



[Environment Horticulture Program Research Summaries](#)

## **IR-4 Environmental Horticulture Program Botrytis Efficacy & Literature Review**

*Botrytis cinerea*  
*Botrytis elliptica*  
*Botrytis paeoniae*  
*Botrytis tulipae*

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## Abstract

At the IR-4 Environmental 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 2020 on environmental horticulture crops. During this time period, numerous products representing 54 active ingredients were tested as foliar applications against several *Botrytis* species causing blight and gray mold on multiple environmental horticulture crops. Most products are now registered and commercially used. Almost all trials were conducted on *Botrytis cinerea*; however, other species tested were *B. elliptica*, *B. paeoniae* and *B. tulipae*. Although there were insufficient IR-4 data for definitive conclusions, seven relatively new products that are included in this research project, Orkestra Intrinsic, Mural and Emblem (NUP 09092), Rhapsody/Serenade, Astun/IKF 5411, Picatina, and Picatina Flora looked effective, while Botector, BW165N, Proud 3, SP2480, SP2770 and SP2773 looked ineffective. Data on other relatively new products (Broadform, EcoSwing, Regime/F9110, MBI-110, Oxiphos, PreStop, Prophytex, Regalia, S2200, Torque, Tourney, Trinity) were limited to provide some conclusions. Of the established registered products, Compass, 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, Phytan 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 43 experiments from 2001 to 2020 received from the IR-4 Environmental Horticulture Program. We also reviewed 33 available experiments 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 2020, numerous products representing 56 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. Sixteen researchers were involved in the testing (Appendix 1).

Products were supplied to researchers 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, 16-014, 17-001, 18-001, 18-002, 19-001 and 20-025. Please visit <https://www.ir4project.org/ehc/ehc-registration-support-research/env-hort-researcher-resources/#Protocols> 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 Environmental Horticulture Crops from 1998 to 2020.**

Active Ingredient(s)	Product(s)	Manufacturer		Rate(s) Tested	# Trials
<i>Aureobasidium pullulans</i> strains DSM14940 and DSM 14941	Botector	Nufarm	Foliar	8 oz per 100 gal 10 oz per 100 gal	19
Azoxystrobin	Heritage	Syngenta	Foliar	1 oz per 100 gal 2 oz per 100 gal 4 oz per 100 gal 8 oz per 100 gal	15
Azoxystrobin + Benzovindiflupyr	Mural	Syngenta	Foliar	5.5 oz per 100 gal 7 oz per 100 gal	7
Azoxystrobin + Difenoconazole	Alibi Flora	Syngenta	Foliar	14 fl oz per 100 gal	3
<i>Bacillus amyloliquifaciens</i> strain F727	MBI-110	Marrone	Foliar	1 gal per 100 gal 1.5 gal per 100 gal	15
	Triathlon	Certis	Foliar	1.5 gal per 100 gal	1
<i>Bacillus subtilis</i> QST 713	QRD 713, Rhapsody	Bayer	Foliar	4 qt per 100 gal 6 qt per 100 gal 8 qt per 100 gal	3

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested	# Trials
	Serenade ASO		14 oz per 100 gal	1
	Serenade Opti		96 oz per 100 gal	2
<i>Bacillus subtilis</i> strain B1111	Prophytex EC	LAM International	40 fl oz per 100 gal	7
	Prophytex WP		20 oz per 100 gal	
Boscalid	BAS 510	BASF	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	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	19
	Echo 90DF	Sipcam	19 oz per 100 gal	1
	Echo 720 6F		22 fl oz per 100 gal	
Chlorothalonil + Thiophanate methyl	Spectro	Cleary	16 oz per 100 gal 5.7 lb per 100 gal	3
Copper hydroxide	Kocide	DuPont	1 lb per 100 gal	1
Copper octanoate	Camelot	SePRO	32 fl oz per 100 gal 48 fl oz per 100 gal	2
Copper oxychloride + Copper hydroxide	Badge X2	Gowan	2 lb per 100 gal	3
Copper sulfate pentahydrate	Phyton 27	Phyton	15 fl oz per 100 gal 20 fl oz per 100 gal	4
Cupric ammonium formate	STBX-304	Phyton	20 oz per 100 gal	2
Cyprodinil	Vanguard	Syngenta	2 oz per 100 gal	1
Cyprodinil + Fludioxonil	Palladium	Syngenta	2 oz per 100 gal 4 oz per 100 gal 5 oz per 100 gal 6 oz per 100 gal 8 oz per 100 gal 12 oz per 100 gal	17
	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	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	36
Fenpyrazamine	V-10135	Valent	7 fl oz per 100 gal 9.6 fl oz per 100 gal 16 fl oz per 100 gal	6

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested		# Trials
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	24
	Emblem, NUP 09092	NuFarm	Foliar	4 fl oz per 100 gal 8 fl oz per 100 gal	9
Fluopyram + Trifloxystrobin)	Broadform SC500	Bayer	Foliar	4 fl oz per 100 gal 6 fl oz per 100 gal 8 fl oz per 100 gal	7
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
	Fame	FMC	Foliar	8 fl oz per 100 gal	1
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	23
<i>Gliocladium catenulatum</i>	Prestop	Verdera	Foliar	0.5 % 4.2 lb per 100 gal 13.2 oz per 100 gal 32 oz per 100 gal	6
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 5 qt per 100 gal 2 gal per 100 gal	9
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
	Chipco 26019 Flo	Bayer	Foliar	16 fl oz per 100 gal	3
Isofetamid	Astun	OHP	Foliar	10 fl oz per 100 gal 13.5 fl oz per 100 gal 17 fl oz per 100 gal	9
	Kenja 400SC	SummitAgro	Foliar	13.5 fl oz per 100 gal	2
	IKF 5411	ISK	Foliar	10 fl oz per 100 gal 13.5 fl oz per 100 gal 17 fl oz per 100 gal	6
<i>Lupinus</i> extract	Regime/F911 0	FMC	Foliar	24 fl oz per 100 gal 46 fl oz per 100 gal	16
Mancozeb	Fore	Corteva	Foliar	1.5 lb per 100 gal	5
	Dithane			2 lb per 100 gal	

Active Ingredient(s)	Product(s)	Manufacturer	Rate(s) Tested		# Trials
Mandestrobin	S2200	NuFarm	Foliar	7.5 fl oz per 100 gal 15 fl oz per 100 gal	20
Mefentriconazole	BAS 750	BASF	Foliar		
Metconazole	Tourney	Valent	Foliar	4 oz per 100 gal	4
Mono and di potassium salts of phosphorus acid + hydrogen peroxide	Oxiphos	BioSafe	Foliar	1 gal per 100 gal	3
Polyoxin D	Affirm	NuFarm	Foliar	8 oz per 100 gal	4
	Endorse	Arysta		4 oz per 100 gal 8 oz per 100 gal 9 oz per 100 gal 12 oz per 100 gal 18 oz per 100 gal 28 oz per 100 gal 36 oz per 100 gal	10
	Veranda O	OHP		4 oz per 100 gal 8 oz per 100 gal	3
Potassium bicarbonate	Kaligreen		Foliar	2.5 lb per 100 gal	1
	Milstop	BioWorks		5 lb per 100 gal	2
Pydiflumetofen	Picatina	Syngenta	Foliar	13.7 fl oz per 100 gal	2
Pydiflumetofen + Difenconazole	Postiva	Syngenta	Foliar	21 fl oz per 100 gal 28 fl oz per 100 gal	1
Pydiflumetofen + Fludioxonil	Picatina Flora	Syngenta	Foliar	13.7 fl oz per 100 gal 27.8 fl oz per 100 gal	3
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	2
	Insignia			4 oz per 100 gal 8 oz per 100 gal 12 oz per 100 gal 16 oz per 100 gal	6
Pyraclostrobin + Boscalid	BAS 516	BASF	Foliar	9.5 oz per 100 gal 18 oz per 100 gal	2
	Pageant			7 oz per 100 gal 9.5 oz per 100 gal 12.5 oz per 100 gal 15 oz per 100 gal 14 oz per 100 gal 18 oz per 100 gal	21
<i>Reynoutria sachalinensis</i> extract	Regalia	Marrone	Foliar	4 fl oz per 100 gal 2 qt per 100 gal 4 qt per 100 gal	8
SP2480	SP2480	SePRO	Foliar	20 fl oz per 100 gal 30 fl oz per 100 gal	7
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

