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IR-4 Ornamental Horticulture Program Botrytis Efficacy & 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 2016 on ornamental horticulture crops. During this time period, numerous products representing 46 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, Emblem (NUP 09092), and S2200 looked effective, while Proud 3 and SP2770 looked ineffective. Data on other relatively new products (Botector, BW165N, F9110, IKF 5411, MBI-110, Prophytex, Regalia, SP2773, Torque, Tourney, Trinity) 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 under the conditions of these experiments.

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 25 experiments from 2001 to 2016 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 2016, numerous products representing 46 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, 16-002 and 16-014. 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 2016.

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested		# Trials
<i>Aureobasidium pullulans</i> strains DSM14940 and DSM 14941	Botector	Nufarm	Foliar	10 oz per 100 gal	3
Azoxystrobin	Heritage	Syngenta	Foliar	1 oz per 100 gal 2 oz per 100 gal 4 oz per 100 gal 8 oz per 100 gal	14
Azoxystrobin + Benzovindiflupyr	Mural	Syngenta	Foliar	7 oz per 100 gal	4
Azoxystrobin + Difenconazole	Alibi Flora	Syngenta	Foliar	14 fl oz per 100 gal	2
<i>Bacillus amyloliquifaciens</i> strain F727	MBI-110	Marrone	Foliar	1 gal per 100 gal 1.5 gal per 100 gal	5
<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
<i>Bacillus subtilis</i> strain B1111	Prophytex EC	LAM International	Foliar	40 fl oz per 100 gal	3
	Prophytex WP			20 oz per 100 gal	

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested		# Trials
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
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 44 fl oz per 100 gal	18
	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 5.7 lb per 100 gal	2
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	3
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	Vanguard	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	15
	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
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	27
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	21
Fludioxonil	Emblem, NUP 09092	NuFarm	Foliar	4 fl oz per 100 gal 8 fl oz per 100 gal	6

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested		# Trials
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
Fluxapyroxad + Pyraclostrobin	Orkestra Intrinsic, BAS 703	BASF	Foliar	4 fl oz per 100 gal 6 fl oz per 100 gal 8 fl oz per 100 gal	10
<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 2 gal per 100 gal	7
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	15
	Chipco 26GT F	Bayer	Foliar	2.5 qt per 100 gal	1
Isofetamid	Kenja 400 SC (IKF 5411)	SummitAgro	Foliar	13.5 fl oz per 100 gal	1
<i>Lupinus</i> extract	F9110	FMC	Foliar	24 fl oz per 100 gal 46 fl oz per 100 gal	10
Mancozeb	Fore	Dow	Foliar	1.5 lb per 100 gal	4
	Dithane			2 lb per 100 gal	
Mandestrobin	S2200	NuFarm	Foliar	7.5 fl oz per 100 gal 15 fl oz per 100 gal	9
Metconazole	Tourney	Valent	Foliar	4 oz per 100 gal	4
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
	Kaligreen		Foliar	2.5 lb per 100 gal	1
Potassium bicarbonate	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
	Empress Intrinsic			6 fl oz per 100 gal	1

Active Ingredient(s)	Product(s)	Manufacturer		Rate(s) Tested	# Trials
	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	17
<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
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 fl oz per 100 gal	2
	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	13
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 fl oz per 100 gal 12 fl oz per 100 gal	4
<i>Ulocladium oudemansii</i> strain U3	BW165N	BioWorks	Foliar	3 lb per 100 gal	1

Results

Comparative Efficacy for Botrytis cinerea

From 1998 through 2016, 38 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 Apr 10, 17, and 26, and May 1; plants were sprayed with *B. cinerea* inoculum on Apr 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 Apr 5 and 19 (14-day intervals) for Heritage, and on Mar 22 and 29, Apr 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 (Apr 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 (Apr 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 (Apr 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 (Dec 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 uninoculated 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 uninoculated 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 Mar 8 and 22 to geranium 'Red II'; plants were sprayed with *B. cinerea* inoculum on Mar 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 <i>Botrytis</i> (%) ^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 Apr 17 and 24, and May 1, 8 and 15 to geranium 'Orbit White'; plants were sprayed with *B. cinerea* inoculum on Apr 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).

^y Disease 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 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).

^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.

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 disease severity 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, Orkestra (BAS 703), Emblem (NUP 09092) and Tournay 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
Emblem (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
Tournay 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 (<i>Lupinus</i> extract)	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 5O (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 uninoculated	-	-	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), Orkestra (BAS 703), Emblem (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 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
Emblem (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 Mar 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 Orkestra (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
Orkestra (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 (<i>Lupinus</i> extract)	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 Mar 16 to Apr 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 uninoculated	-	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 Mar 16 to Apr 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 two lower 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 Mar 29 to May 26. The wetting agent Lescro 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 uninoculated	-	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 uninoculated	-	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 uninoculated	-	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).

^y Severity 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 Sep 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 Sep 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 Sep 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.

In 2016, Chastagner conducted a study to determine the efficacy of several fungicides for control of *Botrytis cinerea* on Douglas fir. Fungicides were sprayed from Sep 13 to Oct 28, with the exception of Spectro 90 which ended on Nov 3 (see Table 35 for specific intervals and dates). Plants were inoculated on Nov 4. After an assessment period on Feb 14-16, 2017, 10 healthy seedlings were chosen from each cell and were bundled together and placed in a plastic bag. A whole 5 cm diameter agar plug that was colonized with *Botrytis* was placed at the base of the seedlings. All plastic bags were placed into large paper seedling bags and stored in a cooler set at 35F, then 44F. Disease pressure was low and variable in this experiment, and none of the treatments were significantly different than the untreated checks (Table 35, Table 36). Seedlings treated with Dithane had significantly higher visual residue ratings as compared to the untreated checks. No phytotoxicity was observed from any treatment, except Zeritol causing yellowing and browning to needles.

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 uninoculated	-	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.

^y Seedlings 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.

Table 35. Efficacy for *Botrytis cinerea* on Douglas Fir (*Pseudotsuga menziesii*), Chastagner WA, 2016.

