= healthy, 3= chlorotic, 5= distinct lesions on some leaves and flowers, 8= numerous spots on several leaves or flowers, and 10= completely collapsed leaves or blossoms.

^x This Regalia rate is lower than the lowest labeled rate of 2 quarts per 100 gal.

In 2015, Ong examined the efficacy of several fungicides for the control of Botrytis blight on pansy. Fungicides were applied from Dec 16, 2015 to Jan 13, 2016. Proud 3 and Palladium were applied weekly and the other treatments were applied biweekly. Plants were inoculated with *B. cinerea* on Dec 18. At the end of the experiment (4 WAT), BAS 703, NUP 09092, S2200, and Pageant provided good control, while Proud 3, Palladium, Tourney, Trinity and Medallion did not significantly control botrytis blight (Table 23). No significant phytotoxicity was observed from any treatment except Proud 3.

Table 23. Efficacy for Botrytis cinerea on on Pansy (Viola x wittrockiana), Ong, TX, 2015.

Treatment	Rate Per 100 Gal	Disease Rating ^x	Phytotoxicity Rating
Orkestra (fluxapyroxad + pyraclostrobin)	6 fl oz	1.8 c	0 b
	8 fl oz	2.0 c	0 b
Medallion WDG (fludioxonil)	8 oz	2.6 bc	0 b
NUP 09092 (fludioxonil)	4 fl oz	1.6 c	0.2 b
	8 fl oz	1.4 c	0 b
Pageant (pyraclostrobin + boscalid)	14 oz	2.2 c	0 b
Palladium (cyprodinil + fludioxonil)	6 oz	2.5 bc	0 b
Proud 3 (thyme oil)	4 qt	6.2 a	5.4 a
S2200 (mandestrobin)	7.5 fl oz	1.4 c	0 b
	15 fl oz	2.0 c	0 b
Tourney (metconazole)	4 oz	3.2 bc	0.6 b
Trinity (triticonazole)	12 fl oz	2.8 bc	0.6 b
Untreated non-inoculated	-	2.4 bc	0 b
Untreated inoculated	-	4.4 b	0 b

^x Botrytis and phytotoxicity severity were rated on a visual scale of 0 to 10 where 0 is “no symptom of Botrytis and phytotoxicity and 10 is “100% symptom of botrytis and phytotoxicity” Means followed by same letter do not differ significantly based on Student-Newman-Keul (P=0.05).

Miniature Rose

In 2013, Jiang conducted an experiment to determine efficacy of several fungicides for the control of Botrytis blight on miniature rose. Fungicides were applied as foliar sprays at 7- or 14-day intervals on March 10 to 21. The collection of efficacy data for *B. cinerea* was compromised by the presence of powdery mildew also. Symptoms included necrotic or blackened petals, an indication of botrytis, or petals with visible sporulation from powdery mildew. Therefore, Jiang collected a combined disease rating for both diseases. Only BAS 703 significantly reduced total disease rating caused by Botrytis and powdery mildew (Table 24). Please note that the Regalia rate in the protocol was lower than the lowest labeled rate of 2 quarts per 100 gal. No phytotoxicity was observed from any treatment.

Table 24. Efficacy for *Botrytis cinerea* on Miniature Rose (*Rosa* sp.) 'Karina', Jiang, CA, 2013.

Treatment	Rate Per 100 Gal	Application Interval	Mean Total Disease Rating (\pm SD) ^{z, y}				Mean Growth (cm)
			0 DAT	7 DAT	14 DAT	21 DAT	0-28 DAT
BAS 703 (Fluxapyroxad + pyraclostrobin)	4 oz	7 Days	0.0(\pm 0)	0.0(\pm 0)	*1.6(\pm 1.0)	*4.6(\pm 1.7)	7.2
	8 oz	7 Days	0.0(\pm 0)	0.0(\pm 0)	*0.9(\pm 0.4)	*3.7(\pm 1.4)	8.6
Disarm (fluoxastrobin)	8 fl oz	14 Days	0.0(\pm 0)	0.0(\pm 0)	4.6(\pm 0.9)	8.1(\pm 1.0)	4.5
F9110	32 oz	7 Days	0.0(\pm 0)	0.0(\pm 0)	2.4(\pm 1.5)	6.8(\pm 1.4)	6.9
Medallion (fludioxonil)	8 oz	14 Days	0.0(\pm 0)	0.0(\pm 0)	5.3(\pm 1.7)	8.7(\pm 0.4)	2.6
Palladium (cyprodinil)	6 oz	7 Days	0.0(\pm 0)	0.0(\pm 0)	4.2(\pm 2.3)	*9.3(\pm 0.9)	3.2
Proud 3 (thyme oil)	4 qt	7 Days	0.0(\pm 0)	0.0(\pm 0)	3.9(\pm 1.0)	8.4(\pm 0.6)	1.4
Regalia (<i>Reynoutria sachalinensis</i> extract) ^x	4 oz	7 Days	0.0(\pm 0)	0.0(\pm 0)	5.9(\pm 2.4)	7.9(\pm 2.2)	3.1
SP2770	2.66 lb	7 Days	0.0(\pm 0)	0.0(\pm 0)	5.7(\pm 2.0)	8.7(\pm 1.6)	3.8
SP2773	1.66 lb	7 Days	0.0(\pm 0)	0.0(\pm 0)	*5.3(\pm 0.9)	8.5(\pm 0.9)	4.1
V10135 SC (fenpyrazamine)	16 fl oz	7 Days	0.0(\pm 0)	0.0(\pm 0)	4.5(\pm 1.8)	9.0(\pm 1.6)	-0.7
Control	-	-	0.0(\pm 0)	0.0(\pm 0)	4.1(\pm 0.5)	7.5(\pm 1.0)	4.8

^zBolded and asterisks values show results with statistical significance when compared to untreated controls based on Student's t test (P=0.05). Data collected at Day28 should be interpreted with caution because almost all flowers senesced and the shelf-life of the minirose were terminated.

^yTotal disease rating: scale of 0-10, where 0 = no infection, 10 = 100 % infection with *Botrytis* and powdery mildew.

^x This Regalia rate is lower than the lowest labeled rate of 2 quarts per 100 gal.

Poinsettia

In 1998, Benson conducted an experiment to determine efficacy of several fungicides for the control of *Botrytis* blight on poinsettia. Fungicides were applied as foliar sprays at 7-day intervals starting on March 16 to April 27. The day following fungicide application, plants were sprayed with a spore suspension of *Botrytis cinerea*. All rates of Decree, Daconil and Chipco 26019 manage a high level of *Botrytis* blight severity (Table 25). No phytotoxicity was observed from any treatment.

Table 25. * Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*), 'Angelica White', Benson, NC, 1998.

Treatment	Rate Per 100 Gal	Disease Severity (1-10) ^{x,y}				
		3/24/98	4/2/98	4/8/98	4/15/98	4/23/98
Chipco 26019 (iprodione)	0.50 lb	1.7 b	3.4 b	2.9 bc	2.7 bc	2.5 bc
Daconil Ultrex 82.5WP (chlorothalonil)	0.68 lb	1.9 b	2.5 bc	3.4 b	3.4 b	2.9 b
	1.35 lb	1.3 b	2.1 c	1.8 cd	2.2 cd	1.5 c
Decree 50WDG (fenhexamid)	0.50 lb	1.5 b	1.5 c	1.6 cd	1.8 cd	1.6 bc
	0.75 lb	1.5 b	1.7 c	1.7 cd	1.6 d	1.4 c
	1.0 lb	1.9 b	2.5 bc	2.4 bcd	2.0 cd	1.8 bc
	2.0 lb	1.5 b	1.4 c	1.4 d	1.3 d	1.4 c
Untreated non-inoculated	-	1.2 b	1.7 c	2.3 bcd	2.3 bcd	2.6 bc
Untreated inoculated	-	3.2 a	5.3 a	6.5 a	7.0 a	5.0 a

* Not an IR-4 Experiment: F&N Tests Vol 55: 557. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Waller-Duncan k-ratio, t-test (P=0.05).

^y Severity rating: 1= healthy, no infection; 2= leaf spots in at least one leaf; 5= about 50% of leaves with spots, 8= about 80% of leaves with spots, defoliation; and 10= most leaves infected, large expanding leaf spots, severe defoliation.

In 1999, Benson conducted two experiments to study fungicide efficacy for *Botrytis* blight on poinsettia. No phytotoxicity was observed from any treatment.

In the first experiment, fungicides were applied as foliar sprays at 7-day intervals starting on March 16 to April 27. The day following fungicide application, plants were sprayed with a spore suspension of *Botrytis cinerea*. Although all rates of Compass were effective in controlling a severe *Botrytis* blight infection, the lower two rates were not as effective as the higher two (Table 26). Chipco 26019, Heritage and Medallion, were all comparable to Compass.

In the second experiment, Benson compared Compass, Daconil Ultrex, and Heritage as foliar sprays at 14-day intervals starting on March 29 to May 26. The wetting agent Lesco 78L was used with all Heritage applications. The day following fungicide application, plants were sprayed with a spore suspension of *Botrytis cinerea*. Compass, Daconil and all rates of Heritage provided excellent control of a high *Botrytis* blight severity (Table 27). No phytotoxicity was observed from any treatment.

Table 26. * Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*), 'Angelica White', Benson, NC, 1999a.

Treatment	Rate Per 100 Gal	Disease Severity (1-10) ^{x, y}				
		4/1/98	4/9/98	4/15/98	4/23/98	4/30/98
Chipco 26019 50W (iprodione)	16.0 oz	1.6 b	1.4 bc	1.7 c	1.6 c	2.0 cd
Compass 50W (trifloxystrobin)	0.5 oz	2.0 b	2.1 bc	2.5 bc	3.3 b	3.1 bc
	1.0 oz	1.9 b	2.4 b	3.1 b	3.3 b	3.9 b
	2.0 oz	1.9 b	2.1 bc	2.3 bc	2.2 bc	2.1 cd
	4.0 oz	1.4 b	1.1 c	1.8 c	2.0 c	1.7 d
Heritage 50WDG (azosystrobin)	1.0 oz	2.3 b	2.4 b	2.2 bc	2.5 bc	2.1 cd
Medallion 50W (fludioxonil)	1.0 oz	1.4 b	1.8 bc	1.7 c	1.3 c	1.5 d
Untreated non-inoculated	-	1.7 b	1.4 bc	1.4 c	1.6 c	2.0 cd
Untreated inoculated	-	4.6 a	5.3 a	5.6 a	7.0 a	6.9 a

* Not an IR-4 Experiment: F&N Tests Vol 55: 556.

^x Means followed by same letter do not differ significantly based on Waller-Duncan k-ratio, t-test (P=0.05).

^y Severity rating: 1= healthy, no infection; 2= leaf spots in at least one leaf; 5= about 50% of leaves with spots, 8= about 80% of leaves with spots, defoliation; and 10= most leaves infected, large expanding leaf spots, severe defoliation.

Table 27. * Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*), 'Angelica White', Benson, NC, 1999b.

Treatment	Rate Per 100 Gal	Disease Severity (1-10) ^{x, y}			
		4/15/98	4/30/98	5/14/98	5/28/98
Compass 50W (trifloxystrobin)	2.0 oz	2.2 b	2.4 b	2.8 bc	2.6 b
Daconil Ultrex 82.5WP (chlorothalonil)	16.0 oz	1.3 c	2.3 bc	2.4 bc	2.3 b
Heritage 50WDG (azosystrobin)	1.0 oz	1.4 bc	2.6 b	3.6 b	2.8 b
	2.0 oz	1.3 c	1.3 c	2.2 c	2.3 b
	4.0 oz	1.3 c	1.8 bc	2.2 c	2.2 b
	8.0 oz	1.9 bc	2.3 bc	2.7 bc	2.3 b
Untreated non-inoculated	-	1.8 bc	2.1 bc	2.2 c	2.7 b
Untreated inoculated	-	3.6 a	5.3 a	6.3 a	6.2 a

* Not an IR-4 Experiment: F&N Tests Vol 55: 558.