Active Ingredient(s)	Product(s)	Manufacturer		Rate(s) Tested	# Trials
<i>Streptomyces griseoviridis</i> Strain K 61	Mycostop	Verdera	Foliar	5 g per 13 gal	1
Tebuconazole	Torque	NuFarm	Foliar	8 fl oz per 100 gal	7
<i>Swinglea glutinosa</i>	EcoSwing	Gowan	Foliar	2 pt per 100 gal	5
Thiophanate methyl	3336	Cleary	Foliar	16 fl oz per 100 gal	3
	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	23
Trifloxystrobin	Compass	Bayer	Foliar	0.5 oz per 100 gal 1 oz per 100 gal 2 oz per 100 gal 4 oz per 100 gal	7
Triflumizole	Terraguard	Chemtura	Foliar	4 oz per 100 gal 8 oz per 100 gal	1
Triticonazole	Trinity	BASF	Foliar	8 floz per 100 gal 12 fl oz per 100 gal	6
<i>Ulocladium oudemansii</i> strain U3	BW165N	BioWorks	Foliar	3 lb per 100 gal 4 lb per 100 gal 1360 oz per 100 gal	13

## Results

### **Comparative Efficacy for *Botrytis cinerea***

From 1998 through 2019, 53 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 (%) <sup>x</sup>		
		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
Nontreated inoculated	-	30.1 a	31.0 a	32.2 a

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

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

In 2017, Jiang conducted a greenhouse trial to determine efficacy of several fungicides for the control of Botrytis blight on begonia. All treatments were applied as foliar sprays, except PreStop applied as soil drench, from Jun 22 to Jul 6 on a schedule shown in Table 3. Plants were sprayed with *B. cinerea* inoculant on Jun 23. F9110 provided the best control of a severe disease pressure, comparable to the non-inoculated check able (Table 3). Prophytex EC provided good control, while other products were generally mediocre or poor. No phytotoxicity was observed from any treatment.

**Table 3. Efficacy for *Botrytis cinerea* on Begonia (*Begonia* sp.) ‘AmeriHybrid Picotee Flamenco’, Jiang, 2017.**

Treatment	Rate Per 100 Gal	Application Dates	Days After Initial Treatment (DAT)			
			7	14	21	28
<i>Overall Plant Affliction Rating (±SD)<sup>x</sup></i>						
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 + strain DSM 14941)	8 oz	6/22, 29, 7/6	1.6(±2.6)	2.9(±4.0) ab	4(±3.7) abc	6.2(±2.8) a
BW165N ( <i>Ulocladium oudemansii</i> strain U3)	3 lb	6/22, 29, 7/6	0.8(±0.8) a	1.6(±1.1)ab	4(±3.2) abc	6.6(±1.5) a
F9110 ( <i>Lupinus</i> extract)	45.7 fl oz	6/22, 29, 7/6	0.4(±0.9) a	1(±0) b	1.4(±0.5) c	4.2(±3.1) a
IKF-5441 (isofetamid)	13.5 fl oz	6/22, 7/6	3.8(±2.7) a	4.6(±2.3)ab	8.6(±1.7) ab	8(±2.9) a
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	6/22, 29, 7/6	2.8(±2.9) a	6.8(±4.3) a	9.4(±1.3) a	8.6(±2.2) a
Medallion (fludioxonil)	8 fl oz	6/22, 7/6	0.2(±0.4) a	4.8(±4.1)ab	5.4(±4.4) abc	6.6(±4.1) a
Orkestra Intrinsic, BAS703 (fluxapyroxad + pyraclostrobin)	8 fl oz	6/22, 7/6	0.6(±0.9) a	1.4(±1.5) ab	4.2(±3.7) abc	6(±3.1) a
Prestop ( <i>Gliocladium catenulatum</i> )	13.2 oz	6/19, 29, 7/6	1.8(±2.5) a	3.2(±3.2)ab	3.6(±4.5) abc	6(±3.7) a
Prophytex EC ( <i>Bacillus subtilis</i> strain B1111)	40 fl oz	6/22, 29, 7/6	1(±1.7) a	1.8(±1.9) ab	2(±1.9) bc	5.8(±0.8) a
Prophytex WP ( <i>Bacillus subtilis</i> strain B1111)	20 oz	6/22, 29, 7/6	0.6(±1.3) a	1.6(±1.5) ab	3(±2.7) abc	5.6(±2.4) a
Proud 3 (thyme oil)	1 gal	6/22, 29, 7/6	0.4(±0.5) a	2.6(±2.1) ab	5(±1.7) abc	6.4(±1.5) a
S2200 (mandestrobin)	7.5 fl oz	6/22, 29, 7/6	0.2(±0.4) a	3.2(±3.2)ab	4.8(±4.3) abc	5(±3.5) a
Nontreated uninoculated	-	-	0.2(±0.4) a	0.6(±0.9) b	1.6(±1.3) c	5.2(±2.2) a
Nontreated inoculated	-	-	0.8(±0.8) a	3.8(±1.5)ab	4.2(±2.9) abc	5.4(±3.1) a
No Spray	-	-	1(±1.7) a	2.6(±1.1)ab	5.4(±3) abc	7.8(±1.3) a
<i>Percent Flower Buds Afflicted by Disease or Senescence (±SD)</i>						
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 + strain DSM 14941)	8 oz	6/22, 29, 7/6	24%(±34%)	12%(±17%)	20%(±23%)	37%(±SD)
BW165N ( <i>Ulocladium oudemansii</i> strain U3)	3 lb	6/22, 29, 7/6	24%(±11%)	12%(±22%)	20%(±18%)	37%(±SD)
F9110 ( <i>Lupinus</i> extract)	45.7 fl oz	6/22, 29, 7/6	24%(±12%)	12%(±9%)	20%(±21%)	37%(±SD)
IKF-5441 (isofetamid)	13.5 fl oz	6/22, 7/6	29%(±22%)	14%(±23%)	21%(±27%)	39%(±SD)
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	6/22, 29, 7/6	22%(±41%)	19%(±22%)	20%(±0%)	31%(±SD)
Medallion (fludioxonil)	8 fl oz	6/22, 7/6	9%(±0%)	23%(±20%)	36%(±0%)	33%(±SD)
Orkestra Intrinsic, BAS703 (fluxapyroxad + pyraclostrobin)	8 fl oz	6/22, 7/6	12%(±7%)	9%(±33%)	21%(±29%)	41%(±SD)
Prestop ( <i>Gliocladium catenulatum</i> )	13.2 oz	6/19, 29, 7/6	17%(±18%)	12%(±23%)	31%(±38%)	43%(±SD)
Prophytex EC ( <i>Bacillus subtilis</i> strain B1111)	40 fl oz	6/22, 29, 7/6	22%(±11%)	23%(±16%)	27%(±36%)	34%(±SD)
Prophytex WP ( <i>Bacillus subtilis</i> strain B1111)	20 oz	6/22, 29, 7/6	41%(±17%)	22%(±12%)	0%(±31%)	0%(±SD)
Proud 3 (thyme oil)	1 gal	6/22, 29, 7/6	7%(±9%)	33%(±23%)	29%(±36%)	43%(±SD)