Treatment	Rate Per 100 Gal	Applic Interval	Applic Dates	Disease Severity ^z	Top Quality ^y	Cross Section Quality ^y	Fungicide Residue ^x	Phytotox icity ^w
Alibi Flora (azoxystrobin+difenoconazole)	14 fl oz	14 day	B	1.2 a	8.2 a	6.6 ab	1.0 bc	0.0 b
Botector (<i>Aureobasidium pullulans</i>)	10 oz	14 day	B	1.4 a	8.6 a	7.0 ab	1.6 abc	0.0 b
Cleary's 3336 (thiophanate methyl)	16 fl oz	14 day	B	1.0 a	8.6 a	7.2 ab	1.4 abc	0.0 b
Daconil Weatherstik (chlorothalonil)	2 3/4 pt	14 day	B	1.4 a	8.4 a	7.0 ab	1.0 bc	0.0 b
Dithane DF (mancozeb)	2 lb	14 day	B	1.6 a	8.0 a	4.0 b	2.4 a	0.0 b
Emblem (fludioxonil)	4 fl oz	14 day	B	1.2 a	8.8 a	7.0 ab	1.4 abc	0.0 b
Empress (pyraclostrobin)	6 fl oz	14 day	B	1.0 a	8.0 a	6.8 ab	1.0 bc	0.0 b
F9110 (<i>Lupinus</i> extract)	24 fl oz	7 day	A	1.4 a	8.4 a	7.6 a	0.8 bc	0.0 b
Heritage (azoxystrobin)	4 oz	14 day	B	1.6 a	8.4 a	7.6 a	1.4 abc	0.0 b
MBI-110 (<i>Bacillus amyloliquifaciens</i> strain F727)	1 gal	7 day	A	1.2 a	8.8 a	6.0 ab	1.4 abc	0.0 b
Mural (azoxystrobin + benzovindiflupyr)	7 oz	14 day	B	1.2 a	8.8 a	6.6 ab	1.4 abc	0.0 b
Orkestra (fluxapyroxad+pyraclostrobin)	6 fl oz	14 day	B	1.2 a	8.2 a	7.6 a	2.0 ab	0.0 b
	8 fl oz	14 day	B	1.2 a	8.2 a	7.8 a	1.0 bc	0.0 b
Pageant 38WG (pyraclostrobin+boscalid)	14 oz	14 day	B	1.6 a	8.6 a	7.6 a	0.8 bc	0.0 b
Prophytex EC (<i>Bacillus subtilis</i> strain B1111)	40 fl oz	14 day	B	1.0 a	8.4 a	7.4 a	0.8 bc	0.0 b
Prophytex WP (<i>Bacillus subtilis</i> strain B1111)	20 oz	14 day	B	1.6 a	8.2 a	7.0 ab	1.2 abc	0.0 b
Proud 3 (thyme oil)	1 gal	7 day	A	1.8 a	8.0 a	7.6 a	1.0 bc	0.0 b
S2200 (mandestrobin)	7.5 fl oz	14 day	B	1.6 a	8.4 a	7.2 ab	1.2 abc	0.0 b
	15 fl oz	14 day	B	1.2 a	8.4 a	6.4 ab	1.8 abc	0.0 b
Spectro 90 (chlorothalonil + thiophanate methyl)	5.7 lb	21 day	C	1.4 a	8.8 a	6.4 ab	1.0 bc	0.0 b
Tourney (metconazole)	4 oz	14 day	B	1.2 a	8.8 a	7.4 a	1.6 abc	0.0 b
ZeroTol 2.0 (hydrogen dioxide+peroxyacetic acid)	2 gal	7 day	A	2.4 a	4.8 b	6.8 ab	0.6 c	3.2 a
Uninoculated check	-	-	-	1.4 a	8.6 a	7.4 a	1.0 bc	0.0 b
Inoculated check	-	-	-	1.4 a	8.4 a	7.0 ab	1.0 bc	0.0 b

^z Rated 2/14-16/17 on a scale of 0 – 5 where 0 = none, 1 = <10% of seedlings had yellow, brown or black needles with no lesions on stems, 2 <10% , 3 = 25-50% , 4 = 51-75% , and 5 = 75-100% foliage diseased with lesions on the stems. Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Rated 2/14-16/17 on a scale of 1-9 where 9 = perfect plant, 6 = commercially acceptable (I would buy that), 1 = dead.

^x Rated 10/11/16 on a scale of 0 to 3 where 0 = no residue, 1 = slight, 2 = moderate, and 3 = severe residue on foliage.

^w Rated 12/23/16 on a scale of 0-10 where 0 = none, 1 = 1-10%, 2 = 11- 20%, ...100 = 91-100% of the plants damaged.

Application Dates: A = 9/13/16, 9/20/16, 9/27/16, 10/3/17, 10/11/16, 10/18/16, 10/28/16; B = 9/13/16, 9/27/16, 10/11/16, 10/28/16; C = 9/13/16, 10/11/16, 11/3/16.

Table 36. Efficacy for *Botrytis cinerea* on Douglas Fir (*Pseudotsuga menziesii*) After 16 Days of Cold Storage, Chastagner WA, 2016.

Treatment	Rate Per 100 Gal	Applic Interval	Applic Dates	Disease Incidence ^x	Disease Severity ^y
Alibi Flora (azoxystrobin+difenoconazole)	14 fl oz	14 day	B	5.4 ab	1.1 ab
Botector (<i>Aureobasidium pullulans</i>)	10 oz	14 day	B	6.2 ab	1.3 ab
Cleary's 3336 (thiophanate methyl)	16 fl oz	14 day	B	5.2 ab	1.0 ab
Daconil Weatherstik (chlorothalonil)	2 3/4 pt	14 day	B	8.6 a	2.2 ab
Dithane DF (mancozeb)	2 lb	14 day	B	6.8 ab	1.0 ab
Emblem (fludioxonil)	4 fl oz	14 day	B	2.0 ab	0.2 b
Empress (pyraclostrobin)	6 fl oz	14 day	B	7.6 ab	1.6 ab
F9110 (<i>Lupinus</i> extract)	24 fl oz	7 day	A	8.8 a	3.2 a
Heritage (azoxystrobin)	4 oz	14 day	B	7.4 ab	2.0 ab
MBI-110 (<i>Bacillus amyloliquifaciens</i> strain F727)	1 gal	7 day	A	6.6 ab	1.6 ab
Mural (azoxystrobin + benzovindiflupyr)	7 oz	14 day	B	5.2 ab	1.1 ab
Orkestra (fluxapyroxad+pyraclostrobin)	6 fl oz	14 day	B	1.0 b	0.1 b
	8 fl oz	14 day	B	2.2 ab	0.2 b
Pageant 38WG (pyraclostrobin+boscalid)	14 oz	14 day	B	7.8 ab	1.4 ab
Prophytex EC (<i>Bacillus subtilis</i> strain B1111)	40 fl oz	14 day	B	7.0 ab	2.1 ab
Prophytex WP (<i>Bacillus subtilis</i> strain B1111)	20 oz	14 day	B	8.6 a	2.0 ab
Proud 3 (thyme oil)	1 gal	7 day	A	5.6 ab	1.3 ab
S2200 (mandestrobin)	7.5 fl oz	14 day	B	6.2 ab	1.3 ab
	15 fl oz	14 day	B	3.4 ab	0.9 ab
Spectro 90 (chlorothalonil + thiophanate methyl)	5.7 lb	21 day	C	6.6 ab	1.4 ab
Tourney (metconazole)	4 oz	14 day	B	7.4 ab	2.0 ab
ZeroTol 2.0 (hydrogen dioxide+peroxyacetic acid)	2 gal	7 day	A	6.8 ab	2.2 ab
Uninoculated check	-	-	-	5.0 ab	0.8 b
Inoculated check	-	-	-	5.8 ab	1.4 ab

^x Rated on a scale of 0-10 where 0 = none, 1 = 1-10%, 2 = 11-20%,100 = 91- 100% disease on foliage. 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%,100 = 91-100% foliage was killed.