^x Means followed by same letter do not differ significantly based on Waller-Duncan k-ratio, t-test (P=0.05).

^y Severity rating: 1= healthy, no infection; 2= leaf spots in at least one leaf; 5= about 50% of leaves with spots, 8= about 80% of leaves with spots, defoliation; and 10= most leaves infected, large expanding leaf spots, severe defoliation.

In 2008, Beckerman studied the efficacy of several fungicides for the control of *Botrytis* blight on greenhouse-grown poinsettia. Fungicides were applied as foliar sprays on Dec 11; plants were sprayed with *B. cinerea* inoculum 2 days after fungicide application. Although no fungicide gave complete disease control, all treatments significantly reduced disease severity (Table 28). Decree and Pageant had the lowest disease severity nine days after inoculation (Dec 22); Medallion, Chipco 26019, and Disarm showed the highest disease severity. No phytotoxicity was observed from any treatment.

Table 28.* Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*) 'Prestige Red', Beckerman, IN, 2008.

Treatment	Rate Per 100 gal	Disease Severity ^{x, y}		
		12/16/08	12/19/08	12/22/08
Chipco 26019 50WDG (iprodione)	2 lb	28.5 de	40.1 bc	52.2 b
Decree 50WG (fenhexamid)	1.75 lb	41.9 abc	34.3 cd	30.5 ef
Disarm 480SC (fluoxastrobin)	21 fl oz	17.8 ef	30.0 d	50.4 bc
Heritage 50WG (azoxystrobin)	8 oz	29.9 cd	33.9 cd	41.7 cd
Insignia 20WDG (pyraclostrobin)	12 oz	43.1 ab	47.9 b	39.2 de
Medallion (fludioxonil)	4 oz	47.0 a	41.8 ab	58.7 b
Pageant 38WG (pyraclostrobin + boscalid)	18 oz	32.3 bcd	34.5 cd	34.2 def
Untreated non-inoculated	-	8.8 f	19.5 e	27.0 f
Untreated inoculated		48.5 a	58.0 a	71.0 a

* Not an IR-4 Experiment: Plant Disease Management Reports 4:OT014.

^x Means followed by same letter do not differ significantly based on Waller-Duncan k ratio t-test, k= 100, $P < 0.0001$.

^y Disease Severity= (average number of bracts with lesions/ average total number of bracts)*100

In 2011, Hausbeck screened several fungicides for the control of *Botrytis* blight on greenhouse-grown poinsettia. Fungicides were applied as foliar sprays on Dec 23; plants were inoculated by spraying with the *B. cinerea* conidial solution 4 hr after fungicide application. The number of leaves sporulating with *B. cinerea* on each plant were counted and a plant health rating was observed on Jan 6. Disease pressure was severe in this trial with the untreated control plants averaging 65.4% of leaves sporulating with *B. cinerea*. Although no products completely prevented infection, Medallion limited infection to less than one leaf sporulating with *B. cinerea* per plant (Table 29). Chipco 26019, Daconil Weatherstik, Pageant and Palladium were all effective and may be good rotation products in a disease control program. No phytotoxicity was observed from any treatment.

Table 29.* Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*) 'Freedom Pink', Hausbeck, MI, 2011.

Treatment	Rate Per 100 Gal	Leaves Sporulating with <i>B. cinerea</i> ^x	Health Rating ^y
Chipco 26019 50WP (iprodione)	2 lb	6.0 a	1.8 ab
Daconil Weatherstik 6SC (chlorothalonil)	1.4 pt	7.0 a	2.0 ab
Decree 50DF (fenhexamid)	1.5 lb	19.1 abc	3.3 bcd
Disarm O 480SC (fluoxastrobin)	4 fl oz	37.7 cd	4.5 d
Heritage 50WG (azoxystrobin)	8 oz	35.8 bcd	4.0 cd
Medallion 50WP (fludioxonil)	4 oz	0.5 a	1.3 a
OHP 6672 F (thiophanate methyl)	20 fl oz	69.4 e	6.8 e
Pageant 38WG (pyraclostrobin + boscalid)	18 oz	5.2 a	1.8 ab
Palladium 62.5WDG (cyprodinil + fludioxonil)	6 oz	13.0 ab	2.3 abc
Veranda O 11.3WDG (polyoxin D)	8 oz	12.3 ab	3.0 a-d
Untreated inoculated	-	65.4 e	7.0 e

* Not an IR-4 Experiment: Plant Disease Management Reports 6:OT007. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Fisher's Protected LSD Test ($P=0.05$).

^y Rated on a scale of 1-10, where 1=healthy, 2=small isolated lesions, 3=moderate-sized isolated lesions, 4=numerous moderate-sized lesions, 5=large necrotic areas, 6=large necrotic areas with 30-50% defoliation, 7=large necrotic areas with 51-70% defoliation, 8=large necrotic areas with 71-90% defoliation, 9=>91% defoliation, 10=plant death.

Primrose

In 2007, Hausbeck studied the efficacy of several fungicides for the control of Botrytis blight on primrose in a greenhouse. Fungicides were applied as foliar sprays at seven-day intervals on Feb 6, 13, 20, 27 and Mar 7, 13, 20, 28; plants were sprayed with *B. cinerea* inoculum 4 hours after each fungicide treatment. The percentage of infected leaves, the number of sporulating *B. cinerea* lesions, and disease severity ratings were recorded on Feb 13, 20, 27 and Mar 7, 13, 20, 28. All fungicide treatments significantly reduced a moderate disease severity (Table 30). Daconil Weather Stik, Endorse, and Heritage received the lowest disease severity ratings. With the exception of Heritage, all products significantly limited the number of sporulating lesions. There was no significant difference between any fungicide treatments compared to the untreated control in the percentage of infected leaves. No phytotoxicity was observed from any treatment.

Table 30.* Efficacy for *Botrytis cinerea* on Primrose (*Primula acaulis*) 'Orion Mix', Hausbeck, MI, 2007.

Treatment	Rate Per 100 Gal	Infected Leaves (%) ^x	Number of Sporulating Lesions	Disease Severity ^y
Daconil Weatherstik 6F (chlorothalonil)	22 fl oz	16.9 ab	0.0 a	3.7 a
Endorse 2.5WP (polyoxin D)	2.2 lb	34.6 d	0.2 a	3.3 a
Heritage 50WG (azoxystrobin)	2 oz	19.2 abc	0.8 ab	3.2 a
Pageant 38WG (pyraclostrobin + boscalid)	9.5 oz	12.8 a	0.2 a	4.0 a
Switch 62.5 WG (cyprodinil + fludioxonil)	14 oz	30.0 bcd	0.0 a	4.0 a
Untreated inoculated	-	21.9 a-d	2.3 b	6.2 b

* Not an IR-4 Experiment: Plant Disease Management Reports 3:OT025. Not all products tested included in table.

^x Means followed by same letter do not differ significantly based on Fisher's Protected LSD Test (P=0.05).

^ySeverity of foliar symptoms was rated on a visual scale of 1 to 10; where 1=no symptoms, 2 to 8=varying degrees of blighting that ranged from a few, necrotic lesions and no defoliation up to large necrotic areas accompanied by defoliation, and 10=100% defoliation and plant death.

Chrysanthemum

In 2008, Buck conducted a greenhouse experiment to determine efficacy of several fungicides for the control of Botrytis blight on chrysanthemum. Fungicides were applied as foliar sprays at 7-day intervals on Sept 19, 26 and Oct 3; plants were inoculated with a mixture of three isolates of *B. cinerea* 3-hr after each treatment. The percentage of infected flowers on each plant was recorded 2 weeks after the final treatment. All products significantly reduced the percentage of infected flowers (Table 31). No phytotoxicity was observed from any treatment.

Table 31.* Efficacy for *Botrytis cinerea* on Chrysanthemum (*Chrysanthemum x morifolium*) ‘Brandi’, Buck, GA, 2008.

Treatment	Rate Per 100 Gal	Infected Flowers (%) ^x
Daconil Ultrex (chlorothalonil)	2.5 lb	11.0 b
Decree 50WG (fenhexamid)	0.75 lb	4.2 b
Heritage 50WG (azoxystrobin)	2 oz	5.8 b
Medallion (fludioxonil)	2 oz	6.9 b
Palladium 62.5 WG (cyprodinil + fludioxonil)	2 oz	5.0 b
	4 oz	15.9 b
	8 oz	6.6 b
Untreated inoculated	-	51.0 a

* Not an IR-4 Experiment: Plant Disease Management Reports 6:OT017.

^x Means followed by same letter do not differ significantly based on Fisher's Protected LSD Test (P=0.05).

Douglas Fir

In 2000 and 2001, Lambe studied the efficacy of Switch 62.5WG (cyprodinil + fludioxonil) for the control of Botrytis gray mold needle disease on Douglas fir seedlings in the greenhouse.

In the 2000 experiment, fungicides were applied as foliar sprays 3 times at 7-day intervals starting at first sign of foliage infection. Approximately 6 weeks after first application, Switch at 6 oz reduced the number of infected plants under low Botrytis levels infecting needles (Table 32); however, significance of this trend was not able to be determined. Low phytotoxicity was observed from the higher rates, with less than 1% of the plants showing yellowing of the lowest needles.

During 2001, similar methods were used with fungicides applied as foliar sprays 3 times at 7-day intervals starting on September 16; four days after treatment plants were inoculated with a spore suspension of *B. cinerea*. Switch reduced the percentage of plants infected under moderate to high pressure (Table 33); however, there was no statistical difference among treatments. No phytotoxicity was observed from any treatment.

Table 32. Efficacy for *Botrytis cinerea* on Douglas Fir (*Pseudotsuga menziesii*), Lambe, WA, 2000.

Treatment	Rate Per 100 Gal	Number of infected plants on 10/23/00
Switch 62.5WG (cyprodinil + fludioxonil)	3 oz	10.0
	6 oz	1.0
	12 oz	6.0
Untreated	-	18.0

Data reviewed in 2014: data collected were counts of disease plants for the entire treated set of plants. No statistics could be performed.

Table 33. Efficacy for *Botrytis cinerea* on Douglas Fir (*Pseudotsuga menziesii*), Lambe, WA, 2001.

Treatment	Rate Per 100 Gal	Infection (%)	
		10/12/01	10/20/01
Switch 62.5WG (cyprodinil + fludioxonil)	3 oz	4.3 a	5.7 a
	6 oz	8.0 a	8.0 a
	12 oz	6.3 a	6.3 a
Untreated inoculated	-	13.0 a	28.0 a

Data analyzed in 2014 using Stata/MP 13.1; means followed by same letter do not differ significantly based on Scheffe's pairwise mean comparison at p=0.05.

Continuing in 2005 with this disease system, Lambe conducted another greenhouse experiment on Douglas fir seedlings expanding to nine different fungicides. All fungicide applications were applied as foliar sprays beginning 3 days before artificial inoculation with a spore suspension of *Botrytis cinerea* on September 23, 2005 and repeated 3 times at 7-day intervals. In general, BAS 516, Endorse at 8 oz, Insignia, Medallion and Milstop performed better than the standard Decree against a low disease infection (Table 34). Phyton 27 and STBX-304 were ineffective. No phytotoxicity was observed from any treatment except Phyton 27 and STBX-304.

Table 34. Efficacy for *Botrytis cinerea* on Douglas Fir (*Pseudotsuga menziesii*), Lambe, WA, 2005.