Treatment	Rate Per 100 Gal	Application Dates	Days After Initial Treatment (DAT)			
			7	14	21	28
S2200 (mandestrobin)	7.5 fl oz	6/22, 29, 7/6	11%(±11%)	16%(±45%)	36%(±9%)	43%(±SD)
Nontreated uninoculated	-	-	18%(±13%)	23%(±7%)	38%(±6%)	37%(±SD)
Nontreated inoculated	-	-	11%(±42%)	45%(±41%)	9%(±39%)	18%(±SD)
No Spray	-	-	0%(±17%)	20%(±14%)	0%(±25)	43%(±SD)
<i>Total Number of Flower Buds (±SD)</i>						
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 + strain DSM 14941)	8 oz	6/22, 29, 7/6	1.6(±2.2)	3(±3.5)	3.4(±3.2)	2.6(±2.9)
BW165N ( <i>Ulocladium oudemansii</i> strain U3)	3 lb	6/22, 29, 7/6	7.2(±6.9)	8.8(±6.5)	7.6(±5.4)	5.8(±2.5)
F9110 ( <i>Lupinus</i> extract)	45.7 fl oz	6/22, 29, 7/6	4(±5.1)	6.4(±6.5)	6.8(±6.6)	6.2(±6.0)
IKF-5441 (isofetamid)	13.5 fl oz	6/22, 7/6	4(±2.5)	6.4(±4.4)	3.6(±4.3)	2.2(±3.3)
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	6/22, 29, 7/6	2.8(±2.2)	0.6(±0.9)	0(±0)	0.2(±0.4)
Medallion (fludioxonil)	8 fl oz	6/22, 7/6	5.8(±5.0)	4.6(5.1)	2.8(±4.8)	3.6(±SD)
Orkestra Intrinsic, BAS703 (fluxapyroxad + pyraclostrobin)	8 fl oz	6/22, 7/6	2.6(±2.6)	4(±3.5)	3.6(±3.8)	4.4(±4.6)
Prestop ( <i>Gliocladium catenulatum</i> )	13.2 oz	6/19, 29, 7/6	4.6(±4.4)	5.8(±7.2)	5.4(±7.2)	6(±S)
Prophytex EC( <i>Bacillus subtilis</i> strain B1111)	40 fl oz	6/22, 29, 7/6	2.8(±2.2)	4.2(±2.7)	3.8(±2.2)	3.8(±2.7)
Prophytex WP( <i>Bacillus subtilis</i> strain B1111)	20 oz	6/22, 29, 7/6	2.6(±3.7)	3.2(±4.7)	4(±5.6)	3.6(±4.2)
Proud 3 (thyme oil)	1 gal	6/22, 29, 7/6	5.2(±3.8)	8.2(±7.2)	7.6(±5.1)	8.4(±6.2)
S2200 (mandestrobin)	7.5 fl oz	6/22, 29, 7/6	1.6(±1.8)	1.2(±1.8)	1(±2.2)	1.4(±2.2)
Nontreated uninoculated	-	-	1.6(±3.0)	1.6(±2.5)	2.4(±3.2)	3(±SD)
Nontreated inoculated	-	-	3.4(±3.9)	3.4(±3.9)	4.2(±6.0)	4.2(±SD)
No Spray	-	-	5.6(±4.3)	6(±2.9)	5.6(±4.4)	6.4(±SD)
<i>Percent Open Flower Buds (±SD)</i>						
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 + strain DSM 14941)	8 oz	6/22, 29, 7/6	20%(±33%)	16%(±21%)	17%(±23%)	19%(±%)
BW165N ( <i>Ulocladium oudemansii</i> strain U3)	3 lb	6/22, 29, 7/6	12%(±19%)	5%(±7%)	31%(±21%)	23%(±%)
F9110 ( <i>Lupinus</i> extract)	45.7 fl oz	6/22, 29, 7/6	18%(±26%)	17%(±27%)	21%(±27%)	14%(±%)
IKF-5441 (isofetamid)	13.5 fl oz	6/22, 7/6	0%(±0%)	12%(±22%)	0%(±0%)	0%(±%)
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	6/22, 29, 7/6	23%(±43%)	40%(±55%)	0%(±0%)	20%(±%)
Medallion (fludioxonil)	8 fl oz	6/22, 7/6	2%(±26%)	24%(±38%)	26%(±36%)	11%(±%)
Orkestra Intrinsic, BAS703 (fluxapyroxad + pyraclostrobin)	8 fl oz	6/22, 7/6	23%(±32%)	25%(±35%)	37%(±39%)	12%(±%)
Prestop ( <i>Gliocladium catenulatum</i> )	13.2 oz	6/19, 29, 7/6	15%(±6%)	45%(±14%)	44%(±36%)	29%(±%)
Prophytex EC( <i>Bacillus subtilis</i> strain B1111)	40 fl oz	6/22, 29, 7/6	0%(±11%)	22%(±45%)	40%(±0%)	44%(±%)



Treatment	Rate Per 100 Gal	Application Dates	Days After Initial Treatment (DAT)			
			7	14	21	28
Prophytex WP ( <i>Bacillus subtilis</i> strain B1111)	20 oz	6/22, 29, 7/6	3% (±14%)	10% (±38%)	21% (±32%)	20% (±%)
Proud 3 (thyme oil)	1 gal	6/22, 29, 7/6	28% (±4%)	32% (±29%)	51% (±36%)	8% (±%)
S2200 (mandestrobin)	7.5 fl oz	6/22, 29, 7/6	5% (±0%)	20% (±24%)	0% (±49%)	0% (±%)
Nontreated uninoculated	-	-	11% (±26%)	13% (±30%)	25% (43±%)	11% (±%)
Nontreated inoculated	-	-	32% (±42%)	18% (±26%)	7% (±11%)	15% (±%)
No Spray	-	-	38% (±38%)	38% (±27%)	30% (±21%)	3% (±%)
<i>Mean plant heights on Day 0 and Day 28, and the mean percent growth between those dates</i>						
			Mean start height (cm)	Mean end height (cm)	Percent Change	
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 + strain DSM 14941)	8 oz	6/22, 29, 7/6	18.2	15.6	-14%	
BW165N ( <i>Ulocladium oudemansii</i> strain U3)	3 lb	6/22, 29, 7/6	17.8	15.8	-11%	
F9110 ( <i>Lupinus</i> extract)	45.7 fl oz	6/22, 29, 7/6	17.4	18	3%	
IKF-5441 (isofetamid)	13.5 fl oz	6/22, 7/6	18.2	9.4	-48%	
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	6/22, 29, 7/6	17.6	9.4	-47%	
Medallion (fludioxonil)	8 fl oz	6/22, 7/6	18	11	-39%	
Orkestra Intrinsic, BAS703 (fluxapyroxad + pyraclostrobin)	8 fl oz	6/22, 7/6	18.2	20.2	11%	
Prestop ( <i>Gliocladium catenulatum</i> )	13.2 oz	6/19, 29, 7/6	17.8	18	1%	
Prophytex EC ( <i>Bacillus subtilis</i> strain B1111)	40 fl oz	6/22, 29, 7/6	17.6	19.6	11%	
Prophytex WP ( <i>Bacillus subtilis</i> strain B1111)	20 oz	6/22, 29, 7/6	17.4	19.2	10%	
Proud 3 (thyme oil)	1 gal	6/22, 29, 7/6	17.4	19.4	11%	
S2200 (mandestrobin)	7.5 fl oz	6/22, 29, 7/6	18.4	15.2	-17%	
Nontreated uninoculated	-	-	17.4	19.2	10%	
Nontreated inoculated	-	-	17.4	19.4	11%	
No Spray	-	-	18.6	16.4	-12%	

<sup>x</sup> Botrytis affliction rating for the overall plant, indicating the severity of Botrytis infection on the leaves, stems, and flowers, ± standard deviation. Plants with a mean higher rating than 3, the threshold score for salability, are marked in red. Means followed by same letter do not differ significantly based on Tukey's post hoc test. For other data recorded, there were no significant differences.

\* All treatments applied foliar, except PreStop which was applied soil drench.

## 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 4). 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 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 5).

In Hausbeck's third greenhouse experiment, fungicides were applied once as foliar sprays on 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 Nontreated control, although differences in sporulation were not noted (Table 6). 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 Nontreated 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 7). Switch did not significantly control leaf blight, but did limit sporulation.

**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 (%) <sup>x</sup>	
		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
Nontreated inoculated	-	14.7 c	33.5 d

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

<sup>x</sup> 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*) 'Lavender', Hausbeck, MI, 2000.**

Treatment	Rate Per 100 Gal	Leaves with Blight and Sporulation (%) <sup>x</sup>			
		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
Nontreated inoculated	-	4.8 ab	14.4 c	17.5 b	17.7 b
Nontreated 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.

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

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

Treatment	Rate Per 100 Gal	Disease Observations <sup>x</sup>				
		4/3/00	4/7/00	4/12/00	4/21/00	4/27/00
<i>Non-sporulating diseased leaves (%)</i>						
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
Nontreated inoculated	-	1.2 a	7.3 cd	2.3 a	2.9 a	2.4 a
<i>Leaves with sporulating Botrytis (%)<sup>y</sup></i>						
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
Nontreated 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.

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

<sup>y</sup> Rating represents percentage of leaves sporulating out of total number of leaves.

**Table 7. \* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit Red', Hausbeck, MI, 2000.**

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) <sup>x</sup>			Leaves sporulating with <i>Botrytis</i> (%) <sup>y</sup>		
		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
Nontreated non-inoculated	-	1.0 a	2.8 a	1.4 a	0.0 a	2.8 a	1.4 a
Nontreated 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.

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

<sup>y</sup> 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 Nontreated control, including the standard Decree and Cabrio, at the higher two rates (Table 8). However, significant differences were observed in the incidence of leaves with sporulating *B. cinerea*. All treatments were significantly better than the Nontreated control in reducing the ability of *B. cinereato* sporulate on infected leaves. No phytotoxicity was observed from any treatment.

**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 (%) <sup>x</sup>			Leaves sporulating with <i>Botrytis</i> (%) <sup>y</sup>		
		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
Nontreated 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.

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

<sup>y</sup> 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 Nontreated uninoculated control plants by the last observation date of Jul 2 (Table 9). Decree, Heritage (2 oz), and Daconil

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

**Table 9. \* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Violet', Hausbeck, MI, 2001.**

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) <sup>x</sup>			Leaves sporulating with <i>Botrytis</i> (%) <sup>y</sup>		
		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	–
Nontreated non-inoculated	-	26.6abc	46.9ab	44.2 b	23.2ab	41.1 bc	41.3 c
Nontreated 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.

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

<sup>y</sup> 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 10). All treatments significantly limited sporulation compared to the Nontreated 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 Nontreated inoculated plants (Table 11). 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 12). 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 10.\* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Violet', Hausbeck, MI, 2002.**

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) <sup>x</sup>				Leaves sporulating with <i>Botrytis</i> (%) <sup>y</sup>			
		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
Nontreated 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
Nontreated 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.