Application Dates: A = 9/13/16, 9/20/16, 9/27/16, 10/3/17, 10/11/16, 10/18/16, 10/28/16; B = 9/13/16, 9/27/16, 10/11/16, 10/28/16; C = 9/13/16, 10/11/16, 11/3/16.

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 37). Significant differences among treatments were not observed. No phytotoxicity was observed from any treatment.

Table 37.* 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).

^y 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 38); however results were not statistically different from untreated 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 39). No phytotoxicity was observed from any treatment.

Table 38. 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 39. Efficacy for *Botrytis cinerea* on Western Hemlock (*Tsuga heterophylla*), Lambe, WA, 2001.

Treatment	Rate Per 100 Gal	Percent 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, Lambe screened several fungicides for efficacy on *Botrytis* gray mold needle and stem disease on western hemlock seedlings. All fungicides were applied as foliar sprays beginning 3 days before artificial inoculation with a spore suspension of *B. cinerea* on Sep 23 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 40). Milstop, Phyton 27 and STBX-304 were ineffective. No phytotoxicity was observed from any treatment except Phyton 27 and STBX-304.

Table 40. 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 uninoculated	-	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 Jun 11, 2012 (Table 41, Table 42). Overall disease incidence and severity ratings of whole cells were taken on a weekly basis starting from Day 0 until Day 80 (Aug 5, 2011) and on Jun 11, 2012 to Sept 19, 2012 (Day 100). On Day 83 (Aug 8, 2011) and Day 115 (Oct 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, Pageant at both rates, Disarm at both rates, and Medallion had significantly less foliage dieback and low severity ratings (Table 41). In 2012, low levels of disease developed. Compared to the Check, 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 42). 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 *B. 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 Jul 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. Orkestra (BAS 703), Mural and S2200 provided the best control of a severe disease pressure, with severity ratings comparable to the uninoculated check (Table). The standard Decree and all other products looked ineffective. There were no significant differences in initial or final plant height.

Table 41. 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 42. 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 43. 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 uninoculated	-	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 Mar 22, and the last application was made on Jun 17, (see Table 44 for specific intervals and dates). Although *B. paeoniae* and *B. 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 44). 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 untreated 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 *B. 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 Aug 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 45). 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.

In 2016, Chastagner studied the efficacy of several fungicides for control of *B. paeoniae* and *B. cinerea* on peony. Fungicides were sprayed from Mar 31 to Jun 30 (see Table for specific intervals and dates). Plants were inoculated with inoculated millet that had been colonized with isolates of *B. cinerea* (isolate AR46) and *B. paeoniae* (isolate AR05) on Apr 12. Disease and plant quality on two varieties ('Sarah Bernhardt' and Mixed Variety peonies) tested were highly variable in this trial, and none of the treatments affected Botrytis rating (Table). However, sufficient red spot or blotch infection, caused by *Graphiopsis chlorocephala* (formerly *Cladosporium paeonia*), developed in the Mixed Variety peony trial to determine effectiveness of the fungicide treatments, with Pageant, Orkestra (BAS 703) and both rates of S2200 having significantly less *G. chlorocephala* than the untreated check. Moderate to high levels of visible residue were evident following applications of several products. Orkestra and Pageant were the only treatments that resulted in significantly higher plant quality ratings on the two varieties. No phytotoxicity was observed from any treatment.

In 2016, Chastagner conducted a second experiment to determine the efficacy of several fungicides for control of *B. paeoniae* and *B. cinerea* on peony. Fungicides were sprayed from Apr 4 to May 18 (see Table for specific intervals and dates). As in 2016, none of the treatments affected Botrytis rating (Table). For red spot, caused by *Graphiopsis chlorocephala*, Orkestra, Palladium, and S2200 at the high rate had significantly less incidence than the untreated check. Higher residue levels on the foliage was observed with Daconil and Fore. Given the limited disease that developed on the plants, leaves were harvested from the plants after the last treatment application and inoculated with mycelial plugs of *B. cinerea* and *B. paeoniae* to assess the residual activity of the fungicide treatments. After 96 hours incubation at 18C, lesion size on the *B. paeoniae* inoculated leaves ranged from 0.0 to 4.37 cm, and ranged from 0.0 to 5.15 cm on the *B. cinerea* inoculated leaves (Figures 3 & 4). Several fungicides either reduced or eliminated the growth of lesions compared to the inoculated checks in the *B. paeoniae* inoculated leaves. The most effective treatments were Daconil, S2200, Kenja, Orkestra, Pageant, Emblem, and Medallion. For *B.*

cinerea, Medallion and Emblem were the only treatments that had lesions that were significantly smaller than the inoculated checks.

To assess the effect of the preharvest applications of fungicides during the growing season on the postharvest development of gray mold on the foliage and flower buds on stems during cold storage, three flower stems were harvested from each plant and held in cold storage for 4 weeks at 1 to 5C. Just prior to storing, the bundles of flowers were sprayed with *B. cinerea* spores and then wrapped in paper to encourage disease development. The foliage was rated for disease severity on a scale of 0 to 10 scale, where 0 = no dieback and 10= 91 to 100% of the foliage is dead. Disease development on the flowers were rated on a scale of 0-3 where 0 = none, 1 = slight infection (< 25% of flower infected), 2 = moderate infection (25-50%), 3 = severe (>50% of flower infected). Cut flowers that were held in cold storage for 4 weeks had high levels of disease on both the foliage and flowers (Figures 5 & 6). Disease ratings on the foliage ranged from 0.1 to 7.4, with MBI-110, Badge X2, Daconil, S2200, Emblem, Pageant, Kenja, Orkestra, Palladium, and Medallion having significantly lower disease ratings on the foliage than the inoculated check. However, compared to the inoculated check, none of the fungicides significantly lowered disease ratings on the flower buds.

Table 44. 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.

Table 45. 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>Reynoutriasachalinensis</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.

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

Table 46. Efficacy for *Botrytis paeoniae* on Peony (*Paeonia* sp.), ‘Sarah Bernhardt’, - Trial 1, Chastagner, WA, 2016.