Treatment	Rate Per 100 Gal	% Diseased ^{x, y}		Phytotoxicity ^z	
		10/13/05	10/27/05	10/13/05	10/27/05
BASF 516 UFF 28% WG (boscalid + pyraclostrobin)	9.5 oz	11.0 cde	5.3 a-d	1.8	1.0
	18.0 oz	0.0 a	3.7 ab	1.2	1.0
Decree (fenhexamid)	1.0 lb	6.3 a-d	8.7 d	1.0	1.0
Endorse CL EXP 04 10% (polyoxin D)	4.0 oz	11.8 de	6.5 a-d	2.0	1.8
	8.0 oz	1.9 a	4.5 a-d	1.2	1.0
	12.0 oz	14.4 ef	8.4 cd	1.2	1.0
Insignia 20% WG (pyraclostrobin)	8.0 oz	1.9 a	4.9 a-d	2.0	1.0
	16.0 oz	2.7 ab	4.6 a-d	1.5	1.0
Medallion (fludioxonil)	2.0 oz	4.6 ab	3.0 ab	1.0	1.0
	4.0 oz	8.3 b-e	3.8 ab	1.2	1.0
	8.0 oz	0.0 a	2.6 a	1.2	1.0
Milstop (potassium bicarbonate)	5.0 lb	8.7 b-e	4.9 a-d	1.2	1.0
Pageant 38WG (pyraclostrobin + boscalid)	12.5 oz	3.0 ab	2.6 a	1.2	1.5
	18.5 oz	3.4 ab	7.3 bcd	1.5	1.0
Phyton 27 (copper sulfate pentahydrate)	15 oz	20.3 f	11.7 de	2.2	1.8
	20 oz	19.7 f	14.8 e	2.5	3.0
STBX-304 (cupric ammonium formate)	15 oz	0.2 ab	9.2 d	2.0	4.0
	20 oz	0.2 ab	11.6 de	2.0	4.0
Untreated non-inoculated	-	5.3 abc	4.2 abc	na	na
Untreated inoculated	-	1.5 a	2.6 a	na	na

^x Means followed by the same letter do not differ significantly at the 0.05 level.

^ySeedlings with sporulating lesions on the needles were counted as diseased.

^z Phytotoxicity occurred as yellowing and needle necrosis where 1= no seedling injury, 2= slight, 3= medium, 4 = severe injury, and 5 = seedlings dead.

Rose

In 2006, Wegulo conducted an outdoor field experiment to determine efficacy of several fungicides for the control of *Botrytis* blight on rose. Fungicides were applied as foliar sprays on Jul 10, 19, and 28. All products significantly reduced a high disease severity (Table 35). Significant differences among treatments were not observed. No phytotoxicity was observed from any treatment.

Table 35.* Efficacy for *Botrytis cinerea* on Rose (*Rosa* sp) ‘Mr. Lincoln’, Wegulo, NE, 2006.

Treatment	Rate Per 100 Gal	Disease Severity ^{x,y}			
		7/20/06	8/6/06	8/16/06	8/25/06
Heritage 50WG (azoxystrobin)	2 oz	3.3 b	0.2 b	0.4 bc	0.9 b
Insignia 20WDG (pyraclostrobin)	8 oz	2.3 bcd	0.1 b	0.4 bc	0.5 b
Medallion (fludioxonil)	2 oz	1.5 d	0.7 b	0.3 c	0.1 b
Palladium 62.5 WG (cyprodinil + fludioxonil)	2 oz	2.5 bcd	0.4 b	0.4 bc	0.3 b
	4 oz	2.2 cd	0.3 b	0.9 bc	0.5 b
Vanguard (cyprodinil)	2 oz	2.6 bc	0.6 b	1.0 b	0.3 b
Untreated	-	4.4 a	3.8 a	2.5 a	2.9 a

* Not an IR-4 Experiment: Plant Disease Management Reports 1:OT019.

^x Means followed by same letter do not differ significantly based on Least Significant Difference Test (P=0.05).

^x Rating of 0 to 5 scale with 0 representing no visible signs of disease and 5 representing 100% flower blight.

Western Hemlock

During 2000 and 2001, Lambe conducted two greenhouse experiments to determine efficacy of Switch 62.5WG (cyprodinil + fludioxonil) for the control of *Botrytis* gray mold needle disease on western hemlock. Fungicides were applied as foliar sprays 3 times at 7-day intervals starting at first sign of foliage infection. In the 2000 experiment, Switch at 3 oz provided excellent control of a very low *Botrytis* infection of needles (Table 36); however results were not statistically different from nontreated controls. No phytotoxicity was observed from any treatment. In the 2001 experiment, Switch significantly reduced the percentage of plants infected under moderate to high *Botrytis* infection of needles (Table 37). No phytotoxicity was observed from any treatment.

Table 36. Efficacy for *Botrytis cinerea* on Western Hemlock (*Tsuga heterophylla*), Lambe, WA, 2000.

Treatment	Rate Per 100 Gal	Percent Infection on 10/23/00
Switch 62.5WG (cyprodinil + fludioxonil)	3 oz	0.0 a
	6 oz	0.5 a
	12 oz	0.9 a
Untreated	-	2.4 a

Data analyzed in 2014 using Stata/MP 13.1; means followed by same letter do not differ significantly based on Scheffe's pairwise mean comparison at $p=0.05$.

Table 37. Efficacy for *Botrytis cinerea* on Western Hemlock (*Tsuga heterophylla*), Lambe, WA, 2001.

Treatment	Rate Per 100 Gal	Infection (%)	
		10/12/01	10/20/01
Switch 62.5WG (cyprodinil + fludioxonil)	3 oz	3.0 a	3.7 a
	6 oz	2.0 a	2.0 a
	12 oz	4.3 a	4.0 a
Untreated inoculated	-	25.7 b	34.0 b

Data analyzed in 2014 using Stata/MP 13.1; means followed by same letter do not differ significantly based on Scheffe's pairwise mean comparison at $p=0.05$.

In 2005, Lamb screened several fungicides for efficacy of *Botrytis* gray mold needle and stem disease on western hemlock seedlings. All fungicide applications were applied as foliar sprays beginning 3 days before artificial inoculation with a spore suspension of *Botrytis cinerea* on September 23, 2005 and repeated 3 times at 7-day intervals. BAS 516, Endorse at 12 oz, Insignia at 16 oz, Medallion at 2 and 4 oz, and the standard Decree provided significant control of a low infection (Table 38). Milstop, Phyton 27 and STBX-304 were ineffective. No phytotoxicity was observed from any treatment except Phyton 27 and STBX-304.

Table 38. Efficacy for *Botrytis cinerea* on Western Hemlock (*Tsuga heterophylla*), Lambe, WA, 2005.

Treatment	Rate Per 100 Gal	% Diseased ^{x, y}		Phytotoxicity	
		10/18/05	11/3/05	10/18/05	11/3/05
BASF 516 UFF 28% WG (boscalid + pyraclostrobin)	9.5 oz	0.4 a	2.0 b-e	2.0	1.0
	18.0 oz	1.6 ab	0.8 abc	3.0	1.0
Decree (fenhexamid)	1.0 lb	1.2 ab	1.2 a-d	1.0	2.0
Endorse CL EXP 04 10% (polyoxin D)	4.0 oz	0.8 a	1.6 a-d	2.0	1.0
	8.0 oz	2.4 ab	2.0 b-e	2.0	1.0
	12.0 oz	2.8 ab	0.8 abc	2.0	1.0
Insignia 20% WG (pyraclostrobin)	8.0 oz	0.4 a	2.0 b-e	2.0	2.0
	16.0 oz	1.6 ab	0.4 ab	1.5	1.0
Medallion (fludioxonil)	2.0 oz	0.8 a	0.0 a	1.0	1.0
	4.0 oz	0.4 a	0.4 ab	1.0	1.0
	8.0 oz	4.3 ab	2.0 b-e	2.0	2.0
Milstop (potassium bicarbonate)	5.0 lb	2.4 ab	2.4 cde	1.0	1.0
Pageant 38WG (pyraclostrobin + boscalid)	12.5 oz	1.2 ab	0.4 ab	2.0	3.0
	18.5 oz	1.2 ab	0.8 ab	3.0	2.0
Phyton 27 (copper sulfate pentahydrate)	15 oz	9.0 c	6.3 g	2.0	2.0
	20 oz	14.9 d	7.8 gh	3.0	3.0
STBX-304 (cupric ammonium formate)	15 oz	2.7 a	4.7 cd	2.0	3.0
	20 oz	2.3 a	2.4 cde	2.0	3.0
Untreated non-inoculated	-	4.3 b	3.5 ef	na	na
Untreated inoculated	-	2.0 ab	2.7 de	na	na

^x Means followed by the same letter do not differ significantly at the 0.05 level.

^ySeedlings with sporulating lesions on the needles were counted as diseased.

Comparative Efficacy for *Botrytis elliptica*

In 2011 and 2012, Chastagner conducted two field trials to test the efficacy of several fungicides for control of *Botrytis elliptica* on Asiatic hybrid lily. Treatments were applied on 1-week, 10-day and 2-week intervals starting on May 18, 2011 and June 11, 2012 (Table 39, Table 40). Overall disease incidence and severity ratings of whole cells were taken on a weekly basis starting from Day 0 until Day 80 (August 5, 2011) and on June 11, 2012 to September 19, 2012 (Day 100). On Day 83 (August 8, 2011) and Day 115 (October 4, 2012), 5 plants from each cell were randomly selected and rated for disease severity (0-10 scale) and the extent of foliage dieback on the lower portion of the stem. In 2011, moderate levels of disease developed. Compared to the Check, applications of Pageant at both rates, Disarm at both rates, and Medallion had significantly less foliage dieback and low severity ratings (Table 39). In 2012, low levels of disease developed. Compared to the Check, applications of Palladium and Proud 3 had significantly lower incidence ratings. Treatments had no effect on overall disease severity, plant growth, or the rate of foliage dieback (Table 40). Please note that the Regalia rate in the protocol was lower than the lowest labeled rate of 2 quarts per 100 gal. Given that only low and moderate levels of disease developed during these trials, additional tests should be conducted to determine the effectiveness of these fungicides in providing acceptable disease control under higher disease pressure. No phytotoxicity was observed from any treatment.

In 2014, Catlin conducted a greenhouse trial to test the efficacy of several fungicides for the control of *Botrytis elliptica* on a hybrid lily cultivar ‘Vermeer’ that is known to be very susceptible to Botrytis blight. Treatments were applied every 2 weeks for 6 weeks, starting on July 9 (30 d after planting), with the exception of F9110, Proud 3, and Decree, which were applied weekly. Plants were evaluated for disease symptoms weekly, starting one week after treatment. BAS 703, Mural and S2200 provided the best control of a severe disease pressure, with severity ratings comparable to the non-inoculated check (Table). The standard Decree and all other products looked ineffective. There were no significant differences in initial or final plant height.

Table 39. Efficacy for *Botrytis elliptica* on Asiatic Hybrid Lily (*Lilium sp.*), ‘Elite’, Chastagner WA, 2011.

Treatment	Rate Per 100 Gal	Application Dates ^y	Application Interval	Length Foliardieback (cm) ^x 8/8/11	DiseaseSeverity 8/8/11
Chipco 26019 (iprodione)	16 oz	B	14-day	11.8 abc	1.72 abc
Disarm (fluoxastrobin)	4 fl oz	B	14-day	7.4 d	1.20 c
	8 fl oz	B	14-day	10.0 bcd	1.44 bc
Medallion (fludioxonil)	8 oz	B	14-day	8.6 cd	1.12 c
Pageant 38WG (pyraclostrobin + boscalid)	7 oz	B	14-day	9.5 bcd	1.36 c
	14 oz	B	14-day	8.4 cd	1.24 c
Palladium (cyprodinil + fludioxonil)	12 oz	B	14-day	12.0 abc	1.80 abc
Trinity (triticonazole)	8 fl oz	A	7-day	12.7 ab	2.12 ab
	12 fl oz	A	7-day	11.1 abcd	1.72 abc
Untreated Check	-	-	-	14.8 a	2.28 a

^x Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Dates: 1 = 5/18/11, 2 = 5/28/11, 3 = 6/4/11, 4 = 6/12/11, 5 = 6/20/11, 6 = 6/28/11, 7 = 7/6/11, 8 = 7/12/11, 9 = 7/19/11, 10 = 7/26/11. A = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; B = 1, 3, 5, 7, 9

Table 40. Efficacy for *Botrytis elliptica* on Asiatic Hybrid Lily (*Lilium sp.*), 'London', Chastagner WA, 2012.