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

<sup>y</sup> Rating represents percentage of leaves sporulating out of total number of leaves.

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

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) <sup>x</sup>			Leaves sporulating with <i>Botrytis</i> (%) <sup>y</sup>	
		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
Nontreated non-inoculated	-	8.3 b	5.3 a	11.7 a	24.6 b-f	28.0 b-e
Nontreated 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.

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

<sup>y</sup> Rating represents percentage of leaves sporulating out of total number of leaves.

**Table 12.\* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Red II', Hausbeck, MI, 2002.**

Treatment	Rate Per 100 Gal	Non-sporulating diseased leaves (%) <sup>x</sup>		Leaves sporulating with Botrytis (%) <sup>y</sup>	
		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
Nontreated non-inoculated	-	27.9 ab	49.0 b	15.8 abc	25.1 cd
Nontreated 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.

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

<sup>y</sup> 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 13). 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 14). For cultivar 'Sonora White,' the Endorse, Decree, Daconil Weather Stik, and Chipco 26019 treatments all significantly reduced disease severity on the last rating (Table 15). Only Decree and Daconil Weather Stik significantly reduced the number of leaves with sporulating *B. cinerea*.

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

Treatment <sup>z</sup>	Rate Per 100 Gal	Leaves with Infection (%) <sup>x</sup>			Leaves with Sporulation (%)			Disease Severity <sup>y</sup>	
		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
Nontreated 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.

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

<sup>y</sup> Rated on a scale of 1 to 10, where 1=no lesions to 10=plant death.

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

**Table 14.\* 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 (%) <sup>x</sup>			Disease Severity <sup>y</sup>		
			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
Nontreated 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.

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

<sup>y</sup> Rated on a scale of 1 to 10, where 1=no lesions to 10=plant death.

**Table 15.\* 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 (%) <sup>x</sup>		Disease Severity <sup>y</sup>	
			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
Nontreated inoculated	-	-	6.5 c	36.5 b	4.5 c	8.8 c

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

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

<sup>y</sup> 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 16). 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 17). Significant differences among treatments were not observed. No phytotoxicity was observed from any treatment.

**Table 16.\* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit White', Hausbeck, MI, 2004.**

Treatment	Rate Per 100 Gal	Leaves with Sporulation (%) <sup>x</sup>			Plant Health <sup>y</sup>		
		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
Nontreated 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.

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

<sup>y</sup> Rated on a scale of 1 to 10, where 1=no lesions to 10=plant death.

**Table 17.\* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x domesticum*) 'Emperor', Hausbeck, MI, 2004.**

Treatment	Rate Per 100 Gal	Number of Lesions <sup>x</sup>	Number of Sporulating Lesions	Disease Severity <sup>y</sup>
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
Nontreated 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.

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

<sup>y</sup> 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 18). 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 18.\* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit Pink', Hausbeck, MI, 2008.**

Treatment	Rate Per 100 Gal	Infected Leaves (%) <sup>x</sup>		Disease Severity <sup>y</sup>		Phytotoxicity <sup>z</sup>
		6/27/08	7/2/08	6/27/08	7/2/08	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
Nontreated 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.

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

<sup>y</sup> 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.

<sup>z</sup> Phytotoxicity 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 19). 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 19.\* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit Red', Hausbeck, MI, 2009.**

Treatment	Rate Per 100 Gal	Sporulating Leaves (%) <sup>x</sup>		Disease Severity <sup>y</sup>	
		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
Nontreated 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.

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

<sup>y</sup> 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 Nontreated control plants averaging 12.8 sporulating leaves per plant. All treatments significantly reduced the number of leaves with sporulating lesions (Table 20). 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 20.\* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Orbit White', Hausbeck, MI, 2010.**

Treatment	Rate Per 100 Gal	No. Leaves with Sporulating Lesions <sup>x</sup>	Total Number of Leaves with Lesions	Disease Severity <sup>y</sup>
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
Nontreated 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.

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

<sup>y</sup> 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, Palmateer conducted a greenhouse experiment to determine efficacy of several fungicides applied as preventative sprays for the control of Botrytis blight on geranium. All products provided excellent control of a moderate disease pressure, at least comparable to the Nontreated uninoculated check (Table 20). The foliage of plants treated with Proud 3 were severely burned, so the disease ratings do not accurately account for symptoms caused by Botrytis. BASF 703 01F provided the greatest level of control and disease severity ratings were statistically lower than plants treated with S2200. This trial identified several products that significantly decreased Botrytis foliar blight disease levels on geranium, compared to the inoculated, Nontreated control.

**Table 21. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Rocky Mountain Red', Palmateer, FL, 2015.**

Treatment	Rate Per 100 Gal	Interval, No. Applications	Disease <sup>x</sup>	
			Incidence <sup>y</sup>	Severity <sup>z</sup>
Alibi Flora SC (azoxystrobin+difenoconazole)	14 fl oz	14-day; 3	2 c	8 bcd
Orkestra (fluxapyroxad + pyraclostrobin)	8 fl oz	14-day; 3	2 c	4 d
Pageant 38WG (pyraclostrobin+boscalid)	14 oz	14-day; 3	2 c	8 bcd
Prestop ( <i>Gliocladium catenulatum</i> )	32 oz	21-day; 2	3 c	6 cd
Proud 3 (thyme oil)	128 fl oz	7-day; 5	0 d *	1 e *
Regalia ( <i>Reynoutria sachalinensis</i> extract) <sup>v</sup>	0.64 fl oz	7-day; 5	2 c	8 bcd
S2200 4SC (mandestrobin)	7.5 fl oz	14-day; 3	4 b	14 b
Torque 3.6 SC (tebuconazole)	8 fl oz	14-day; 3	2 c	6 cd
Trinity (triticonazole)	12 fl oz	14-day; 3	2 c	7 cd
ZeroTol 2.0 (hydrogen dioxide+peroxyacetic acid)	64 fl oz	7-day; 5	4 bc	10 bcd
	160 fl oz	7-day; 5	3 c	10 bcd
Nontreated uninoculated	-	-	3 bc	10 bc
Nontreated inoculated	-	-	7 a	35 a

<sup>x</sup> Average of ratings recorded at 0, 7, 14, 21 and 28 days. Means followed by same letter do not differ significantly based on Student-Newman-Keul test (P=0.05).

<sup>y</sup> Number of diseased leaves.

<sup>z</sup> Percent of plant surface area exhibiting disease.

\* The leaves of plants treated with the 128 fl oz rate of Proud 3 were severely burned



In 2016, Hand conducted a greenhouse experiment to determine efficacy of several fungicides applied as preventative sprays on a 7 or 14 day interval for the control of Botrytis blight on geranium. Fungicides were sprayed from Oct 28 to Nov 11 on a schedule shown in **Table 22** and **Table 23**. On Oct 29, plants were inoculated with *B. cinerea*. Overall results indicate good efficacy from Astun/Isfetamid, Orkestra, Proud and S2200, with the other products providing mediocre efficacy. Phytotoxicity was not observed in any of the treated plants.

**Table 22. Efficacy for Botrytis cinerea Leaf Blight on Geranium (*Pelargonium x hortorum*) ‘Maverick Appleblossom’, Hand, OH, 2016.**