Treatment	Rate Per 100 Gal	Applic Interval	Applic Dates	<i>G. cyclocephala</i> Incidence ^x	Botrytis Ratings		Plant Quality ^w	Fungicide Residue ^z
					Leaf Lesion Incidence ^x	Stem Dieback Severity ^y		
Badge X2 (copper oxychloride+copper hydroxide)	2 lb	14 day	B	3.4 a	3.6 a	1.0 a	4.0 d	1.6 b-e
Botector (<i>Aureobasidium pullulans</i>)	10 oz	14 day	B	3.8 a	4.0 a	0.6 a	3.8 d	0.4 ef
Chipco 26019 N/G (iprodione)	16 oz	14 day	B	3.2 a	3.2 a	0.4 a	4.8 b-d	2.0 a-c
Daconil Weatherstik (chlorothalonil)	1.4 pt	14 day	B	1.0 a	3.2 a	0.8 a	3.4 d	2.6 ab
Decree 50 WDG (fenhexamid)	1.5 lb	14 day	B	2.6 a	3.2 a	0.6 a	4.6 cd	1.6 b-e
Emblem (fludioxonil)	4 fl oz	14 day	B	2.4 a	3.4 a	0.6 a	5.2 a-d	0.6 d-f
F9110 (<i>Lupinus</i> extract)	24 fl oz	7 day	A	1.8 a	3.0 a	1.0 a	3.8 d	0.4 ef
Fore 80 WP (mancozeb)	1.5 lb	7 day	A	0.6 a	2.6 a	1.2 a	4.8 b-d	3.0 a
MBI-110 (<i>Bacillus amyloliquefaciens</i> strain F727)	6 qt	7 day	A	0.4 a	3.0 a	0.8 a	4.6 cd	0.6 d-f
Medallion WDG (fludioxonil)	8 oz	14 day	B	3.6 a	1.6 a	0.0 a	5.2 a-d	0.8 c-f
Orkestra (fluxapyroxad + pyraclostrobin)	8 fl oz	14 day	B	0.0 a	1.4 a	0.0 a	8.0 a	0.8 c-f
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	14 day	B	0.0 a	1.8 a	0.0 a	7.8 ab	1.6 b-e
Palladium 62.5WG (cyprodinil + fludioxonil)	6 oz	7 day	A	2.2 a	1.8 a	0.0 a	5.6 a-d	1.0 c-f
Prophytex EC (<i>Bacillus subtilis</i> strain B1111)	40 fl oz	7 day	A	2.8 a	3.4 a	1.2 a	4.2 cd	0.0 f
Prophytex WP (<i>Bacillus subtilis</i> strain B1111)	20 oz	7 day	A	2.0 a	3.0 a	1.4 a	4.0 d	1.8 a-d
Proud 3 (thyme oil)	1 gal	7 day	A	2.8 a	4.8 a	0.8 a	4.0 d	0.0 f
S2200 4SC (mandestrobin)	7.5 fl oz	14 day	B	0.0 a	2.2 a	0.0 a	6.2 a-d	1.0 c-f
	15 fl oz	14 day	B	0.0 a	1.2 a	0.0 a	7.2 a-c	0.8 c-f
ZeroTol 2.0 (hydrogen dioxide+peroxyacetic acid)	2 gal	14 day	B	1.6 a	4.4 a	1.0 a	4.0 d	0.2 f
Uninoculated check	-	-	-	3.0 a	3.4 a	0.4 a	3.8 d	0.0 f
Inoculated check	-	-	-	2.2 a	3.4 a	0.2 a	4.4 cd	0.0 f

^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 Rated on a scale of 0 to 10 scale, where 0 = no dieback and 10 = 91 to 100% of the foliage is dead.

^w Rated on a scale of 1-9 where 9 = perfect plant, 6 = commercially acceptable (I would buy that), 1 = dead.

^z Rated on a scale of 0 to 3 where 0 = no residue, 1 = slight, 2 = moderate, and 3 = severe residue on foliage.

Application dates: A = 3/31/16, 4/7/16, 4/15/16, 4/21/16, 4/28/16, 5/6/16, 5/13/16, 5/26/16, 6/3/16, 6/9/16, 6/16/16, 6/24/16, 6/30/16; B = 3/31/16, 4/15/16, 4/28/16, 5/13/16, 5/26/16, 6/9/16, 6/24/16.

Table 47. Efficacy for *Botrytis paeoniae* on Peony (*Paeonia* sp.), Mixed Varieties, - Trial 1, Chastagner, WA, 2016.

Treatment	Rate Per 100 Gal	Applic Interval	Applic Dates	Disease Severity ^x		Plant Quality ^y
				Graphiopsis	Botrytis	
Badge X2 (copper oxychloride + copper hydroxide)	2 lb	14 day	B	4.4 a-d	2.4 a	1.0 d
Botector (<i>Aureobasidium pullulans</i>)	10 oz	14 day	B	3.8 a-e	1.2 a	1.4 cd
Chipco 26019 N/G (iprodione)	16 oz	14 day	B	3.2 a-e	1.4 a	2.2 b-d
Daconil Weatherstik (chlorothalonil)	1.4 pt	14 day	B	2.4 a-e	0.6 a	3.0 a-d
Decree 50 WDG (fenhexamid)	1.5 lb	14day	B	4.6 a-c	1.2 a	1.4 cd
Emblem (fludioxonil)	4 fl oz	14 day	B	5.3 ab	0.0 a	2.2 b-d
F9110 (<i>Lupinus</i> extract)	24 fl oz	7 day	A	3.6 a-e	1.4 a	2.0 b-d
Fore 80 WP (mancozeb)	1.5 lb	7 day	B	1.8 b-e	2.3 a	2.6 b-d
MBI-110 (<i>Bacillus amyloliquifaciens</i> strain F727)	1.5 gal	7 day	A	5.0 ab	2.5 a	1.0 d
Medallion WDG (fludioxonil)	8 oz	14 day	B	2.2 a-e	1.0 a	2.6 b-d
Orkestra (fluxapyroxad + pyraclostrobin)	8 fl oz	14 day	B	0.0 e	1.0 a	5.8 a
Pageant 38WG (pyraclostrobin + boscalid)	14 oz	14 day	B	0.0 e	1.3 a	4.0 a-c
Palladium 62.5WG (cyprodinil + fludioxonil)	6 oz	7 day	A	2.6 a-e	1.2 a	2.6 b-d
Prophytex EC (<i>Bacillus subtilis</i> strain B1111)	40 fl oz	7 day	A	2.8 a-e	1.5 a	1.2 cd
Prophytex WP (<i>Bacillus subtilis</i> strain B1111)	20 oz	7 day	A	6.3 a	2.3 a	1.2 cd
Proud 3 (thyme oil)	1 gal	7 day	A	3.8 a-e	2.0 a	2.0 b-d
S2200 (mandestrobin)	7.5 fl oz	14 day	B	0.6 c-e	1.8 a	4.4 ab
	15 fl oz	14 day	B	0.4 de	1.0 a	3.8 a-d
ZeroTol 2.0 (hydrogen dioxide+peroxyacetic acid)	2 gal	14 day	B	3.6 a-e	1.6 a	1.6 b-d
Untreated check	-	-	-	5.0 ab	1.6 a	1.0 d

^x Rated on a 0 to 10 scale, where 0 = no disease and 10 = 91 to 100% of the foliage was dead. 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 1-9 where 9 = perfect plant, 6 = commercially acceptable (I would buy that), 1 = dead.

Application dates: A = 3/31/16, 4/7/16, 4/15/16, 4/21/16, 4/28/16, 5/6/16, 5/13/16, 5/26/16, 6/3/16, 6/9/16, 6/16/16, 6/24/16, 6/30/16; B = 3/31/16, 4/15/16, 4/28/16, 5/13/16, 5/26/16, 6/9/16, 6/24/16.