Treatment	Rate Per 100 Gal	Application Dates^z	Application Interval	Disease Incidence^y 9/19/12	Foliage Dieback 10/4/12	Disease Severity 10/4/12	Growth (cm)^x
Chipco 26019 (iprodione)	16 oz	A	14-day	9.0 a	6.0 a	3.0 a	14.3 a
Disarm (fluoxastrobin)	8 fl oz	A	14-day	9.0 a	5.3 a	3.0 a	17.8 a
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	A	14-day	8.5 ab	4.0 a	3.8 a	15.0 a
Palladium (cyprodinil + fludioxonil)	12 oz	B	7-day	2.3 c	8.3 a	1.3 a	14.2 a
Proud 3 (thyme oil)	4 qt	B	7-day	6.5 b	4.3 a	4.0 a	14.7 a
Regalia 50 (extract of <i>Reynoutria sachalinensis</i>) ^w	4 fl oz	B	7-day	8.3 ab	5.0 a	3.8 a	13.0 a
Torque (tebuconazole)	8 fl oz	A	14-day	8.3 ab	6.8 a	2.5 a	15.7 a
Tourney 50WDG (metconazole)	4 oz	A	14-day	8.3 ab	5.3 a	3.5 a	13.1 a
Trinity (triticonazole)	12 fl oz	A	14-day	8.3 ab	6.5 a	1.8 a	14.2 a
V-10135 (fenpyrazamine)	16 oz	B	7-day	8.0 ab	4.5 a	4.3 a	16.1 a
ZeroTol (hydrogen peroxide)	1 gal	C	10-day	9.5 a	5.0 a	4.5 a	15.5 a
Untreated Check	-	-	-	9.3 a	4.8 a	4.3 a	15.3 a

^z Dates: 1 = 6/11/12, 2 = 6/20/12, 3 = 6/25/12, 4 = 6/27/12, 5 = 6/29/12, 6 = 7/5/12, 7 = 7/9/12, 8 = 7/12/12, 9 = 7/19/12, 10 = 7/24/12, 11 = 7/26/12, 12 = 8/2/12, 13 = 8/9/12, 14 = 8/17/12, 15 = 8/23/12, 16 = 8/24/12, 17 = 8/28/12, 18 = 8/31/12, 19 = 9/7/12. A = 1, 3, 7, 10, 13, 15, 19; B = 1, 2, 4, 6, 8, 9, 11, 12, 13, 14, 16, 18, 19; C = 1, 2, 5, 8, 10, 12, 14, 17, 19

^y Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^x Numbers represent the difference between average plant heights taken on June 11 and July 26, 2012.

^w This Regalia rate is lower than the lowest labeled rate of 2 quarts per 100 gal.

Table 41. Efficacy for *Botrytis elliptica* on Hybrid Lily (*Lilium sp.*), 'Vermeer', Catlin, NY, 2014.

Treatment	Rate Per 100 Gal	Disease Severity Rating ^x				Initial Height (in)	Final Height (in)
		7/22	7/30	8/8	8/15	7/16	8/19
Orkestra (fluxapryoxad + pyraclostrobin)	8 fl oz	0.0 c	0.1 c	0.8 c	0.6 b	25.3 a	28.1 a
Decree (fenhexamid)	1.5 lb	1.0 abc	1.1 abc	3.1 abc	6.8 a	24.2 a	26.1 a
F9110 (extract of <i>Lupinus</i>)	24 oz	1.1 ab	2.9 a	3.8 ab	6.9 a	24.4 a	26.8 a
Mural (azoxystrobin + benzovindiflupyr)	7 oz	0.0 c	0.4 bc	1.0 c	2.1 b	24.6 a	27.7 a
Proud 3 (thyme oil)	4 qt	1.0 abc	2.1 ab	3.6 ab	6.8 a	24.2 a	27.3 a
S2200 (mandestrobin)	7.5 oz	0.3 abc	1.3 abc	1.3 bc	2.3 b	24.8 a	28.0 a
SP2770 10WP	2.66 lb	1.0 abc	2.1 ab	3.0 abc	6.5 a	24.6 a	26.8 a
SP2773	3.31 lb	1.0 abc	1.5 abc	3.0 abc	7.5 a	24.3 a	26.7 a
Tourque (tebuconazole)	8 fl oz	0.9 abc	2.4 a	3.9 a	6.9 a	25.0 a	27.9 a
Untreated non-inoculated	-	0.1 bc	0.4 bc	0.9 c	1.3 b	25.0 a	27.8 a
Untreated inoculated	-	1.3 a	2.6 a	5.0 a	8.3 a	24.6 a	27.1 a

^x Rated on a scale from 0 to 10 where 0=no symptoms and 10=100% of leaves affected by symptoms. Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

Comparative Efficacy for *Botrytis paeoniae*

In 2013, Chastagner studied the efficacy of several fungicides for control of *Botrytis paeoniae* and *B. cinerea* on peony. The first fungicide application was made on March 22, 2013 and the last application was made on June 17, 2013 (see Table 42 for specific intervals and dates). Although *Botrytis paeoniae* and *Botrytis cinerea* were associated with irregular shaped leaf lesions and a shoot blight/dieback on plants during this trial, insufficient disease caused by these *Botrytis* spp. developed to evaluate the control of these pathogens (Table 42). However, sufficient red spot or blotch infection, caused by *Cladosporium paeoniae*, developed to determine effectiveness of the fungicide treatments. All of the treatments, except Medallion, Prestop, Chipco 26019, SP2770 and Proud 3, reduced the severity of red spots compared to the non-treated check. Torque, Pageant, Disarm, DaconilWeatherStik, Kocide, Trinity, Palladium, and SP2773 were the most effective materials tested. Compared to the non-treated checks, none of the treatments had any effect on overall vigor of the plants in this trial. Kocide and Daconil sprays resulted in visible residues on the plants.

In 2014, Chastagner studied the efficacy of several fungicides for control of *Botrytis paeoniae* and *B. cinerea* on peony. Fungicides were sprayed from Apr 18 to Oct 10 (see Table for specific intervals and dates). Treatments were delayed starting mid-June due to the onset of very warm and dry weather that did not favor disease development. The treatments were resumed on August 28, and plants were inoculated with a spore suspension of *B. cinerea* and *B. paeoniae* on Aug 29. Although average disease severity ranged from 0.8 to 5.0, there was considerable variability within the data and none of the treatments affected disease development (Table 43). Based on overall plant quality ratings, none of the fungicides delayed senescence of the plants. Badge X2, Pageant, Mural, Medallion, SP2770 and SP2773 had significantly higher residue ratings than untreated checks. No phytotoxicity was observed from any treatment.

Table 42. Efficacy for *Botrytis paeoniae* on Peony (*Paeonia* sp.), Chastagner WA, 2013.

Treatment	Rate Per 100 Gal	Application Dates ^z	Severity Ratings ^{x, y} 7/2/13			Plant Vigor ^w
			Red Spots	Botrytis		
				Leaf Lesions	Shoot Blight	
Chipco 26019 N/G (iprodione)	16 oz	2	3.5 abc	0.0 a	0.4 ab	2.5 ab
Daconil (chlorothalonil)	1.4 pt	2	1.4 cd	0.4 a	0.7 ab	2.3 ab
Decree (fenhexamid)	1.5 lb	2	2.6 bc	0.5 a	0.2 b	2.2 ab
Disarm 480SC (fluoxastrobin)	8 fl oz	2	1.2 cd	0.3 a	0.2 b	2.2 ab
F9110 (extract of <i>Lupinus</i>)	24 oz	1	2.6 bc	0.6 a	0.1 b	2.2 ab
Kocide DF (copper hydroxide)	1 lb	2	1.6 cd	0.1 a	0.3 ab	2.4 ab
Medallion 50WDG (fludioxonil)	8 oz	2	3.3 abc	0.1 a	0.3 ab	2.1 ab
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	2	0.2 d	0.7 a	0.5 ab	2.4 ab
Palladium 62.5WG (cyprodinil + fludioxonil)	6 oz	2	2.3 bcd	0.2 a	0.2 b	2.2 ab
Prestop (<i>Gliocladium catenulatum</i>)	0.5 %	3	3.3 abc	0.1 a	1.0 a	2.6 a
Proud 3 (thyme oil)	4 qt	2	5.2 a	0.7 a	0.8 ab	2.3 ab
SP2770 10WP	2.66 lb	2	4.6 ab	0.4 a	0.3 ab	2.5 ab
SP2773	1.66 lb	2	2.4 bcd	0.5 a	0.1 b	2.3 ab
Torque 3.6 SC (tebuconazole)	8 fl oz	2	0.2 d	0.4 a	0.2 b	2.0 b
Trinity 2SC (triticonazole)	12 fl oz	2	2.2 cd	0.2 a	0.2 ab	2.2 ab
V-10135 SC (fenpyrazamine)	16 oz	1	2.8 bc	0.0 a	0.2 b	2.4 ab
Untreated Check	-	-	5.5 a	0.0 a	0.4 ab	2.3 ab

^x Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Rated on a scale of (0-10) where: 0 = none, 1 = 1-10%, 2 = 11-20%, ... 10 = 91-100% foliage exhibiting symptoms of red leaf spot or Botrytis leaf lesions. Botrytis shoot blight was rated on a 0-10 scale where: 0 = none, 1 = 1-10%, 2 = 11-20%, ... 10 = 91-100% of the shoots on the plants exhibited symptoms of shoot dieback.

^w Vigor (1-3) where: 1 = plant < 12" tall, 2 = plant 12-25" tall, 3 = plant > 25" tall.

^z Date 1 = 3/22/13, 3/29/13, 4/3/13, 4/12/13, 4/18/13, 4/26/13, 5/2/13, 5/10/13, 5/20/13, 5/31/13, 6/7/13, 6/17/13; Date 2 = 3/22/13, 4/3/13, 4/18/13, 5/2/13, 5/20/13, 6/3/13, 6/17/13; Date 3 = 3/22/13, 4/12/13, 4/18/13, 5/20/13, 6/17/13.

^z Numbers represent the difference between average plant heights taken on June 11 and July 26, 2012.

Table 43. Efficacy for *Botrytis paeoniae* on Peony (*Paeonia* sp.), 'Coral Sunset', Chastagner WA, 2014.

Treatment	Rate Per 100 Gal	Application Interval	Application Dates ^z	Disease Severity ^x	Plant Quality ^w	Residues ^y
Alibi Flora SC (azoxystrobin+difenoconazole)	14 fl oz	14 day	C	0.8 a	2.8 a	0.4 de
Badge X2 (copper oxychloride+copper hydroxide)	2 lb	7-14 day	B	5.0 a	2.0 a	3.0 a
Orkestra (fluxapyroxad+pyraclostrobin)	8 fl oz	14 day	C	1.8 a	2.5 a	0.6 de
F9110 (extract of <i>Lupinus</i>)	24 fl oz	7 day	A	2.8 a	2.4 a	0.0 e
Medallion WDG (fludioxonil)	8 oz	14 day	C	2.2 a	2.0 a	1.8 bc
Mural WDG (azoxystrobin + benzovindiflupyr)	7 oz	14 day	C	2.2 a	3.2 a	1.0 cd
Pageant 38WG (pyraclostrobin+boscalid)	14 oz	14 day	C	3.6 a	2.4 a	1.6 bc
Prestop (<i>Gliocladium catenulatum</i>)	4.2 lb	21 day	D	3.6 a	2.0 a	0.0 e
Proud 3 (thyme oil)	4 qt	7 day	A	3.0 a	2.0 a	0.0 e
Regalia 50 (<i>Reynoutria sachalinensis</i> extract) ^v	4 fl oz	7 day	A	2.8 a	1.8 a	0.2 de
S2200 4SC (mandestrobin)	7.5 fl oz	14 day	C	2.0 a	2.6 a	0.6 de
SP2770 10WP	2.66 lb	7 day	A	3.6 a	2.6 a	2.0 b
SP2773	1.66 lb	14 day	C	2.4 a	2.0 a	1.8 bc
	3.31 lb	14 day	C	1.6 a	2.2 a	1.8 bc
Torque 3.6 SC (tebuconazole)	8 fl oz	14 day	C	1.8 a	2.4 a	0.4 de
ZeroTol (hydrogen dioxide+peroxyacetic acid)	1 gal	7 day	A	2.4 a	2.0 a	0.4 de
Untreated non-inoculated	-	-	-	2.4 a	2.4 a	0.0 e
Untreated inoculated	-	-	-	1.2 a	3.0 a	0.0 e

^x Rated on a 0 to 10 scale, where 0 = no disease and 10 = 91 to 100% of the foliage was diseased. Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Fungicide residue was rated on a scale of 0 to 3 where 0 = no residue, 1 = slight, 2 = moderate, and 3 = severe residue on foliage.