Treatment	Rate Per 100 Gal	Application Dates	Leaf Blight Incidence <sup>x</sup>				Leaf Blight Severity			
			11/4	11/11	11/18	11/25	11/4	11/11	11/18	11/25
Astun/Isofetamid 400 SC (isofetamid)	10 fl oz	10/28, 11/4, 11	27.6 abc	34.1 ab	51.5 a-d	82.0 abc	7.7 b	13.9 cd	13.1 cd	13.3 cde
	13.5 fl oz	10/28, 11/4, 11	25.0 abc	31.2 abc	47.6 de	77.8 a-e	7.7 b	8.9 cd	9.2 d	13.1 de
	17 fl oz	10/28, 11/4, 11	15.5 d	22.4 c	47.6 cde	76.1 b-e	2.4 c	6.1 d	8.5 d	17.0 b-e
Botector ( <i>Aureobasidium pullulans</i> )	8 oz	10/28, 11/4, 11	32.3 a	37.7 a	45.8 de	71.6 de	11.1 a	14.8 bcd	16.8 abc	21.8 a-e
F9110 ( <i>Lupinus</i> extract)	45.7 fl oz	10/28, 11/4, 11	25.6 abc	34.3 ab	54.7 a-d	68.3 ef	7.4 b	4.9 d	22.5 ab	23.7 a-d
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	10/28, 11/4, 11	29.3 ab	39.4 a	58.5 abc	78.7 a-d	7.6 b	14.2 cd	23.4 a	24.4 abc
NUP 09092 (fludioxonil)	4 fl oz	10/28, 11/11	26.1 abc	36.51 ab	60.6 a	87.3 a	6.3 b	19.5 bc	14.4 cd	28.4 a
Orkestra (fluxapyroxad + pyraclostrobin)	8 fl oz	10/28, 11/11	26.0 abc	33.4 ab	37.4 e	61.1 f	7.6 b	5.6 d	10.1 cd	28.9 a
Prophytex EC ( <i>Bacillus subtilis</i> strain B1111)	40 fl oz	10/28, 11/4, 11	22.8 bcd	35.5 ab	59.1 ab	80.4 a-d	7.2 b	35.8 a	13.3 cd	16.2 cde
Prophytex WP ( <i>Bacillus subtilis</i> strain B1111)	20 oz	10/28, 11/4, 11	21.1 cd	38.8 a	55.5 a-d	78.4 a-e	6.6 b	19.7 bc	13.7 cd	16.6 b-e
Proud 3 (thyme oil)	1 gal	10/28, 11/4, 11	27.4 abc	40.6 a	46.5 de	75.4 cde	7.5 b	20.5 bc	14.4 cd	12.0 e
S2200 (mandestrobin)	7.5 fl oz	10/28, 11/11	22.0 bcd	37.7 a	53.1 a-d	83.6 abc	5.7 bc	15.2 bcd	15.7 bcd	14.8 cde
	15 fl oz	10/28, 11/11	25.0 abc	33.2 ab	51.6 a-d	79.5 a-d	7.3 b	15.0 bcd	14.5 cd	15.3 cde
Nontreated uninoculated	-	-	22.4 bcd	26.9 bc	53.6 a-d	86.1 ab	6.5 b	7.7 cd	16.8 abc	28.4 a
Nontreated inoculated	-	-	26.5 abc	32.9 ab	48.2 b-e	83.4 abc	8.2 ab	27.7 ab	11.4 cd	27.8 ab

**Table 23. Efficacy for *Botrytis cinerea* Flower Blight on Geranium (*Pelargonium x hortorum*) ‘Maverick Appleblossom’, Hand, OH, 2016.**

Treatment	Rate Per 100 Gal	Application Dates	Flower Blight Incidence <sup>x</sup>				Flower Blight Severity				Salability <sup>z</sup>
			11/4	11/11	11/18	11/25	11/4	11/11	11/18	11/25	
Astun/Isometamid 400 SC (isometamid)	10 fl oz	10/28, 11/4, 11	0.0 a	60.0 abc	100.0 a	100.0 a	0.0 a	16.6 abc	38.9 bc	95.0 cde	3.4 bcd
	13.5 fl oz	10/28, 11/4, 11	0.0 a	50.0 abc	90.0 ab	100.0 a	0.0 a	6.1 c	36.9 bc	86.5 de	2.7 de
	17 fl oz	10/28, 11/4, 11	0.0 a	60.0 abc	95.0 a	100.0 a	0.0 a	11.6 abc	34.9 bc	91.7 b-e	3.4 bcd
Botector ( <i>Aureobasidium pullulans</i> )	8 oz	10/28, 11/4, 11	0.0 a	80.0 ab	85.0 ab	100.0 a	0.0 a	30.5 a	40.1 bc	96.9 a-e	2.7 de
F9110 ( <i>Lupinus</i> extract)	45.7 fl oz	10/28, 11/4, 11	0.0 a	30.0 c	100.0 a	100.0 a	0.0 a	8.0 bc	46.3 abc	97.0 a-d	2.9 cde
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	10/28, 11/4, 11	0.0 a	40.0 bc	100.0 a	100.0 a	0.0 a	5.8 c	70.5 a	99.5 abc	3.3 bcd
NUP 09092 (fludioxonil)	4 fl oz	10/28, 11/11	0.0 a	40.0 bc	95.0 a	100.0 a	0.0 a	14.1 abc	28.8 c	94.0 a	3.3 bcd
Orkestra (fluxapyroxad + pyraclostrobin)	8 fl oz	10/28, 11/11	0.0 a	40.0 bc	75.0 b	100.0 a	0.0 a	14.5 abc	34.5 bc	94.8 a	3.6 abc
Prophytex EC ( <i>Bacillus subtilis</i> strain B1111)	40 fl oz	10/28, 11/4, 11	0.0 a	40.0 bc	100.0 a	100.0 a	0.0 a	27.5 ab	40.8 bc	87.1 cde	3.6 abc
Prophytex WP ( <i>Bacillus subtilis</i> strain B1111)	20 oz	10/28, 11/4, 11	0.0 a	50.0 abc	100.0 a	100.0 a	0.0 a	16.2 abc	39.6 bc	98.1 b-e	3.4 bcd
Proud 3 (thyme oil)	1 gal	10/28, 11/4, 11	0.0 a	60.0 abc	90.0 ab	100.0 a	0.0 a	26.8 ab	50.5 abc	94.3 e	4.3 a
S2200 (mandestrobin)	7.5 fl oz	10/28, 11/11	0.0 a	40.0 bc	100.0 a	100.0 a	0.0 a	13.5 abc	61.5 ab	86.7 cde	3.8 ab
	15 fl oz	10/28, 11/11	0.0 a	30.0 c	95.0 a	100.0 a	0.0 a	14.1 abc	38.5 bc	94.4 cde	4.3 a
Nontreated uninoculated	-	-	0.0 a	80.0 ab	90.0 a	100.0 a	0.0 a	19.2 abc	41.0 bc	98.6 a	2.4 e
Nontreated inoculated	-	-	0.0 a	90.0 a	100.0 ab	100.0 a	0.0 a	28.6 a	57.4 abc	97.0 ab	2.8 cde

<sup>x</sup> Rated on a Modified Horsfall-Barret scale of 0 to 12, where 0=0% leaf area affected, 1=<1%, 2=1-3%, 3=3-6%, 4=6-12%, 5=12-25%, 6=25-50%, 7=50-75%, 8=75-87%, 9=>87-94%, 10=94-97%, 11=97-100%, and 12=100% leaf are affected. Means followed by same letter do not differ significantly based on Fisher's LSD Test (P=0.05).

<sup>z</sup> Salability is reported as the average score of six replicates for each treatment (0= completely salable, no adverse impacts, 10= complete plant affected) at the end of the trial; 3 or higher indicates crop quality is not adequate for sale.

In 2017, Santamaria conducted a greenhouse experiment to determine efficacy of several fungicides applied as preventative sprays for the control of *Botrytis* blight on geranium. Of all the treatments, two fungicides (Astun and IKF-5411) that contained active ingredient isofetamid resulted in the lowest foliar severity and lowest overall salability rating at 4 weeks post-inoculation (Table 24). These treatments did not differ significantly from the negative control, but also did not vary significantly from the positive control. BW165N was the least effective fungicide, resulting in a significantly higher foliar severity and higher overall salability rating than the positive control. All other treatments did not differ from either control in terms of foliar severity or salability. *Botrytis cinerea* did not seem to affect the geranium flowers; as mentioned previously, all floral severity ratings were close to 0, with no significant difference from either control. As with foliar severity, Astun and IDK-5411 were the only two fungicides that displayed a significant decrease in disease incidence when compared to the positive control. Stunting was not observed for any of the treatments.

**Table 24. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) ‘Nano’, Santamaria, OR, 2017.**

Treatment	Rate Per 100 Gal	Interval, No. Applications	Disease		Salability <sup>z</sup>
			Incidence <sup>x</sup>	Severity <sup>y</sup>	
Astun (isofetamid)	13.5 fl oz	14 days, 3	44.4 c	0.6 b	0.0 a
Botector ( <i>Aureobasidium pullulans</i> )	8 oz	14 days, 3	100.0 a	5.2 ab	0.0 a
Broadform SC500 (fluopyram + trifloxystrobin)	6 fl oz	14 days, 3	88.9 ab	4.9 ab	0.2 a
BW165N ( <i>Ulocladium oudemansii</i> strain U3)	1360 oz	14 days, 3	100.0 a	6.3 a	0.3 a
IKF-5411 isofetamid)	13.5 fl oz	14 days, 3	55.6 bc	0.8 b	0.0 a
MBI 110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	192 fl oz	14 days, 3	100.0 a	3.9 ab	0.3 a
Okestra Intrinsic (fluxapyroxad + pyraclostrobin)	8 fl oz	14 days, 3	88.9 ab	1.3 ab	0.0 a
S2200 4SC (mandestrobin)	15 fl oz	14 days, 2	100.0 a	2.3 ab	0.0 a
Nontreated uninoculated	-	-	66.7 abc	0.7 b	0.0 a
Nontreated inoculated	-	-	100.0 a	4.3 ab	0.4 a

<sup>x</sup> Percent of plants infected at 28 days post-inoculation. Means followed by same letter do not differ significantly based on Waller Duncan K-ratio (P=0.05).