Table 48. Efficacy for *Botrytis paeoniae* on Peony (*Paeonia* sp.), ‘Sarah Bernhardt’ - Experiment 2, Chastagner, WA, 2016.

Treatment	Rate Per 100 Gal	Applic Interval	Applic Dates	% Basal stem decay ^x	Incidence of <i>Botrytis</i> on the foliage ^y	Incidence of red spots on foliage	Fungicide Residue ^z
Badge X2 (copper oxychloride+copper hydroxide)	2 lb	14 day	B	14.4 ab	1.0 ab	0.6 bc	1.4 ab
Botector (<i>Aureobasidium pullulans</i>)	10 oz	7day	A	12.0 ab	1.6 ab	1.4 bc	0.0 b
BW165N (<i>Ulocladium oudemansii</i> U3 strain) + SilWet ECO	3 lb + 0.05%	7 day	A	7.5 b	2.0 ab	1.0 bc	0.0 b
Chipco 26019 N/G (iprodione)	16 oz	14 day	B	7.7 b	0.6 ab	1.2 bc	1.0 b
Daconil Weatherstik (chlorothalonil)	1.4 pt	14 day	B	20.0 ab	1.4 ab	0.8 bc	2.8 a
Decree 50 WDG (fenhexamid)	1.5 lb	14day	B	12.4 ab	1.0 ab	1.0 bc	0.8 b
Emblem (fludioxonil)	4 fl oz	14 day	B	22.1 ab	1.2 ab	0.4 bc	1.0 b
F9110 (<i>Lupinus</i> extract)	45.7 fl oz	7 day	A	23.7 ab	1.8 ab	0.8 bc	0.0 b
Fore 80 WP (mancozeb)	1.5 lb	7 day	A	8.3 ab	0.5 ab	0.3 bc	2.8 a
Kenja 400 SC (IKF 5411) (isofetamid)	13.5 fl oz	7 day	A	13.5 ab	0.8 ab	0.2 bc	1.0 b
MBI-110 (<i>Bacillus amyloliquifaciens</i> strain F727)	1.5 gal	7 day	A	26.7 ab	2.0 ab	0.6 bc	0.0 b
Medallion WDG (fludioxonil)	8 oz	14 day	B	10.2 ab	0.0 b	0.4 bc	0.8 b
Orkestra (fluxapyroxad+pyraclostrobin)	8 fl oz	14 day	B	15.0 ab	0.2 ab	0.0 c	1.0 b
Pageant 38WG (pyraclostrobin+boscalid)	14 oz	14 day	B	20.8 ab	0.2 ab	0.2 bc	1.0 b
Palladium 62.5WG (cyprodinil + fludioxonil)	6 oz	7 day	A	18.2 ab	0.4 ab	0.0 c	0.2 b
Prophytex EC (<i>Bacillus subtilis</i> strain B1111)	40 fl oz	7 day	A	14.6 ab	1.2 ab	1.0 bc	0.0 b
Prophytex WP (<i>Bacillus subtilis</i> strain B1111)	20 oz	7 day	A	24.0 ab	1.8 ab	1.0 bc	0.4 b
Proud 3 (thyme oil)	1 gal	7 day	A	23.5 ab	0.8 ab	3.6 a	0.0 b
S2200 (mandestrobin)	7.5 fl oz	14 day	B	14.0 ab	0.4 ab	0.8 bc	1.2 b
	15 fl oz	14 day	B	10.4 ab	0.4 ab	0.0 c	1.0 b
ZeroTol 2.0 (hydrogen dioxide+peroxyacetic acid)	2 gal	14 day	B	41.8 a	2.4 a	1.8 bc	0.0 b
Untreated Check	-	-	-	14.5 ab	1.0 ab	2.0 ab	0.0 b

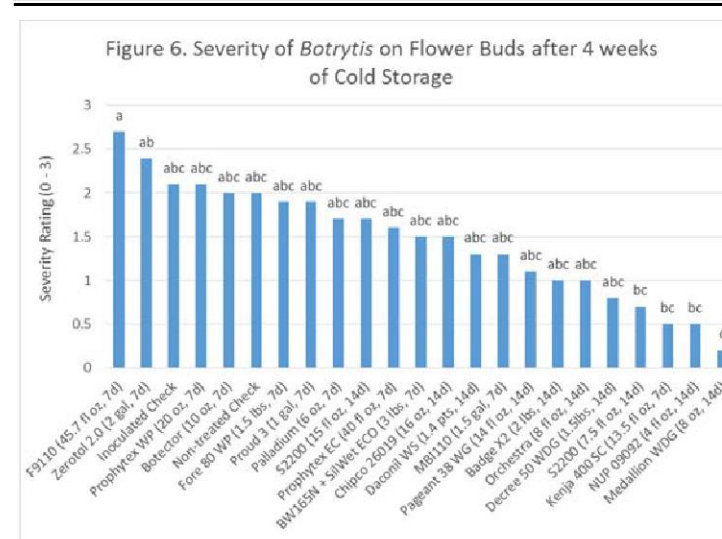
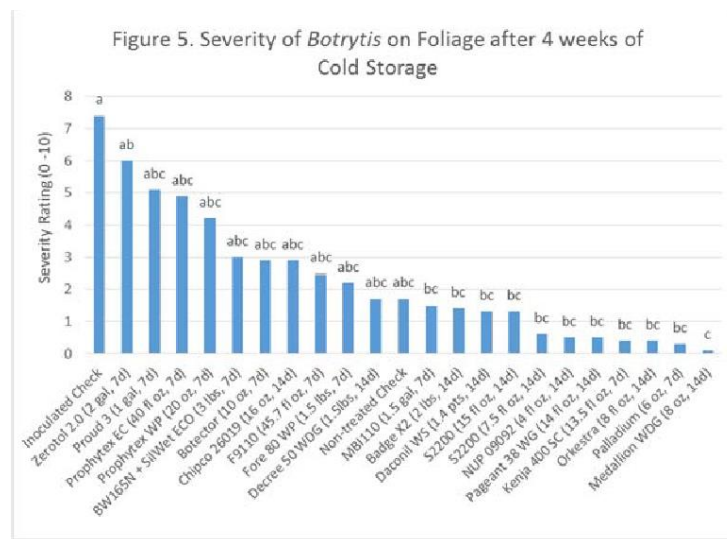
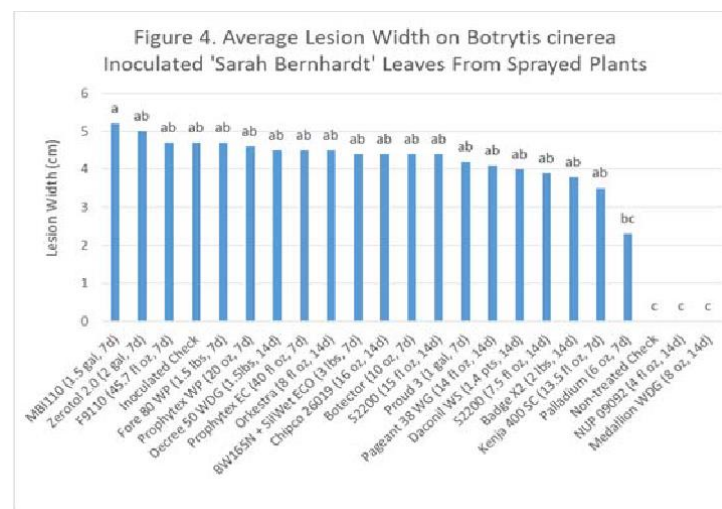
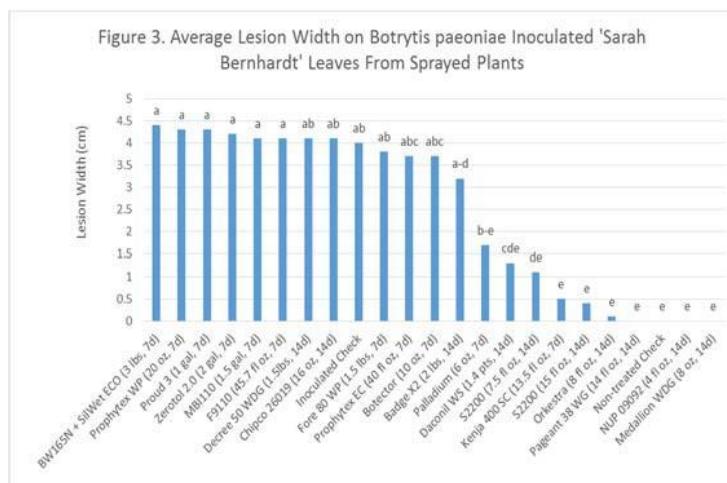
^x Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