^w Overall plant quality was rated on a scale of 1-5 where 1 = dead foliage, 2 = yellow foliage, 3 = yellow/green foliage, 4 = mostly green foliage, 5 = excellent plants with green foliage.

^z Dates: 1 = 4/18/14, 2 = 4/25/14, 3 = 5/2/14, 4 = 5/8/14, 5 = 5/16/14, 6 = 5/22/14, 7 = 5/30/14, 8 = 6/6/14, 9 = 6/16/14, 10 = 6/23/14, 11 = 8/28/14, 12 = 9/4/14, 13 = 9/11/14, 14 = 9/19/14, 15 = 9/27/14, 16 = 10/7/14, 17 = 10/10/14; A = 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16; B = 1, 2, 3, 4, 5, 7, 9, 11, 13, 15, 17; C = 1, 3, 5, 7, 9, 11, 13, 15, 17; D = 1, 4, 7, 10, 11, 14, 17.

^v This Regalia rate is lower than the lowest labeled rate of 2 quarts per 100 gal.

Comparative Efficacy for *Botrytis tulipae*

In 2014, Chastagner conducted two field trials to test the efficacy of several fungicides for control of *Botrytis tulipae* on tulips. The first application was made on Feb 27, 2014 and the last application was made on April 22, 2014 (see Table 44 for specific intervals and dates). In the first trial, all treatments except Proud 3 had severity ratings and percent blighted flowers that were significantly less than the non-treated control plants (Table 44). Pageant and BAS 703 were the most effective materials in reducing disease development. The biofungicide F9110 significantly reduce disease development of the foliage and flowers. BAS 703 and Pageant treated plants also had significantly more flowers that were greater than 13" tall and yielded more bulbs greater than 12cm than the control plants (Table 45). In the second trial, both rates of SP2773 had significantly lower severity ratings than the non-treated control plants (Table 46). The high rate of SP2773 had significantly less blighted flowers and more flowers greater than 13" tall than the controls and also yielded significantly more bulbs that were 10-12 cm (Table 47). SP2770 was ineffective. No phytotoxicity was observed from any treatment.

In 2015, Chastagner conducted a field trial to test the efficacy of several fungicides for control of *Botrytis tulipae* on tulips. Treatments were applied at 1- and 2-week intervals starting on Feb 13, except MBI-110 which was initially applied on Feb 20. All treatments except Proud 3 and MBI-110 had severity ratings that were significantly less than the checks (Table 48). Pageant 38WG, both rates of Orkestra, both rates of S2200, and the high rate of NUP 09092 were the most effective materials in reducing disease development. These products, and Chipco 26019, had fewer blighted flowers and yielded more bulbs greater than 12 cm-in-diameter than the Untreated checks (Table 48 and Table 49). The biofungicide F9110, which was 12 months old, did significantly reduce disease development on the foliage; Proud 3 and MBI-110 were ineffective. No phytotoxicity was observed, except for Proud 3 (leaf injury).

Table 44. Efficacy for *Botrytis tulipaeon* Tulip Flowers (*Tulipa* sp.), 'Dynasty' - Trial 1, Chastagner WA, 2014.

Treatment	Rate Per 100 Gal	Application Dates / Interval ^y	% Blighted Flowerson 4/30/14 ^x	Severity (0-10) on 5/12/2014 ^z	Flower Height (inches) ^x			
					< 10	10-13	> 13	Total
Orkestra (fluxapyroxad + pyraclostrobin)	8 oz	A / 14-day	19.2 d	1.3 c	2.0 b	11.8 a	21.0 a	34.8 ab
Chipco 26019 N/G (iprodione)	16 oz	A / 14-day	59.4 b	3.3 b	5.5 ab	15.8 a	13.3 abc	34.5 ab
F9110 (extract of <i>Lupinus</i>)	24 fl oz	B / 7-day	30.2 cd	3.3 b	10.8 ab	15.5 a	6.0 abc	32.3 ab
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	A / 14-day	20.1 d	1.5 c	6.3 ab	9.3 a	17.8 ab	33.3 ab
Proud 3 (thyme oil)	4 qts	B / 7-day	100.0 a	8.8 a	11.5 ab	16.5 a	2.0 bc	30.0 ab
S2200 (mandestrobin)	7.5 fl oz	A / 14-day	72.0 b	2.8 bc	5.3 ab	15.0 a	15.0 abc	35.3 ab
Torque 3.6SC (tebuconazole)	8 fl oz	A / 14-day	56.6 bc	2.8 bc	8.8 ab	13.8 a	14.0 abc	36.5 a
Untreated Check	-	-	100.0 a	8.0 a	16.0 a	11.5 a	1.0 c	28.5 b

^x Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Dates: : 1 = 2/27/14, 2= 3/7/14, 3 3/13/14, 4 = 3/21/14, 5 = 3/31/14, 6 = 4/8/14, 7 = 4/14/14, 8 = 4/22/14. A = 1, 3, 5, 7; B = 1, 2, 3, 4, 5, 6, 7, 8.

^z Scale of 0 to 10 where 0 = none, 1 = 1-10%, 2 = 11-20%,....., and 10 = 91-100% of plant foliage were diseased.

Table 45. Efficacy for *Botrytis tulipaeon* Tulip Bulb Weight (*Tulipa* sp.), 'Dynasty' - Trial 1, Chastagner WA, 2014.

Treatment	Rate Per 100 Gal	Application Dates / Interval ^y	Wt (g) of Bulbs on 4/10/2014 ^x				
			< 8 cm	8-10 cm	10-12 cm	> 12 cm	Total
Orkestra (fluxapyroxad + pyraclostrobin)	8 oz	A / 14-day	225.6 a	95.2 ab	314.1 ab	416.0 a	1050.9 a
Chipco 26019 N/G (iprodione)	16 oz	A / 14-day	216.2a	114.3 ab	289.8 ab	136.3 bc	756.6 ab
F9110 (extract of <i>Lupinus</i>)	24 fl oz	B / 7-day	241.6 a	110.9 ab	271.1 ab	163.6 abc	787.2 ab
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	A / 14-day	206.6 a	91.7 b	166.7 ab	314.6 ab	779.6 ab
Proud 3 (thyme oil)	4 qts	B / 7-day	183.8 a	134.7 ab	110.2 b	0.0 c	428.7 b
S2200 (mandestrobin)	7.5 fl oz	A / 14-day	238.8 a	126.4 ab	343.1 a	156.4 abc	864.6 ab
Torque 3.6SC (tebuconazole)	8 fl oz	A / 14-day	223.9 a	204.5 a	238.6 ab	151.3 bc	818.3 ab
Untreated Check	-	-	200.7 a	125.1 ab	124.5 ab	0.0 c	450.3 b

^x Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Dates: : 1 = 2/27/14, 2= 3/7/14, 3 3/13/14, 4 = 3/21/14, 5 = 3/31/14, 6 = 4/8/14, 7 = 4/14/14, 8 = 4/22/14. A = 1, 3, 5, 7; B = 1, 2, 3, 4, 5, 6, 7, 8.

Table 46. Efficacy for *Botrytis tulipaeon* Tulip Flowers (*Tulipa* sp.), 'Dynasty' - Trial 2, Chastagner WA, 2014.

Treatment	Rate Per 100 Gal	Application Dates ^y	% Blighted Flowers on 4/30/2014 ^x	Severity (0-10) on 5/12/2014 ^z	Flower Height on 4/10/2014 (inches) ^x			
					< 10	10-13	> 13	Total
SP2770	2.66 lb	1, 4, 5, 6, 7, 8	100.0 a	9.8 a	24.0 a	7.0 b	0.0 b	31.0 a
SP2773	1.66 lb	1, 4, 5, 7	99.1 ab	6.0 bc	12.0 b	18.0 a	1.8 ab	31.8 a
SP2773	3.313 lb	1, 4, 5, 7	93.4 b	5.3 c	6.8 b	17.0 ab	9.0 a	32.8 a
Untreated Check	-	-	100.0 a	8.0 a	16.0 ab	11.5 ab	1.0 ab	28.5 a

^x Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Dates: : 1 = 2/27/14, 2= 3/7/14, 3 3/13/14, 4 = 3/21/14, 5 = 3/31/14, 6 = 4/8/14, 7 = 4/14/14, 8 = 4/22/14.

^z Scale of 0 to 10 where 0 = none, 1 = 1-10%, 2 = 11-20%,....., and 10 = 91-100% of plant foliage were diseased.

*Although initially planned as 7-day or 14-day interval regimes, there was a 3-week interval between the first and second applications of these products.

Table 47. Efficacy for *Botrytis tulipaeon* Tulip Bulb Weight (*Tulipa* sp.), 'Dynasty' - Trial 2, Chastagner WA, 2014.

Treatment	Rate Per 100 Gal	Application Dates ^y	Wt (g) of Bulbs ^x				
			< 8 cm	8-10 cm	10-12 cm	> 12 cm	Total
SP2770	2.66 lb	1, 4, 5, 6, 7, 8	229.2 a	124.0 a	22.7 c	0.0 a	375.9 c
SP2773	1.66 lb	1, 4, 5, 7	220.5 a	156.2 a	175.1 ab	7.3 a	559.0 ab
SP2773	3.313 lb	1, 4, 5, 7	219.8 a	198.3 a	220.6 a	20.2 a	658.9 a
Untreated Check	-	-	200.7 a	125.1 a	124.5 b	0.0 a	450.3 bc

^x Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Dates: : 1 = 2/27/14, 2= 3/7/14, 3 3/13/14, 4 = 3/21/14, 5 = 3/31/14, 6 = 4/8/14, 7 = 4/14/14, 8 = 4/22/14.

*Although initially planned as 7-day or 14-day interval regimes, there was a 3-week interval between the first and second applications of these products.

Table 48. Efficacy for *Botrytis tulipae* on Tulip Flowers (*Tulipa* sp.), 'Pink Jumbo', Chastagner WA, 2015.