<sup>y</sup> Rating scale of 0-10, 0 = healthy, 3 + slight disease, 5 + moderate disease, 8 = severe disease, 10 = death 28 days post-inoculation.

<sup>z</sup> Rating scale of 0-10, 0 = completely salable, no adverse impacts, 10 = complete plant affected 28 days post-inoculation.

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 Tourney provided highly effective control of a severe disease pressure (Table 25). 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 25. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Red', Hausbeck, MI, 2015.**

Treatment	Rate Per 100 Gal	Applic. Interval (days)	Disease Severity <sup>x</sup>		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
Tourney 50WDG (metconazole)	4 oz	1 applic.	1.8 a-c	4.0 ab	9.0 ab	13.8 a
Nontreated	-	-	4.8 i	8.6 h	39.4 d	76.6 ef

<sup>x</sup> 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).

In 2017, Hausbeck conducted a greenhouse experiment to determine efficacy of several experimental fungicides for the control of *Botrytis* blight on geranium. Treatments were applied at the intervals described in the table below, on Nov 9, 16, and 25. Plants were inoculated by spraying with *B. cinerea* conidial suspension after initial fungicide application. On the final rating, only Affirm statistically limited the proportion of leaves sporulating from a severe disease pressure (Table 26). Although Orkestra treated plants were statistically similar to the Nontreated control on the Dec 4, it should be noted that the product did significantly reduce disease severity and leaves with sporulating *B. cinerea* on the Nov 25 rating. The biocontrol products included in this study were not efficacious and would not be recommended to producers when they are managing a severe outbreak of *Botrytis* blight in their greenhouse. The susceptible flower buds and stalks were not adequately protected by any the treatment by the final rating date. No phytotoxicity was observed from any treatment.

In 2018, Hausbeck conducted a greenhouse experiment to determine efficacy of several experimental fungicides for the control of *Botrytis* blight on geranium. Treatments were applied at the intervals described in the table below, on Dec 13, 21 and 28. Plants were inoculated by spraying with *B. cinerea* conidial suspension after initial fungicide application. At the final rating, all treatments statistically limited *B. cinerea* infection compared to the Nontreated control, with Picatina, Picatina Flora, and industry standard Decree resulting in statistically less infection compared to all other products (Table 27). Decree and Picatina Flora were the only treatments that resulted in leaves without *B. cinerea* infection on the final rating. The biocontrol products included in this study generally provided poor efficacy. No phytotoxicity was observed from any treatment, except Picatina Flora (chlorosis, likely caused by the fludioxonil component).

In 2019, Hausbeck conducted a greenhouse experiment to determine efficacy of the low and high labeled rates for the newly-registered products, Astun SC and Broadform SC, compared to the high labeled rate of industry standard Decree for the control of Botrytis blight on geranium. Treatments were applied on Feb 22 and Mar 4. Plants were inoculated by spraying with *B. cinerea* conidial suspension 2 days after initial fungicide application. Astun SC and Broadform SC, were similar to the industry standard Decree 50WDG for both leaves with sporulation (%) and disease severity rating from a moderate disease pressure (Table 28.\* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Premium White', Hausbeck, MI, 2019.). Phytotoxicity was not observed for any treatments.

**Table 26. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Premium White', Hausbeck, MI, 2017.**

Treatment ( <i>Application Interval</i> )	Rate Per 100 Gal	Leaves with Sporulation (%) <sup>x</sup>			Disease Severity <sup>y</sup>			Flower Disease Severity <sup>z</sup>		
		11/16	11/25	12/4	11/16	11/25	12/4	11/16	11/25	12/4
Affirm WG (polyoxin D), 7-day	0.5 lb	0.8 a	13.5 a	34.5 a	1.1 a	2.5 a	4.1 a	2.1 ab	5.1 a	10.0 a
Botector ( <i>Aureobasidium pullulans</i> ), 7-day	8 oz	12.5 ab	38.0 ab	53.0 ab	3.1 bc	5.3 bc	5.6 ab	4.6 abc	10.0 b	10.0 a
F9110 ( <i>Lupinus</i> extract), 7-day	45.7 fl oz	13.1 ab	41.8 ab	64.1 b	3.3 bc	6.3 c	6.3 ab	5.8 c	10.0 b	10.0 a
IKF-5411 (isofetamid), 14-day	13.5 fl oz	1.8 a	33.0 ab	59.0 b	1.3 ab	3.3 ab	5.6 ab	1.6 a	5.3 a	10.0 a
MBI 110 ( <i>Bacillus amyloliquifaciens</i> strain F727), 7-day	6 qt	17.6 b	63.6 b	80.4 b	4.0 c	8.0 c	8.4 b	5.3 bc	9.4 b	10.0 a
Orkestra SC (fluxapyroxad+pyraclostrobin), 14-day	8 fl oz	0.5 a	22.3 a	62.3 b	1.1 a	2.6 a	5.3 ab	1.3 a	5.0 a	10.0 a
Proud 3 (thyme oil), 7-day	4 qt	17.3 b	42.8 ab	62.8 b	3.5 bc	6.1 c	5.5 ab	4.1 abc	8.5 ab	10.0 a
Nontreated uninoculated	-	8.5 ab	51.3 ab	69.8 b	2.3 ab	5.5 bc	6.0 ab	2.6 abc	8.6 ab	10.0 a
Nontreated inoculated	-	12.1 ab	45.0 ab	68.0 b	3.1 bc	6.3 c	6.5 ab	4.5 abc	8.3 ab	10.0 a

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

<sup>y</sup> Rated on a scale of 0 to 10, where 0=healthy, 1-9=increased levels of disease symptoms observed, 10=plant death.

<sup>z</sup> Flower health severity rating was on a scale of 0-10; where 0=healthy, 1-9=increased levels of flower infection observed, 10=flower stalk abscission.

**Table 27. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Premium White', Hausbeck, MI, 2018.**

Treatment (Application Interval)	Rate Per 100 Gal	Leaves with Sporulation (%) <sup>x</sup>			Disease Severity <sup>y</sup>			Flower Disease Severity <sup>z</sup>		
		12/20	12/27	1/4	12/20	12/27	1/4	12/20	12/27	1/4
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 + strain DSM 14941), 7-day	8 oz	6.0 abc	21.4 bc	34.0 b	2.5 b	4.7 b	5.7 cd	1.3 a	3.0 abc	5.0 bcd
BW165N ( <i>Ulocladium oudemansii</i> strain U3), 7-day	3 lb	9.9 bc	21.0 bc	37.7 b	2.8 bc	5.5 b	7.2 cde	1.0 a	3.8 abc	7.2 def
	4 lb	11.8 c	24.3 c	38.4 b	2.7 bc	5.8 b	7.5 de	2.3 b	5.0 c	8.8 ef
Decree (fenhexamid), 1.5 lb, 7-day	1.5 lb	0.0 a	0.5 a	0.0 a	1.2 a	1.3 a	1.2 a	1.0 a	1.2 a	2.0 a
EcoSwing ( <i>Swinglea glutinosa</i> ), 7-day	2 pt	8.7 abc	19.5 bc	30.5 b	2.5 ab	4.2 b	5.7 cd	1.0 a	2.5 abc	5.3 bcd
Picatina (pydiflumetofen), 14-day	13.7 fl oz	0.8 ab	8.4 ab	9.3 a	1.3 a	2.7 a	2.8 b	1.0 a	1.2 a	3.0 ab
Picatina Flora (pydiflumetofen + fludioxonil), 14-day	27.8 fl oz	0.0 a	1.7 a	0.0 a	1.0 a	1.5 a	1.0 a	1.0 a	1.8 ab	2.0 a
S2200 (mandestrobin), 14-day	7.5 fl oz	6.2 abc	20.1 bc	33.9 b	2.3 b	4.5 b	6.2 cd	1.2 a	2.5 abc	4.8 bcd
	15 fl oz	2.3 abc	14.7 bc	26.2 b	1.7 ab	4.3 b	5.2 c	1.0 a	1.8 ab	3.8 abc
SP2480 + Capsil, 7-day	20 fl oz + 0.03%	6.7 abc	23.7 c	30.0 b	2.7 bc	5.3 b	5.7 cd	1.0 a	2.8 abc	6.5 cde
	30 fl oz + 0.03%	6.2 abc	22.0 bc	34.1 b	2.5 b	5.5 b	6.3 cd	1.0 a	2.3 ab	7.5 def
Nontreated inoculated	-	13.3 c	40.2 c	62.8 c	3.7 c	7.3 c	8.8 e	1.3 a	4.2 bc	9.5 f

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

<sup>y</sup> Rated on a scale of 0 to 10, where 0=healthy, 1-9=increased levels of disease symptoms observed, 10=plant death.

<sup>z</sup> Flower health severity rating was on a scale of 0-10; where 0=healthy, 1-9=increased levels of flower infection observed, 10=flower stalk abscission.