^y Rated on a scale of 0 to 10, where 0 = no disease and 10 = 91 to 100% of the foliage diseased.

^w Rated on a scale of 0 to 3 where 0 = no residue, 1 = slight, 2 = moderate, and 3 = severe residue on foliage.

Application Dates: A = 4/4/17, 4/11/17, 4/18/17, 4/27/17, 5/4/17, 5/12/17, 5/18/17; B = 4/4/17, 4/18/17, 5/4/17, 5/18/17.

Figure 1. Incidence and Severity of *Botrytis paeoniae* on Peony (*Paeonia* sp.), 'Sarah Bernhardt' - Experiment 2, Chastagner, WA, 2016.



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. Treatments were sprayed from Feb 27 to Apr 22 (see Table 49 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 untreated control plants (Table 49). Pageant and Orkestra (BAS 703) were the most effective materials in reducing disease development. The biofungicide F9110 significantly reduce disease development of the foliage and flowers. Orkestra and Pageant treated plants also had significantly more flowers that were greater than 13" tall and yielded more bulbs greater than 12 cm than the control plants (Table 50). In the second trial, both rates of SP2773 had significantly lower severity ratings than the untreated control plants (Table 51). 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 52). 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 *B. 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 53). Pageant 38WG, both rates of Orkestra, both rates of S2200, and the high rate of Emblem (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 53 and Table 54). 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 49. Efficacy for *Botrytis tulipae* on 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 (<i>Lupinus</i> extract)	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 50. Efficacy for *Botrytis tulipae* on 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 51. Efficacy for *Botrytis tulipae* on 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 52. Efficacy for *Botrytis tulipae* on 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 53. 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	Phytotoxicity 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
Emblem (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 54. 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
Emblem (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, 2015, 2016 and 2017 Botrytis efficacy projects.

Aureobasidium pullulans strains DSM14940 and DSM 14941. Botector applied preharvest in a peony experiment provided mediocre efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of another peony trial, and an experiment for *B. cinerea* on Douglas fir were inconclusive.

Azoxystrobin. Heritage generally provided good to excellent efficacy for *B. cinerea* in 13 experiments on geranium, poinsettia, lisianthus, rose, primrose and chrysanthemum. A trial for *B. cinerea* on Douglas fir produced inconclusive data.

Azoxystrobin + Difenoconazole. Results of single trials with Alibi Flora for *B. cinerea* on Douglas fir and for *B. paeoniae* and *B. cinerea* on peony were inconclusive because of insufficient or 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. When applied preharvest in a peony experiment, it provided good efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of another peony trial, and an experiment for *B. cinerea* on Douglas fir were inconclusive.

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

Bacillus subtilis strain B1111. Prophytex EC and WP formulations applied preharvest in a peony experiment provided mediocre efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of another peony trial, and an experiment for *B. cinerea* on Douglas fir were inconclusive.

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. Echo was very effective against *B. cinerea* in a geranium experiment. When applied preharvest in a peony experiment, it provided good efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of 2 other experiments for *B. paeoniae* and *B. cinerea* on peony were inconclusive because of insufficient or considerable variability in disease development. Also a trial for *B. cinerea* on Douglas fir produced inconclusive data.

Chlorothalonil + Thiophanate methyl. Spectro provided excellent efficacy for *B. cinerea* in an experiment on geranium; a trial on Douglas fir produced inconclusive data.

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. When applied

preharvest in a peony experiment, Badge X2 provided good efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of 3 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. When applied preharvest in a peony experiment, Palladium provided good efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of 2 other experiments for *B. paeoniae* and *B. cinerea* on peony, and 2 trials for *B. elliptica* on Asiatic hybrid lily 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. When applied preharvest in a peony experiment, it provided mediocre efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of 2 other experiments for *B. paeoniae* and *B. cinerea* 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. When applied preharvest in a peony experiment, it provided excellent efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage; results of 2 other trials on peony were inconclusive. The experimental product Emblem (NUP 09092) provided excellent efficacy for *B. cinerea* in two geranium and pansy experiments, and for *Botrytis tulipae* in a tulip trial. When applied preharvest, it provided good efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage in a peony experiment. Results of another peony trial, and an experiment for *B. cinerea* on Douglas fir were inconclusive.

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. Orkestra and 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. When applied preharvest in a peony experiment, it provided good efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of 2 other trials for *B. paeoniae* and *B. cinerea* on peony were inconclusive because of insufficient or considerable variability in disease development. Also a trial for *B. cinerea* on Douglas fir produced inconclusive data.

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. When applied preharvest in a peony experiment, it provided poor efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (and no efficacy on flower buds) on stems during cold storage. Results of 4 experiments for *B. cinerea* on Douglas fir, for *B. elliptica* on Asiatic hybrid lily, and for *B. paeoniae* and *B. cinerea* 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.

Isofetamid. Kenja applied preharvest in a peony experiment provided good efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage.