Treatment	Rate Per 100 Gal	Applic Interval (days)	% Blighted Flowers ^x on 4/10/15 ^x	Severity ^y on 4/28/2015	Foliage Residue ^z	Phytotox icity on 3/2/15	Flower Height (inches) on 3/17/15			
							< 10	10-13	> 13	Total
Orkestra (fluxapyroxad + pyraclostrobin)	4 fl oz	14	6.2 cd	1.3 d	0.8 b	0.0 b	8.3 ab	16.5 a	16.3 a	41.0 a
	8 fl oz	14	3.5 d	1.0 d	1.0 b	0.0 b	7.0 ab	17.8 a	12.0 ab	36.8 a
Chipco 26019 (iprodione)	16 oz	14	20.1 cd	2.3 cd	1.0 b	0.0 b	9.0 ab	22.5 a	6.0 ab	37.5 a
F-9110 (extract of <i>Lupinus</i>)	24 fl oz	7	69.5 ab	4.0 bc	0.0 c	0.0 b	9.3 ab	18.8 a	8.3 ab	36.3 a
MBI-110 (<i>Bacillus amyloliquifaciens</i> strain F727)	1 gal	7	69.6 ab	5.0 ab	0.0 c	0.0 b	8.0 ab	16.8 a	11.0 ab	35.8 a
NUP 09092 (fludioxonil)	4 fl oz	14	73.1 ab	2.0 cd	1.0 b	0.0 b	6.8 ab	19.5 a	8.0 ab	34.3 a
	8 fl oz	14	40.9 bc	1.3 d	1.0 b	0.0 b	6.8 ab	19.5 a	14.8 a	41.0 a
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	14	4.9 cd	1.0 d	1.0 b	0.0 b	5.0 b	17.5 a	14.3 ab	37.5 a
Proud 3 (thyme oil)	4 qt	7	84.1 a	6.8 a	0.0 c	4.0 a	14.5 a	22.5 a	2.0 b	39.0 a
S2200 (mandestrobin)	7.5 fl oz	14	29.9 cd	1.3 d	1.0 b	0.0 b	8.5 ab	17.3 a	13.8 ab	39.5 a
	15 fl oz	14	14.5 cd	1.3 d	2.0 a	0.0 b	5.0 b	20.5 a	11.0 ab	36.5 a
Untreated Check	-	-	81.9 a	6.8 a	0.0 c	0.0 b	7.8 ab	18.3 a	10.5 ab	36.5 a

^x Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Scale of 0 to 10 where 0 = none, 1 = 1-10%, 2 = 11-20%, and 10 = 91-100% of plant foliage were diseased.

^z Scale of 0 to 3 where 0 = none, 1 = slight, 2 = moderate, and 3 = severe residue present on foliage.

Table 49. Efficacy for *Botrytis tulipae* on Tulip Bulb Weight (*Tulipa* sp.), 'Pink Jumbo', Chastagner WA, 2015.

Treatment	Rate Per 100 Gal	Applic Interval (days)	Wt (g) of Bulbs on 6/30/2015 ^x			
			8-10 cm	10-12 cm	> 12 cm	Total
Orkestra (fluxapyroxad + pyraclostrobin)	4 fl oz	14	5.0 c	9.5 a	23.3 a	37.8 ab
	8 fl oz	14	5.0 c	14.0 a	19.8 ab	38.8 ab
Chipco 26019 (iprodione)	16 oz	14	5.5 c	12.3 a	14.3 a-d	32.0 b
F-9110 (extract of <i>Lupinus</i>)	24 oz	7	8.8 bc	14.8	8.3 cde	31.8 b
MBI-110 (<i>Bacillus amyloliquifaciens</i> strain F727)	1 gal	7	10.0 abc	15.3 a	6.3 de	31.5 b
NUP 09092 (fludioxonil)	4 fl oz	14	7.0 c	14.5 a	14.0 bcd	35.5 ab
	8 fl oz	14	6.5 c	17.8 a	18.0 ab	42.3 a
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	14	6.3 c	14.3 a	20.3 ab	40.8 ab
Proud 3 (thyme oil)	4 qt	7	16.5 a	17.8 a	2.3 e	36.5 ab
S2200 (mandestrobin)	7.5 fl oz	14	8.0 bc	16.5 a	14.8 a-d	39.3 ab
	15 fl oz	14	4.8 c	14.5 a	17.3 abc	36.5 ab
Untreated Check	-	-	14.8 ab	15.5 a	1.8 e	32.0 b

^x Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

Efficacy Summary by Product/Active Ingredient

A brief efficacy summary for select products is given below, with a reminder that there are very limited data available to draw definitive conclusions for many products. Products were selected based on interest in these products for testing in 2012, 2013, 2014 and 2015 Botrytis efficacy projects.

Azoxystrobin. Heritage generally provided good to excellent efficacy for *B. cinerea* in 13 experiments on geranium, poinsettia, lisianthus, rose, primrose and chrysanthemum experiments.

Azoxystrobin + Difenoconazole. Results of a trial with Alibi Flora for *B. paeoniae* and *B. cinerea* on peony were inconclusive because of considerable variability in disease development.

Bacillus amyloliquifaciens strain F727. MBI-110 provided poor efficacy for *B. cinerea* and *B. tulipae* in single experiments on geranium and tulip.

Bacillus subtilis. Rhapsody and QRD 713 provided good efficacy for *B. cinerea* in 2 experiments on geranium and lisianthus.

Azoxystrobin + Benzovindiflupyr. Mural provided good to excellent efficacy for *B. cinerea* and *B. elliptica* in single experiments on geranium and hybrid lily. Results of a trial against *B. paeoniae* and *B. cinerea* on peony were inconclusive because of considerable variability in disease development.

Chlorothalonil. Daconil generally provided excellent efficacy for *B. cinerea* in 21 experiments on chrysanthemum, geranium, lisianthus, poinsettia and primrose. Results of an experiment on *B. paeoniae* on peony were inconclusive because insufficient disease developed. Echo was very effective against *B. cinerea* in a geranium experiment.

Chlorothalonil + Thiophanate methyl. Spectro provided excellent efficacy for *B. cinerea* in an experiment on geranium.

Copper Products. The copper products Camelot, Phyton 27 and STBX-304 generally provided poor efficacy for *B. cinerea* in 5 experiments on Douglas fir, geranium and western hemlock. Results of two experiments with Kocide and Badge X2 for *B. paeoniae* and *B. cinerea* on peony were inconclusive because of insufficient or considerable variability in disease development.

Cyprodinil + Fludioxonil. Palladium and Switch generally provided excellent efficacy for *B. cinerea* in 16 experiments on begonia, chrysanthemum, Douglas fir, geranium, pansy, poinsettia, rose and western hemlock; some experiments on Douglas fir, western hemlock and pansy produced inconclusive data. Results of experiments for *B. elliptica* on Asiatic hybrid lily and for *B. paeoniae* on peony were inconclusive.

Fenhexamid. Decree generally provided excellent efficacy for *B. cinerea* in 23 experiments on Douglas fir, geranium, lisianthus, poinsettia, and western hemlock; an experiment on pansy produced inconclusive data. Also, results of an experiment for *B. paeoniae* were inconclusive. It looked ineffective for *B. elliptica* in a hybrid lily trial.

Fenpyrazamine. V-10135 provided good efficacy for *B. cinerea* in 2 geranium experiments; a trial on pansy produced inconclusive data. Also, results of experiments for *B. elliptica* on Asiatic hybrid lily and for *B. paeoniae* on peony were inconclusive. It provided no efficacy for *B. cinerea* and powdery mildew in a miniature rose experiment.

Fludioxonil. Medallion generally provided good to excellent efficacy for *B. cinerea* in 13 experiments on begonia, chrysanthemum, Douglas fir, geranium, lisianthus, poinsettia, rose and western hemlock; an experiment on pansy produced inconclusive data. Results of experiments for *B. elliptica* on Asiatic hybrid lily and for *B. paeoniae* on peony were inconclusive. The experimental product NUP 09092 provided excellent efficacy for *B. cinerea* in two geranium and pansy experiments, and for *Botrytis tulipae* in a tulip trial.

Fluoxastrobin. Disarm provided mediocre efficacy for *B. cinerea* in 3 experiments on geranium and poinsettia, but no efficacy in a miniature rose trial; an experiment on pansy produced inconclusive data. Also, results of experiments for *B. elliptica* on Asiatic hybrid lily and for *B. paeoniae* on peony were inconclusive.

Fluxapyroxad + pyraclostrobin. BAS 703 provided generally excellent efficacy for *B. cinerea* in single experiments on geranium, miniature rose and pansy, for *B. elliptica* on a hybrid lily trial, and for *B. tulipae* in two tulip experiments. Results of a trial for *B. paeoniae* and *B. cinerea* on peony were inconclusive because of considerable variability in disease development.

Gliocladium catenulatum. Results of two experiments with Prestop for *B. paeoniae* on peony were inconclusive.

Hydrogen dioxide + peroxyacetic acid. ZeroTol provided mediocre efficacy for *B. cinerea* in 2 geranium experiments. Results of 2 experiments for *B. elliptica* on Asiatic hybrid lily, and for *B. paeoniae* on peony were inconclusive.

Iprodione. Chipco 26019 and Chipco 26GT generally provided good efficacy for *B. cinerea* in 9 experiments on begonia, geranium and poinsettia, but provided variable efficacy (mediocre and good) for *B. tulipae* in two tulip trials. Results of 2 experiments for *B. elliptica* on Asiatic hybrid lily and for *B. paeoniae* on peony were inconclusive.

Lupinus extract. F9110 provided mediocre efficacy for *B. tulipae* in two tulip experiments. It was ineffective for *B. cinerea* in a geranium experiment, and for *B. elliptica* on a hybrid lily trial. Results of an experiment for *B. cinerea* on pansy, and 2 trials for *B. paeoniae* on peony were inconclusive.

Mandestrobin. S2200 generally provided excellent efficacy for *B. elliptica* on a hybrid lily experiment, and for *B. tulipae* in two tulip trials, and good efficacy for *B. cinerea* in 2 geranium and pansy experiments. Results of a trial for *B. paeoniae* and *B. cinerea* on peony were inconclusive because of considerable variability in disease development.

Metconazole. Tourney provided excellent efficacy for *B. cinerea* in a geranium experiment, but poor efficacy in a pansy trial. Results of an experiment for *B. elliptica* on Asiatic hybrid lily were inconclusive.

Polyoxin D. Affirm, Endorse and Veranda O generally provided good efficacy for *B. cinerea* in 14 experiments on Douglas fir, geranium, primrose, and western hemlock.

Potassium bicarbonate. Kaligreen and Milstop generally provided good efficacy for *B. cinerea* in 3 experiments on Douglas fir, lisianthus and western hemlock.

Pyraclostrobin. Insignia, Cabrio and BAS 500 generally provided excellent efficacy for *B. cinerea* in 8 experiments on Douglas fir, geranium, poinsettia, rose, and western hemlock.

Pyraclostrobin+Boscalid. Pageant and BAS 516 generally provided excellent efficacy for *B.cinerea* in nine experiments on Douglas fir, geranium, pansy, poinsettia, primrose and western hemlock, for *B.elliptica* in an experiment on Asiatic hybrid lily, and for *B.tulipae* in two tulip trials. Results of 3 experiments on *B. cinerea* on pansy and *B. paeoniae* on peony were inconclusive.

Reynoutria sachalinensis extract. Regalia 50 provided no efficacy for *B. cinerea* and powdery mildew in a miniature rose experiment. Results of 3 experiments for *B. cinerea* on pansy, for *B. elliptica* on Asiatic hybrid lily, and for *B. paeoniae* on peony were inconclusive. However, the rate testes was lower than the lowest labeled rate of 2 quarts per 100 gal.

SP2770. This product provided no efficacy for *B. cinerea* and powdery mildew in a miniature rose experiment, for *B. elliptica* in a hybrid lily trial, and for *B. tulipae* in a tulip experiment. Results of 3 experiments with SP2770 for *B. cinerea* on pansy and for *B. paeoniae* on peony were inconclusive.

SP2773. This product provided poor efficacy for *B. tulipae* in a tulip experiment but no efficacy for *B. cinerea* and powdery mildew in a miniature rose experiment, and for *B. elliptica* in a hybrid lily trial. Results of 3 experiments with SP2773 for *B. cinerea* on pansy and for *B. paeoniae* on peony were inconclusive.

Tebuconazole. Torque provided good efficacy for *B. tulipae* in a tulip experiment, but was ineffective for *B. elliptica* in a hybrid lily trial. Results of 4 experiments for *B. cinerea* on pansy, for *B. elliptica* on Asiatic hybrid lily and for *B. paeoniae* on peony were inconclusive.

Thiophanate methyl. OHP6672, 3336 and Fungo provided poor efficacy for *B. cinerea* in 4 experiments on geranium and poinsettia.