**Table 28.\* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Premium White', Hausbeck, MI, 2019.**

Treatment	Rate Per 100 Gal	Leaves with Sporulation (%) <sup>x</sup>		Disease Severity <sup>y</sup>	
		3/4	3/13	3/4	3/13
Astun (isofetamid)	10 fl oz	9.3 a	11.1 a	2.5 b	3.0 a
	17 fl oz	8.0 a	8.5 a	2.0 ab	2.2 a
Broadform (fluopyram + trifloxystrobin)	4 fl oz	2.5 a	5.4 a	1.5 ab	1.7 a
	8 fl oz	0.8 a	2.9 a	1.2 a	1.5 a
Decree (fenhexamid)	1.5 lb	3.1 a	8.5 a	1.5 ab	2.0 a
Nontreated inoculated	-	31.1 b	38.3 b	4.7 c	6.2

\* Not an IR-4 Experiment: Plant Disease Management Reports 13:OT020.

<sup>x</sup> Means followed by same letter do not differ significantly based on Fishers protected LSD test (P=0.05).

<sup>y</sup> Rated on a scale of 1 to 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/30-50% defoliation, 7=large necrotic areas/51-70% defoliation, 8=large necrotic areas/71-90% defoliation, 9=>91% defoliation, 10=plant death.

In 2017, Beckerman conducted a greenhouse experiment to determine efficacy of several fungicides for the control of Botrytis blight on geranium. Preventive fungicides were applied on May 2, 17 May 24 and 31, while curative fungicides were applied on May 17, 24 and 31. Plants were inoculated on May 11. The biological fungicide Serenade ASO performed almost as well as the standard Decree (Table 29). Although Serenade Opti performed well in controlling Botrytis blight, unacceptable levels of residue remained on the treated plants.

**Table 29. \* Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Pinto Red', Beckerman, IN, 2017.**

Treatment	Rate Per 100 Gal	Treatment Type	% Incidence	% Severity	% Sporulation
Broadform (fluopyram + trifloxystrobin)	8 oz	curative	25.0 ab	56.7 ab	32.5 b
	4 oz	preventive	10.0b	17.5 bc	0.8 b
Decree 50WG (fenhexamid)	12 oz	preventive	5.0 b	4.2 c	1.7 b
Serenade ASO ( <i>Bacillus subtilis</i> strain QST 713)	14 oz	curative	16.7b	20.0 abc	6.7 b
Serenade Opti ( <i>Bacillus subtilis</i> strain QST 713)	96 oz	curative	18.3 ab	18.3 bc	5.0 b
Nontreated inoculated	-	-	31.7 a*	60.8 a	76.7 a

\* Not an IR-4 Experiment: Plant Disease Management Reports 12:OT016.

<sup>x</sup> Means followed by same letter do not differ significantly based on Tukey-Kramer HSD Test (P=0.05).

In 2017, Meadows conducted a greenhouse experiment to determine efficacy of several fungicides for the control of Botrytis blight on geranium. Plants were inoculated on Mar 5 with a concentration of 5.4 x 10<sup>5</sup> spores/ml and again on Mar 23 at 6.9 x 10<sup>5</sup> spores/ml. Prestop was first applied on Mar 5, three days before the first treatment application on Mar 8 for the other treatments. Botector, BW165N + Activator 90, Proud 3, and PreStop were applied weekly. IKF-5411 and Decree were applied biweekly. All of the treatments except Proud 3 significantly reduced AUDPC from a light to moderate disease pressure (Table 30). However, all plants were not salable by the end of the trial. No phytotoxicity was observed from any treatment.

**Table 30. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Maverick Scarlet', Meadows, NC, 2017.**

Treatment	Rate Per 100 Gal	Salability <sup>z</sup>	Disease Incidence <sup>y</sup>		Foliar AUDPC <sup>x</sup>
			Foliar	Floral	
Botector ( <i>Aureobasidium pullulans</i> )	8 oz	4.5	6/6	1/6	135.4 b
BW165N ( <i>Ulocladium oudemansii</i> ) + Activator 90	3 lb	3.8	6/6	1/6	133.2 b
Decree 50 WDG (fenhexamid)	1.5 lb	3.5	6/6	1/6	92.7 b
IKF-5411 (isofetamid)	13.5 fl oz	3.3 <sup>y</sup>	6/6	1/6	91.3 b
PreStop ( <i>Gliocladium catenulatum</i> )	13.2 oz	3.8	6/6	1/6	157.7 b
Proud 3 (thyme oil)	1 gal	4.8	6/6	3/6	333.1 a
Nontreated uninoculated	N/A	4.7	6/6	3/6	118.8 b
Nontreated inoculated	N/A	5.3	6/6	2/6	255.2 a

<sup>z</sup>Salability is reported as the average score of six replicates for each treatment (0= completely salable, no adverse impacts, 10= complete plant affected) at the end of the trial; 3 or higher indicates crop quality is not adequate for sale).

<sup>y</sup>The total number of plants with symptoms on the foliage or flowers and buds (floral) out of the total number of replicates.

<sup>x</sup> Number in columns followed by the same letter are not significantly different based on Fisher's LSD test(<0.001).

In 2018, Meadows conducted a greenhouse experiment to determine efficacy of several fungicides for the control of Botrytis blight on geranium. Plants were inoculated three times: on Jan 9 with a concentration of  $9.1 \times 10^5$  spores/ml; on Jan 23 at  $3.2 \times 10^5$  spores/ml; and on Feb 6 at  $6.2 \times 10^4$  spores/ml. PreStop was applied on Jan 4, three days before the first treatment application on Jan 7. Botector, BW165N, EcoSwing, SP2480 (20 fl oz, 30 fl oz), and PreStop were applied weekly. Picatina, Picatina Flora, S2200, Astun, and Decree were applied biweekly. Disease severity was low to moderate throughout the trial. Picatina and Picatina Flora were the only treatments with salable plants (Table 31). Numerically, Picatina, Picatina Flora, and Botector provided the best control for disease, but the AUDPC was not significantly different than the other treatments except for SP2480 (20 fl oz, 30 fl oz). No phytotoxicity was observed from any treatment. A dark-colored spray residue was noted on plants treated with BW165N.

In 2019, Catlin conducted a greenhouse experiment to determine efficacy of several fungicides for the control of Botrytis blight on geranium. Fungicides were sprayed from Nov 18 to Dec 9 on a schedule shown in Table 32. The overall results showed Postiva and the standard Decree providing the best control of a severe disease pressure. Botector, BW165N, Ecoswing, S2200 and 2P2480 provided some control also; these treatments would likely be useful for prevention, in rotations, and/or at lower disease pressure. No phytotoxicity symptoms were observed and no meaningful differences in plant size were observed.

**Table 31. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) 'Maverick Scarlet', Meadows, NC, 2018.**

Treatment	Rate Per 100 Gal	Salability <sup>z</sup>	Disease Severity <sup>x</sup>			Disease Incidence <sup>y</sup> (n=6)		Foliar AUDPC <sup>x</sup>
			2/19	2/26	3/5	Foliar	Floral	
Astun (isofetamid)	13.5 fl oz	3	3.1 a	2.3 a	3.7 ab	6	0	10.9 ab
Botector ( <i>Aureobasidium pullulans</i> )	8 oz	3	4.1 a	2.7 a	3.4 ab	6	0	7.4 a
BW165N ( <i>Ulocladium oudemansii</i> ) + Activator 90	3 lb	3	3.1 a	5.6 ab	6.3 abc	6	2	21.0 ab
Decree (fenhexamid) Standard	1.5 lb	3	4.1 a	3.5 a	4.1 ab	6	0	11.6 ab
EcoSwing ( <i>Swinglea glutinosa</i> )	2 pt	3	8.2 abc	3.5 a	4.4 ab	6	0	11.6 ab
Picatina (pydiflumetofen)	13.7 fl oz	2	3.1 a	1.4 a	2.2 a	6	0	6.5 a
Picatina Flora (pydiflumetofen + fludioxonil)	27.8 fl oz	2	3.8 a	3.0 a	2.3 a	6	0	8.0 a
PreStop ( <i>Gliocladium catenulatum</i> ) Standard	13.2 oz	3	7.8 ab	4.5 ab	6.7 abc	6	0	20.3 ab
S2200 (mandestrobin)	15 fl oz	3	4.1 a	3.8 a	5.0 ab	5	0	17.3 ab
SP2480 (SP2480) + Activator 90	20 fl oz	3	10.0 bc	8.5 bc	9.3 cd	6	0	25.6 bc
SP2480 (SP2480) + Activator 90	30 fl oz	4	13.7 c	10.0 c	11.8 d	6	2	38.2 c
Nontreated uninoculated	-	3	2.7 a	3.4 a	4.4 ab	6	0	15.4 ab
Nontreated inoculated	-	4	5.2 ab	5.7 ab	7.8 bcd	6	0	21.5 abc

<sup>z</sup>Salability is reported as the average score of six replicates for each treatment (0= completely salable, no adverse impacts, 10= complete plant affected) at the end of the trial; 3 or higher indicates crop quality is not adequate for sale.