Lupinus extract. F9110 provided mediocre efficacy for *B. tulipae* in two tulip experiments. When applied preharvest in a peony trial, it provided mediocre efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. It was ineffective for *B. cinerea* in a geranium experiment, and for *B. elliptica* in a hybrid lily trial. Results of an experiment for *B. cinerea* on pansy, and 3 trials for *B. paeoniae* on peony were inconclusive. Also a trial for *B. cinerea* on Douglas fir produced inconclusive data.

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. When applied preharvest in a peony experiment, it provided good efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of 2 other trial for *B. paeoniae* and *B. cinerea* on peony were inconclusive because of of insufficient or considerable variability in disease development. Also a trial for *B. cinerea* on Douglas fir produced inconclusive data.

Metconazole. Tourney provided excellent efficacy for *B. cinerea* in a geranium experiment, but poor efficacy in a pansy trial. Results of single trials for *B. elliptica* on Asiatic hybrid lily, and for *B. cinerea* on Douglas fir 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; a trial with Empress for *B. cinerea* on Douglas fir produced inconclusive data.

Pyraclostrobin + Boscalid. Pageant and BAS 516 generally provided excellent efficacy for *B. cinerea* in 9 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. When applied

preharvest in a peony experiment, it provided good efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of 4 experiments for *B. cinerea* on pansy and Douglas fir, and for *B. paeoniae* and *B. cinerea* 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 tested 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, and 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; a trial on Douglas fir produced inconclusive data.

Thyme Oil. Proud 3 provided no efficacy for *B. cinerea* in 4 experiments on geranium, pansy and miniature rose, for *B. elliptica* on Asiatic hybrid lily in 2 trials, and for *B. tulipae* in 2 tulip experiments. When applied preharvest in a peony trial, it provided mediocre efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage. Results of 2 other experiments for *B. paeoniae* and *B. cinerea* on peony were inconclusive because of insufficient or considerable variability in disease development. Also a trial for *B. cinerea* on Douglas fir produced inconclusive data.

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.

Ulocladium oudemansii strain U3. BW165N applied preharvest in a peony experiment provided mediocre efficacy on the postharvest development of gray mold, caused by *B. paeoniae* and *B. cinerea*, on the foliage (but no efficacy on flower buds) on stems during cold storage.

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, STBX-304 and ZeroTol caused phytotoxicity in Douglas fir experiments, Torque in a 2013 poinsettia experiment, and Proud 3 in 2015 pansy and tulip experiments.