Thyme Oil. Proud 3 provided no efficacy for *B. cinerea* in four experiments on geranium, pansy and miniature rose, for *B. elliptica* on Asiatic hybrid lily in two trials, and for *B. tulipae* in two tulip experiments. Results of two experiments for *B. paeoniae* on peony were inconclusive.

Trifloxystrobin. Compass generally provided good to excellent efficacy against *B. cinerea* in 7 experiments on geranium and poinsettia.

Triticonazole. Trinity provided poor efficacy for *B. cinerea* in a pansy experiment. Results of 3 trials for *B. elliptica* on Asiatic hybrid lily and for *B. paeoniae* on peony were inconclusive.

Phytotoxicity

No phytotoxicity was observed with the products listed above with the exception of Switch and Medallion in a 2001 geranium experiment, Captan in a 2004 geranium experiment, and Palladium in two 2008 and 2009 geranium experiments. Also, Phyton 27 and STBX-304 caused phytotoxicity in a 2005 Douglas fir experiment, Torque in a 2013 poinsettia experiment, and Proud 3 in 2015 pansy and tulip experiments.

Table 50. Summary of product efficacy by pathogen and crop.

Note: Table entries are sorted by product, pathogen Latin name, and then by crop Latin name. Only those IR-4 trials received by 7/15/2016 are included in the table below.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
32633	Affirm (Polyoxin D zinc salt)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	Highly effective control of a severe disease pressure with 8 oz oz per 100 gal applied twice.
32070	Alibi Flora (A13703G) SC (Azoxystrobin + difenconazole)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 14 fl oz per 100 gal.
31355	Badge X2 (Copper Oxychloride + Copper Hydroxide)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field In-Ground	Chastagner	WA	2014	Foliar	Did not reduce a low to moderate disease severity with 2 lb per 100 gal.
25046	BAS 516 UFF (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from untreated Check at 9.5 oz and 18 oz per 100 gal.
25047	BAS 516 UFF (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Significantly reduced low disease infection at 9.5 and 18 oz per 100 gal; comparable to Decree.
32791	Bayleton 25WP (Triadimefon)	Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'Whiskey' and 'Vodka'	Greenhouse	Peterson	NJ	1982	Foliar	Good to excellent efficacy based on rate; some disease occurred at 1, 2, and 4 oz per 100 gal, while 8 oz per 100 gal provided complete control.
31532	Chipco 26019 N/G 50WP (Iprodione)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Did not significantly reduce severity of red spot/blotch caused by Cladosporium paeoniae with 16 oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
30556	Chipco 26019 N/G 50WP (Iprodione)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Elite'	Field In-Ground	Chastagner	WA	2011	Foliar	Did not significantly reduce foliage dieback and severity of a moderate disease pressure with 16 oz per 100 gal.
30556	Chipco 26019 N/G 50WP (Iprodione)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low disease pressure with 16 oz per 100 gal applied every 14 days.
32042	Chipco 26019 N/G 50WP (Iprodione)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Dynasty'	Field In-Ground	Chastagner	WA	2014	Foliar	Significantly reduced high % blighted flowers and disease severity with 16 oz per 100 gal.
32042	Chipco 26019 N/G 50WP (Iprodione)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Pink Jumbo'	Field In-Ground	Chastagner	WA	2015	Foliar	Significantly reduced high % blighted flowers and disease severity with 16 oz per 100 gal.
29793	Daconil 54EC (Chlorothalonil)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum)	Greenhouse	Hausbeck	MI	2002	Foliar	No significant impact on disease at 17.3 fl oz per 100 gal under severe pressure; no injury.
31533	Decree (Fenhexamid)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Significantly reduced severity of red spot/blotch caused by Cladosporium paeoniae with 1.5 lb per 100 gal.
25740	Decree (Fenhexamid)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from untreated Check at 1 lb per 100 gal.
25744	Decree (Fenhexamid)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Significantly reduced low disease infection at 1 lb per 100 gal.
32068	Decree (Fenhexamid)	Botrytis Gray Mold (Botrytis cinerea)	Pansy (Viola sp.) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
32351	Decree (Fenhexamid)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field In-Ground	Catlin	NY	2014	Foliar	Mediocre control of a severe disease pressure with 1.5 lb per 100 gal applied 6 times; inferior to uninoculated Check.
31529	Disarm 480SC (Fluoxastrobin)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Significantly reduced severity of red spot/blotch caused by Cladosporium paeoniae with 0.08 g + 1 oz per 100 gal.
31569	Disarm 480SC (Fluoxastrobin)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Did not reduce Botrytis and powdery mildew severity with 8 fl oz per 100 gal.
32065	Disarm 480SC (Fluoxastrobin)	Botrytis Gray Mold (Botrytis cinerea)	Pansy (Viola sp.) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
30448	Disarm 480SC (Fluoxastrobin)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Elite'	Field In-Ground	Chastagner	WA	2011	Foliar	Significantly reduced foliage dieback and severity of a moderate disease pressure with 4 and 8 fl oz per 100 gal.
30448	Disarm 480SC (Fluoxastrobin)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low disease pressure with 8 fl oz per 100 gal applied every 14 days.
25228	Endorse (Polyoxin D)	Botrytis Gray Mold (Botrytis cinerea)	Geranium (Pelargonium sp.) P. x hortorum	Greenhouse	Hausbeck	MI	2002	Foliar	Some reduction in sporulation; no injury.
25218	Endorse (Polyoxin D)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from untreated Check at 4, 8 and 12 oz per 100 gal.
25203	Endorse (Polyoxin D)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Significantly reduced low disease infection at 4, 8 and 12 oz per 100 gal; comparable to Decree.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
31522	F9110 (F9110)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Significantly reduced severity of red spot/blotch caused by Cladosporium paeoniae with 24 oz per 100 gal.
32253	F9110 (F9110)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 24 fl oz per 100 gal.
32377	F9110 (F9110)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	No significant control of a severe disease pressure with 24 fl oz per 100 gal applied twice.
31562	F9110 (F9110)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Did not significantly reduce Botrytis and powdery mildew severity with 32 oz per 100 gal.
32058	F9110 (F9110)	Botrytis Gray Mold (Botrytis cinerea)	Pansy (Viola sp.) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
32346	F9110 (F9110)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2014	Foliar	Poor control of a severe disease pressure with 24 oz per 100 gal applied 6 times; slightly inferior to standard Decree applied 6 times.
31947	F9110 (F9110)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Dynasty'	Field In-Ground	Chastagner	WA	2014	Foliar	Significantly reduced high % blighted flowers and disease severity with 24 fl oz per 100 gal.
31947	F9110 (F9110)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Pink Jumbo'	Field In-Ground	Chastagner	WA	2015	Foliar	Significantly reduced high % blighted flowers and disease severity with 24 fl oz per 100 gal.
25741	Insignia 20WDG Intrinsic Brand Fungicide (Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from untreated Check at 8 and 16 oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
25745	Insignia 20WDG Intrinsic Brand Fungicide (Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Significantly reduced low disease infection at 8 and 16 oz per 100 gal; comparable to Decree.
32378	MBI 110 (MBI110)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	No significant control of a severe disease pressure with 1 gal per 100 gal applied twice.
32263	MBI 110 (MBI110)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Pink Jumbo'	Field In- Ground	Chastagner	WA	2015	Foliar	Did not significantly reduce high % blighted flowers and disease severity with 1 gal per 100 gal.
31534	Medallion (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In- Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Did not significantly reduce severity of red spot/blotch caused by Cladosporium paeoniae with 8 oz per 100 gal.
32259	Medallion (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 8 oz per 100 gal.
23120	Medallion (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum)	Greenhouse	Hausbeck	MI	2002	Foliar	No significant impact on disease at 1, 2, and 4 oz per 100 gal under severe pressure; no injury.
25048	Medallion (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from untreated Check at 4 and 8 oz per 100 gal.
31572	Medallion (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Did not reduce Botrytis and powdery mildew severity with 8 oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
24809	Medallion (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Significantly reduced low disease infection at 2 and 4 oz per 100 gal; comparable to Decree.
32069	Medallion (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana)	Greenhouse	Ong	TX	2015	Foliar	No significant reduction of a moderate disease severity with 8 oz per 100 gal applied 3 times biweekly.
32069	Medallion (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
30555	Medallion (Fludioxonil)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Elite'	Field In-Ground	Chastagner	WA	2011	Foliar	Significantly reduced foliage dieback and severity of a moderate disease pressure with 8 oz per 100 gal.
32792	Milban 39EC (Dodemorph)	Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'Whiskey' and 'Vodka'	Greenhouse	Peterson	NJ	1982	Foliar	Great efficacy at 32, 64, and 96 fl oz per 100 gal.
25042	MilStop (Potassium bicarbonate)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from untreated Check at 5 lb per 100 gal.
25043	MilStop (Potassium bicarbonate)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from untreated Check at 5 lb per 100 gal.
32071	Mural (A18126B) WDG (Azoxystrobin + benzovindiflupyr)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 7 oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
32630	Mural (A18126B) WDG (Azoxystrobin + benzovindiflupyr)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	Moderate control of a severe disease pressure with 7 oz per 100 gal applied twice; inferior to the standard Affirm.
32350	Mural (A18126B) WDG (Azoxystrobin + benzovindiflupyr)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field In-Ground	Catlin	NY	2014	Foliar	Excellent control of a severe disease pressure with 7 oz per 100 gal applied 3 times; equal to uninoculated Check.
32379	NUP 09092 (fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	Highly effective control of a severe disease pressure with 4 and 8 fl oz per 100 gal applied twice; comparable to the standard Affirm.
32720	NUP 09092 (fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana)	Greenhouse	Ong	TX	2015	Foliar	Significant reduction of a moderate disease severity with 4 and 8 fl oz per 100 gal applied 3 times biweekly.
32225	NUP 09092 (fludioxonil)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Pink Jumbo'	Field In-Ground	Chastagner	WA	2015	Foliar	Significantly reduced high % blighted flowers and disease severity with 4 and 8 fl oz per 100 gal; one of four most effective treatments.
31935	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 8 fl oz per 100 gal.
32376	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	Effective control of a severe disease pressure with 6 and 8 fl oz per 100 gal applied twice; higher rate comparable to the standard Affirm.
31894	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Significantly reduced Botrytis and powdery mildew severity with 4 and 8 oz per 100 gal; best treatment.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
32715	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana)	Greenhouse	Ong	TX	2015	Foliar	Significant reduction of a moderate disease severity with 6 and 8 fl oz per 100 gal applied 3 times biweekly.
32345	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2014	Foliar	Excellent control of a severe disease pressure with 8 fl oz per 100 gal applied 3 times; equal to uninoculated Check.
31946	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Dynasty'	Field In-Ground	Chastagner	WA	2014	Foliar	Significantly reduced high % blighted flowers and disease severity with 8 fl oz per 100 gal; one of two most effective treatments.
31946	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Pink Jumbo'	Field In-Ground	Chastagner	WA	2015	Foliar	Significantly reduced high % blighted flowers and disease severity with 8 fl oz per 100 gal; one of four most effective treatments.
31530	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field In-Ground	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 14 oz per 100 gal.
32631	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	Moderate control of a severe disease pressure with 14 oz per 100 gal applied twice; inferior to the standard Affirm.
25742	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Effective control of red spot/blotch caused by Cladosporium paenoniae on peony with 14 oz per 100 gal.
25742	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from untreated Check at 12.5 and 16.5 oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
25746	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Statistically less Botrytis with 12.5 and 18.5 oz per 100 gal than untreated controls, but infection level was very low; moderate level of injury with the BAS 516-04 38% WG formulation.
32066	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana)	Greenhouse	Ong	TX	2015	Foliar	Significant reduction of a moderate disease severity with 14 oz per 100 gal applied 3 times biweekly.
32066	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
30480	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Elite'	Field In-Ground	Chastagner	WA	2011	Foliar	Significantly reduced foliage dieback and severity of a moderate disease pressure with 7 and 14 oz per 100 gal.
30480	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low disease pressure with 14 oz per 100 gal applied every 14 days.
32041	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Dynasty'	Field In-Ground	Chastagner	WA	2014	Foliar	Significantly reduced high % blighted flowers and disease severity with 14 oz per 100 gal; one of two most effective treatments.
32041	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Pink Jumbo'	Field In-Ground	Chastagner	WA	2015	Foliar	Significantly reduced high % blighted flowers and disease severity with 14 oz per 100 gal; one of four most effective treatments.
31523	Palladium (Cyprodinil + fludioxanil)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Significantly reduced severity of red spot/blotch caused by Cladosporium paeoniae with 6 oz per 100 gal.
31563	Palladium (Cyprodinil + fludioxanil)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Did not reduce Botrytis and powdery mildew severity with 6 oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
32059	Palladium (Cyprodinil + fludioxanil)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana)	Greenhouse	Ong	TX	2015	Foliar	No significant reduction of a moderate disease severity with 6 oz per 100 gal applied 5 times weekly.
32059	Palladium (Cyprodinil + fludioxanil)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
30554	Palladium (Cyprodinil + fludioxanil)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Elite'	Field In-Ground	Chastagner	WA	2011	Foliar	Did not significantly reduce foliage dieback and severity of a moderate disease pressure with 12 oz per 100 gal.
30554	Palladium (Cyprodinil + fludioxanil)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Significantly reduced incidence but not severity of a low disease pressure with 12 oz per 100 gal applied every 7 days; best treatment.
25044	Phyton-27 (Copper sulfate pentahydrate)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Higher than untreated Check at 1.5 and 2 oz per 100 gal; phytotoxic
25045	Phyton-27 (Copper sulfate pentahydrate)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Higher than untreated Check at 1.5 and 2 oz per 100 gal; phytotoxic
31535	Prestop (Gliocladium catenulatum Strain J1446)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Did not significantly reduce severity of red spot/blotch caused by Cladosporium paeoniae with 0.5 % dilution.
32260	Prestop (Gliocladium catenulatum Strain J1446)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 4.2 lb per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
31524	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Did not significantly reduce severity of red spot/blotch caused by Cladosporium paeoniae with 4 qt per 100 gal.
32254	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 4 qt per 100 gal.
32380	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	No significant control of a severe disease pressure with 4 qt per 100 gal applied twice.
31564	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Did not reduce Botrytis and powdery mildew severity with 4 qt per 100 gal.
32060	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Pansy (Viola sp.) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
32716	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana)	Greenhouse	Ong	TX	2015	Foliar	No reduction of a moderate disease severity with 4 qt per 100 gal applied 5 times weekly; high injury.
31356	Proud 3 (Thyme oil (5.6%))	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Significantly reduced incidence but not severity of a low disease pressure with 4 qt per 100 gal applied every 7 days.
32679	Proud 3 (Thyme oil (5.6%))	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2014	Foliar	Poor control of a severe disease pressure with 4 qt per 100 gal applied 6 times; slightly inferior to standard Decree applied 6 times.
31948	Proud 3 (Thyme oil (5.6%))	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Dynasty'	Field In-Ground	Chastagner	WA	2014	Foliar	Did not reduce high % blighted flowers and disease severity with 4 qt per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
31948	Proud 3 (Thyme oil (5.6%))	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Pink Jumbo'	Field In-Ground	Chastagner	WA	2015	Foliar	Did not reduce high % blighted flowers and disease severity with 1 gal per 100 gal; moderate leaf phytotoxicity.
32080	Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field In-Ground	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 4 fl oz per 100 gal.
31571	Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Did not reduce Botrytis and powdery mildew severity with 4 oz per 100 gal.
32067	Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	Botrytis Gray Mold (Botrytis cinerea)	Pansy (Viola sp.) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
31360	Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low disease pressure with 4 fl oz per 100 gal applied every 7 days.
31936	S2200 4SC (Mandestrobin)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 7.5 fl oz per 100 gal.
32381	S2200 4SC (Mandestrobin)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	Moderate control of a severe disease pressure with 7.5 and 15 fl oz per 100 gal applied twice; inferior to the standard Affirm.
32717	S2200 4SC (Mandestrobin)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana)	Greenhouse	Ong	TX	2015	Foliar	Significant reduction of a moderate disease severity with 7.5 and 15 fl oz per 100 gal applied 3 times biweekly.
32347	S2200 4SC (Mandestrobin)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2014	Foliar	Great control of a severe disease pressure with 7.5 fl oz per 100 gal applied 3 times; equal to uninoculated Check.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
31949	S2200 4SC (Mandestrobin)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Dynasty'	Field In-Ground	Chastagner	WA	2014	Foliar	Significantly reduced high % blighted flowers and disease severity with 7.5 fl oz per 100 gal.
31949	S2200 4SC (Mandestrobin)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Pink Jumbo'	Field In-Ground	Chastagner	WA	2015	Foliar	Significantly reduced high % blighted flowers and disease severity with 7.5 and 15 fl oz per 100 gal; one of four best treatments.
31525	SP2770 10WP (SP2770)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Did not significantly reduce severity of red spot/blotch caused by Cladosporium paeoniae with 2.66 lb per 100 gal.
32255	SP2770 10WP (SP2770)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 2.66 lb per 100 gal.
31565	SP2770 10WP (SP2770)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Did not reduce Botrytis and powdery mildew severity with 2.66 lb per 100 gal.
32061	SP2770 10WP (SP2770)	Botrytis Gray Mold (Botrytis cinerea)	Pansy (Viola sp.) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
32348	SP2770 10WP (SP2770)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field In-Ground	Catlin	NY	2014	Foliar	Mediocre control of a severe disease pressure with 2.66 lb per 100 gal applied 3 times; equal to standard Decree applied 6 times.
31950	SP2770 10WP (SP2770)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Dynasty'	Field In-Ground	Chastagner	WA	2014	Foliar	Did not reduce high % blighted flowers and disease severity with 2.66 lb per 100 gal.
31526	SP2773 (SP2773)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Significantly reduced severity of red spot/blotch caused by Cladosporium paeoniae with 1.66 lb per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
32256	SP2773 (SP2773)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 1.66 and 3.31 lb per 100 gal.
31566	SP2773 (SP2773)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Did not reduce Botrytis and powdery mildew severity with 1.33 lb per 100 gal.
32062	SP2773 (SP2773)	Botrytis Gray Mold (Botrytis cinerea)	Pansy (Viola sp.) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
32349	SP2773 (SP2773)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field In-Ground	Catlin	NY	2014	Foliar	Mediocre control of a severe disease pressure with 3.31 lb per 100 gal applied 3 times; equal to standard Decree applied 6 times.
31951	SP2773 (SP2773)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Dynasty'	Field In-Ground	Chastagner	WA	2014	Foliar	Significantly reduced a high disease severity with 1.66 and 3.31 lb per 100 gal.
20266	Switch 62.5WG (Cyprodinil + Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) P. x hortorum	Greenhouse	Hausbeck	MI	2002	Foliar	No consistent impact on disease with 3, 6, and 12 oz per 100 gal; no injury observed.
18663	Switch 62.5WG (Cyprodinil + Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Greenhouse	Lambe	WA	2000	Foliar	Good control of a low infection at 3, 6, and 12 oz per 100 gal per acre; no phytotoxicity. NOTE: Data reviewed in 2014 and data collected were counts of disease plants for the entire treated set of plants. No statistics could be performed.
18663	Switch 62.5WG (Cyprodinil + Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Greenhouse	Lambe	WA	2001	Foliar	Good control at 3, 6, and 12 oz per acre; no injury. NOTE: Data analyzed in 2014, and, while there is a trend for good efficacy, it was not statistically different from untreated inoculated controls.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
18665	Switch 62.5WG (Cyprodinil + Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Lambe	WA	2000	Foliar	Good control of a low level infection with 3, 6, and 12 oz per 100 gal with 100 gal per acre; slight chlorosis of lower needles at 6 and 12 oz per 100 gal. NOTE: statistics performed in 2014 indicate no statistical difference among treatments.
18665	Switch 62.5WG (Cyprodinil + Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla) t. heterophylla	Greenhouse	Lambe	WA	2001	Foliar	Great control with 3, 6, and 12 oz per acre; no injury.
31527	Torque 3.6SC (Tebuconazole)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Effective control of red spot/blotch caused by Cladosporium paeoniae with 8 fl oz per 100 gal.
32257	Torque 3.6SC (Tebuconazole)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field Container	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 8 fl oz per 100 gal.
32063	Torque 3.6SC (Tebuconazole)	Botrytis Gray Mold (Botrytis cinerea)	Pansy (Viola sp.) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
31357	Torque 3.6SC (Tebuconazole)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low disease pressure with 8 fl oz per 100 gal applied every 14 days.
31357	Torque 3.6SC (Tebuconazole)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field In-Ground	Catlin	NY	2014	Foliar	Poor control of a severe disease pressure with 8 oz per 100 gal applied 3 times; slightly inferior to standard Decree applied 6 times.
31952	Torque 3.6SC (Tebuconazole)	Botrytis tulipae (Botrytis tulipae)	Tulip (Tulipa sp.) 'Dynasty'	Field In-Ground	Chastagner	WA	2014	Foliar	Significantly reduced high % blighted flowers and disease severity with 8 fl oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
32632	Tourney 50WDG (Metconazole)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Red'	Greenhouse	Hausbeck	MI	2015	Foliar	Highly effective control of a severe disease pressure with 4 oz per 100 gal applied twice; comparable to the standard Affirm.
32718	Tourney 50WDG (Metconazole)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana)	Greenhouse	Ong	TX	2015	Foliar	No significant reduction of a moderate disease severity with 4 oz per 100 gal applied 3 times biweekly.
31358	Tourney 50WDG (Metconazole)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low disease pressure with 4 oz per 100 gal applied every 14 days.
31531	Trinity 2SC (Triticonazole)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Significantly reduced severity of red spot/blotch caused by Cladosporium paeoniae with 12 fl oz per 100 gal.
32719	Trinity 2SC (Triticonazole)	Botrytis Gray Mold (Botrytis cinerea)	Garden Pansy (Viola x wittrockiana)	Greenhouse	Ong	TX	2015	Foliar	No significant reduction of a moderate disease severity with 12 fl oz per 100 gal applied 3 times biweekly.
30449	Trinity 2SC (Triticonazole)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Elite'	Field In-Ground	Chastagner	WA	2011	Foliar	Did not significantly reduce foliage dieback and severity of a moderate disease pressure with 8 fl oz per 100 gal.
30449	Trinity 2SC (Triticonazole)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low disease pressure with 12 fl oz per 100 gal applied every 14 days.
31528	V-10135 (Fenpyrazamine)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.)	Field In-Ground	Chastagner	WA	2013	Foliar	Insufficient Botrytis spp. infection. Significantly reduced severity of red spot/blotch caused by Cladosporium paeoniae with 16 fl oz per 100 gal.
31568	V-10135 (Fenpyrazamine)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2013	Foliar	Did not reduce Botrytis and powdery mildew severity with 16 fl oz per 100 gal.

PR#	Product (Active Ingredients)	Target	Crop	ProductionSite	Researcher	State	Year	ApplicationType	Results
32064	V-10135 (Fenpyrazamine)	Botrytis Gray Mold (Botrytis cinerea)	Pansy (Viola sp.) V. x wittrockiana 'Delta Premium Pure White'	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including untreated inoculated and untreated uninoculated.
31359	V-10135 (Fenpyrazamine)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In- Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low disease pressure with 16 oz per 100 gal applied every 7 days.
31937	ZeroTol (Hydrogen dioxide)	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Coral Sunset'	Field In- Ground	Chastagner	WA	2014	Foliar	Did not significantly reduce a low to moderate disease severity with 1 gal per 100 gal.
31361	ZeroTol (Hydrogen dioxide)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) London	Field In- Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low disease pressure with 1 gal per 100 gal applied every 10 days.

Appendix 1: Contributing Researchers

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