Table 55. 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 11/15/2017 are included in the table below.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33083	Affirm (Polyoxin D zinc salt)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Good control of a severe disease pressure with 8 oz per 100 gal applied weekly.
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.
32881	Alibi Flora (A13703G) SC (Azoxystrobin + difenconazole)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathehouse	Palmateer	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 14 fl oz per 100 gal; comparable to non-inoculated check.
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.
33075	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Poor control of a severe disease pressure with 10 oz per 100 gal applied weekly.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33033	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Mediocre efficacy on a very high disease pressure with 8 oz per 100 gal applied 3 times weekly.
32751	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Parade'	Greenhouse	Jiang	CA	2016	Foliar	Poor efficacy with 10 oz per 100 gal applied once.
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.
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.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
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.
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.
33078	Emblem (aka NUP 09092) (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Highly effective control of a severe disease pressure with 4 and 8 fl oz per 100 gal applied biweekly.
32379	Emblem (aka NUP 09092) (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Mediocre efficacy on a very high disease pressure with 4 fl oz per 100 gal applied twice biweekly.
32379	Emblem (aka 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.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32226	Emblem (aka NUP 09092) (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Parade'	Greenhouse	Jiang	CA	2016	Foliar	Fair efficacy with 4 and 8 fl oz per 100 gal applied 2 times.
32226	Emblem (aka NUP 09092) (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Victoria' miniature rose	Greenhouse	Jiang	CA	2015	Foliar	Excellent efficacy with 8 fl oz per 100 gal only for 7 days after 1st application; no efficacy after 14 days.
32720	Emblem (aka NUP 09092) (Fludioxonil)	Botrytis Gray Mold (Botrytis cinerea)	Wittrock's Violet; 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.
32676	Emblem (aka NUP 09092) (Fludioxonil)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Dazzle'	Field Container	Catlin	NY	2015	Foliar	Effective control of a high disease incidence and severity with 4 and 8 fl oz per 100 gal applied 3 times biweekly; comparable to non-inoculated check.
32225	Emblem (aka 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.
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.
33076	F9110-1 (F9110)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Poor control of a severe disease pressure with 45.7 fl oz per 100 gal applied weekly.
31522	F9110-1 (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	F9110-1 (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	F9110-1 (F9110)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Good efficacy on a very high disease pressure with 45.7 fl oz per 100 gal applied 3 times weekly.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32377	F9110-1 (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	F9110-1 (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.
31562	F9110-1 (F9110)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Parade'	Greenhouse	Jiang	CA	2016	Foliar	Poor efficacy with 45.7 fl oz per 100 gal applied 3 times.
31562	F9110-1 (F9110)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Victoria' miniature rose	Greenhouse	Jiang	CA	2015	Foliar	Poor efficacy with 24 oz per 100 gal applied 3 times.
32058	F9110-1 (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	F9110-1 (F9110)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Dazzle'	Field Container	Catlin	NY	2015	Foliar	No control of a high disease incidence and severity with 24 oz per 100 gal applied 5 times weekly.
32346	F9110-1 (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	F9110-1 (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	F9110-1 (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.
33085	IKF-5411 (isofentamid)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Highly effective control of a severe disease pressure with 10, 13.5 and 17 fl oz per 100 gal applied weekly.
33088	IKF-5411 (isofentamid)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Good efficacy on a very high disease pressure with 10, 13.5 and 17 fl oz per 100 gal applied 3 times weekly.
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	Production Site	Researcher	State	Year	Application Type	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.
33077	MBI 110 (MBI110)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Good control of a severe disease pressure with 6 qt per 100 gal applied biweekly.
32378	MBI 110 (MBI110)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Mediocre efficacy on a very high disease pressure with 1.5 gal per 100 gal applied 3 times weekly.
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.
32261	MBI 110 (MBI110)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Parade'	Greenhouse	Jiang	CA	2016	Foliar	Poor efficacy with 6 qt per 100 gal applied 3 times.
32261	MBI 110 (MBI110)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Victoria' miniature rose	Greenhouse	Jiang	CA	2015	Foliar	Poor efficacy with 1 gal per 100 gal applied 3 times.
32675	MBI 110 (MBI110)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Dazzle'	Field Container	Catlin	NY	2015	Foliar	No control of a high disease incidence and severity with 1 gal per 100 gal applied 5 times weekly.
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	Production Site	Researcher	State	Year	Application Type	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)	Wittrock's Violet; 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)	Wittrock's Violet; 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.
33084	Mural (A18126B) WDG (Azoxystrobin + benzovindiflupyr)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Good control of a severe disease pressure with 7 oz per 100 gal applied biweekly. Some phytotoxicity (necrotic spots on bracts).
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.
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.
33003	Mural (A18126B) WDG (Azoxystrobin + benzovindiflupyr)	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Dazzle'	Field In-Ground	Catlin	NY	2015	Foliar	Effective control of a high disease incidence and severity with 7 oz per 100 gal applied 3 times biweekly; comparable to non-inoculated check.
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.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33074	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Highly effective control of a severe disease pressure with 8 fl oz per 100 gal applied biweekly.
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.
32876	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathehouse	Palmateer	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 8 fl oz per 100 gal; better than non-inoculated check.
32376	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Mediocre efficacy on a very high disease pressure with 8 fl oz per 100 gal applied twice biweekly.
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.
31894	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Parade'	Greenhouse	Jiang	CA	2016	Foliar	Poor efficacy with 8 fl oz per 100 gal applied 2 times.
31894	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Victoria' miniature rose	Greenhouse	Jiang	CA	2015	Foliar	Poor efficacy with 8 fl oz per 100 gal applied 3 times.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32715	Orkestra Intrinsic (BAS703 06F/BAS703 01F) (Fluxapyroxad + pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Wittrock's Violet; 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.) 'Dazzle'	Field Container	Catlin	NY	2015	Foliar	Effective control of a high disease incidence and severity with 8 fl oz per 100 gal applied 3 times biweekly; comparable to non-inoculated check.
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.
32882	Pageant Intrinsic (Boscalid + Pyraclostrobin)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathehouse	Palmateer	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 14 oz per 100 gal; comparable to non-inoculated check.
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 paeoniae on peony with 14 oz per 100 gal.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
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.
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)	Wittrock's Violet; 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)	Wittrock's Violet; 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	Production Site	Researcher	State	Year	Application Type	Results
32059	Palladium (Cyprodinil + fludioxanil)	Botrytis Gray Mold (Botrytis cinerea)	Wittrock's Violet; 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)	Wittrock's Violet; 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.
32884	Prestop (Gliocladium catenulatum Strain J1446)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathehouse	Palmateer	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 32 oz per 100 gal; comparable to non-inoculated check.
33079	Prophytex EC (Bacillus subtilis strain B1111)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Poor control of a severe disease pressure with 40 fl oz per 100 gal applied weekly.
33034	Prophytex EC (Bacillus subtilis strain B1111)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Mediocre efficacy on a very high disease pressure with 40 fl oz per 100 gal applied 3 times weekly.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32752	Prophytex EC (Bacillus subtilis strain B1111)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Parade'	Greenhouse	Jiang	CA	2016	Foliar	Poor efficacy with 40 fl oz per 100 gal applied 3 times.
33080	Prophytex WP (Bacillus subtilis strain B1111)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	No control of a severe disease pressure with 20 oz per 100 gal applied weekly.
33035	Prophytex WP (Bacillus subtilis strain B1111)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Mediocre efficacy on a very high disease pressure with 20 oz per 100 gal applied 3 times weekly.
32753	Prophytex WP (Bacillus subtilis strain B1111)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Parade'	Greenhouse	Jiang	CA	2016	Foliar	Fair efficacy with 20 oz per 100 gal applied 3 times.
33081	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	No control of a severe disease pressure with 1 gal per 100 gal applied weekly.
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) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Mediocre efficacy on a very high disease pressure with 1 gal per 100 gal applied 3 times weekly.
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.
32878	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathehouse	Palmateer	FL	2015	Foliar	Efficacy not reliable because leaves were severely burned with 4 qt per 100 gal.
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.
31564	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Parade'	Greenhouse	Jiang	CA	2016	Foliar	Good efficacy with 1 gal per 100 gal applied 3 times; comparable to uninoculated check on salability, disease incidence and healthy open flowers; one of two best treatments.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
31564	Proud 3 (Thyme oil (5.6%))	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Victoria' miniature rose	Greenhouse	Jiang	CA	2015	Foliar	Poor efficacy with 4 qt per 100 gal applied 3 times.
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)	Wittrock's Violet; 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.
32679	Proud 3 (Thyme oil (5.6%))	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Dazzle'	Field Container	Catlin	NY	2015	Foliar	No control of a high disease incidence and severity with 1 gal per 100 gal applied 5 times weekly.
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.
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 Container	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.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
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.
32885	Regalia SC (MOI 106) (Extract of Reynoutria sachalinensis)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathehouse	Palmateer	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 0.64 fl oz per 100 gal; comparable to non-inoculated check.
33082	S2200 4SC (Mandestrobin)	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Early Prestige Red'	Greenhouse	Hausbeck	MI	2016	Foliar	Highly effective control of a severe disease pressure with 7.5 and 15 fl oz per 100 gal applied biweekly.
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) 'Maverick Appleblossom'	Greenhouse	Hand	OH	2016	Foliar	Good efficacy on a very high disease pressure with 7.5 and 15 fl oz per 100 gal applied twice biweekly.
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.
32879	S2200 4SC (Mandestrobin)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathehouse	Palmateer	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 7.5 fl oz per 100 gal; comparable to non-inoculated check.
32227	S2200 4SC (Mandestrobin)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Parade'	Greenhouse	Jiang	CA	2016	Foliar	Good efficacy with 7.5 fl oz per 100 gal applied 2 times; comparable to uninoculated check on salability, disease incidence and healthy open flowers; one of two best treatments.
32227	S2200 4SC (Mandestrobin)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Victoria' miniature rose	Greenhouse	Jiang	CA	2015	Foliar	Good efficacy with 15 fl oz per 100 gal only for 7 days after 1st application; no efficacy after 14 days.
32717	S2200 4SC (Mandestrobin)	Botrytis Gray Mold (Botrytis cinerea)	Wittrock's Violet; 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.) 'Dazzle'	Field Container	Catlin	NY	2015	Foliar	Effective control of a high disease incidence and severity with 7.5 and 15 fl oz per 100 gal applied 3 times biweekly; comparable to non-inoculated check.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
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.
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.
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.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
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.
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.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
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.
32880	Torque 3.6SC (Tebuconazole)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathehouse	Palmateer	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 8 oz per 100 gal; comparable to non-inoculated check.
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.
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)	Wittrock's Violet; 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.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32883	Trinity 2SC (Triticonazole)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathehouse	Palmateer	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 12 fl oz per 100 gal; comparable to non-inoculated check.
32262	Trinity 2SC (Triticonazole)	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Victoria' miniature rose	Greenhouse	Jiang	CA	2015	Foliar	Excellent efficacy with 12 fl oz per 100 gal only for 7 days after 1st application; poor efficacy by 14 days.
32719	Trinity 2SC (Triticonazole)	Botrytis Gray Mold (Botrytis cinerea)	Wittrock's Violet; 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.
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.

PR#	Product(Active Ingredients)	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32877	ZeroTol 2.0 (Hydrogen dioxide + peroxyacetic acid)	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lathhouse	Palmateer	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 1.25 gal per 100 gal; comparable to non-inoculated check.

Appendix 1: Contributing Researchers

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