<sup>x</sup>Rated on a Modified Horsfall-Barret scale of 0 to 12, where 0=0% leaf area affected, 1=<1%, 2=1-3%, 3=3-6%, 4=6-12%, 5=12-25%, 6=25-50%, 7=50-75%, 8=75-87%, 9=>87-94%, 10=94-97%, 11=97-100%, and 12=100% leaf are affected. Means followed by same letter do not differ significantly based on Fisher's LSD Test (P=0.05).

<sup>y</sup>The total number of plants with symptoms on the foliage or flowers and buds (floral) out of the total number of replicates (6).

**Table 32. Efficacy for *Botrytis cinerea* on Geranium (*Pelargonium x hortorum*) ‘Orbit White’, Catlin, NY, 2019.**

Treatment	Rate Per 100 Gal	Applic. Timing (days)	No. Leaves with Leaf Lesions				No. Leaves w/ Sporulating Lesion				Disease Severity <sup>x</sup>			
			12/2	12/9	12/16	12/23	12/2	12/9	12/16	12/23	12/2	12/9	12/16	12/23
Botector ( <i>Aureobasidium pullulans</i> )	8 oz	0, 7, 14	0.25	1.92	4.25	4.75	0	0.83	3.58	3.25	0.25	1.08	2.83	3.67
	8 oz	-7, 0, 7, 14	0.08	0.92	4.08	5.00	0	0.25	2.25 *	3.00	0.08	0.58 *	1.92 *	3.58
BW165N ( <i>Ulocladium oudemansii</i> )	3 lb	0, 7, 14	0.42	0.67 *	4.50	4.92	0.17	0.33	2.50 *	2.83	0.33	0.50 *	2.00 *	3.42
	4 lb	0, 7, 14	0.42	2.58	5.42	5.08	0	0.42	3.25	3.00	0.42	1.42	2.58	4.08
Decree (fenhexamid)	1.5 lb	0, 14	0.33	0.75 *	4.08	4.00	0	0.25	1.25 *	1.67 *	0.33	0.50 *	2.17 *	2.50 *
EcoSwing ( <i>Swinglea glutinosa</i> )	2 pt	0, 7, 14	0	2.08	4.58	5.25	0	0.42	2.83	3.42	0	1.25	2.08 *	3.83
	2 pt	-7, 0, 7, 14	0.25	1.58	5.58	5.67	0	0.25	3.25	4.33	0.17	0.83 *	2.75	4.50
Postiva (pydiflumetofen + difenoconazole)	21 fl oz	0d, 7d, 14	0.08	0.33 *	3.67 *	5.67	0	0.08 *	0.58 *	2.25	0.08	0.33 *	1.17 *	3.92
	28 fl oz	0d, 7d, 14	0.08	0.25 *	3.25 *	4.92	0	0 *	0.16 *	1.33 *	0.08	0.25 *	1.17 *	3.50
S2200 (mandestrobin)	7.5 fl oz	0, 14	0.17	1.67	6.25	6.25	0	0.58	4.42	3.25	0	1.25	2.08 *	3.83
	15 fl oz	0, 14	0.58	2.33	5.83	5.75	0.08	0.83	3.33	3.33	0.17	0.83 *	2.75	4.50
SP2480 (SP2480)	20 fl oz	0, 7, 14	0.33	1.08 *	4.00	4.92	0.08	0.42	1.67 *	3.42	0.08	0.33 *	1.17 *	3.92
	30 fl oz	0, 7, 14	0.42	1.83	5.17	5.17	0	0.75	3.25	3.83	0.08	0.25 *	1.17 *	3.50
Nontreated uninoculated	-	-	0.17	0.33 *	0.5 *	0.75 *	0	0 *	0 *	0.17 *	0.17	0.33 *	0.50 *	0.42 *
Nontreated inoculated	-	-	0.25	2.67	5.42	5.17	0.08	1.00	4.33	3.58	0.25	1.67	3.58	4.42

<sup>x</sup> Disease severity was evaluated on a scale of 0 to 5 (where 0=no symptoms). Asterisk indicate significant differences within a column compared with Nontreated inoculated control (\*p<0.05) as assessed by one-way ANOVA with Dunnett’s test. No infection observed on Nov 26 so data was not included in table.

## Hydrangea

In 2016 and 2017, Baysal-Gurel studied the efficacy of several fungicides applied as foliar sprays for the control of Botrytis blight on hydrangea grown in a shadehouse. In 2016, fungicides were applied on a 10-day interval on Oct 4, 14 and 24. Hydrangea plants were inoculated by uniformly spraying foliage with conidia of *Botrytis cinerea* (FBG2015-02) (approximately  $3 \times 10^4$  conidia/ml) on Oct 5. All treatments were highly effective in reducing severity and AUDPC from a moderate disease pressure (Table 33). Final disease severity rating in plants treated with IKF-5411, regardless of rate, was significantly less than plants treated with Decree 50WDG.

In 2017, fungicides were applied on Jun 5 and reapplied on 7-, 10- or 14-days intervals. Three hydrangea leaves were collected from 4 single-plant replications per treatment on Jun 6, 13, 16, 20 and 27 and a plug of potato-dextrose agar (PDA) colonized with *Botrytis cinerea* was applied to the upper surface of detached leaf, and then placed in a moist chamber container. All treatments were highly effective in reducing mean lesion area compared to the non-treated, inoculated control. All products significantly reduced a low disease incidence on the final rating date, with Astun at the high rate comparable to non-inoculated check (Table 34). Astun provided better efficacy than the standard Decree. In both years, no phytotoxicity was observed from any treatment.

In 2018, Baysal-Gurel studied the efficacy of several fungicides applied as post-harvest dip treatments for the control of Botrytis blight on hydrangea grown in a shadehouse. Hydrangea cut flowers were evaluated on Jan 25, 28, 29, 30 and 31, 2019 for Botrytis blight severity and AUDPC. Botrytis blight disease pressure was low in this post-harvest dip trial with non-treated, inoculated control hydrangea flowers showing 16.7% disease severity by 31 Jan. All of the treatments significantly reduced Botrytis blight severity throughout the experiment compared to the non-treated, inoculated control (Table 35). All of the treatments with the exception of Regalia also significantly reduced AUDPC compared to the non-treated, inoculated control. Final disease severity rating in plants treated with Astun, BW165N, Chipco, both rates of SP 2480, Botector and Medallion were significantly less than plants treated with Oxiphos and Regalia. Phytotoxicity was not observed in any of the treated hydrangea flowers. But, chemical residue was observed on flowers treated with BW165N (dark chemical residue on flower petals) and Regalia (red or pink color on flower petals). The chemical residue impacted marketability and also shelf life (longevity) of white hydrangea flowers.

In 2019, Baysal-Gurel studied the efficacy of several fungicides applied as pre-harvest foliar treatments for post-harvest control of Botrytis blight on hydrangea grown in a shadehouse. The disease severity was calculated when flowers of Nontreated, inoculated control were high on severity (>75%). Orkestra Intrinsic and Astun provided excellent control, while other treatments were not statistically different than Nontreated, inoculated control (Table 36). Phytotoxicity was not observed in any of the treated hydrangea flowers. But, chemical residue was observed on flowers treated with BW165N (dark chemical residue on flower petals) and Regalia (red or pink color on flower petals). The chemical residue impacted marketability and also shelf life (longevity) of white hydrangea flowers.

**Table 33.\* Efficacy for *Botrytis cinerea* on Hydrangea (*Hydrangea macrophylla*) ‘Zaunkoenig’ x ‘Princess Juliana’, Baysal-Gurel, TN, 2016.**

Treatment	Rate Per 100 Gal	Disease severity (%) <sup>x</sup> 11/8	AUDPC
Decree 50WDG (fenhexamid)	1.5 lb	6.9 b	85.3 b
IKF-5411 (isofetamid)	10 fl oz	2.1 c	35.4 bc
IKF-5411 (isofetamid)	13.5 fl oz	1.6 c	9.2 c
IKF-5411 (isofetamid)	17 fl oz	0.3 c	0.9 c
Nontreated uninoculated	-	0.0 c**	0.0 c
Nontreated inoculated	-	43.8 a	612.5 a

\* Not an IR-4 Experiment: Plant Disease Management Reports 11:OT022.

<sup>x</sup> Disease severity and area under the disease progress curve (AUDPC) were based on percentage of the foliage area affected. Numbers in columns followed by the same letter are not significantly different based on Fisher’s LSD Test (P=0.05).

**Table 34.\* Efficacy for *Botrytis cinerea* on Hydrangea (*Hydrangea macrophylla*) ‘Zaunkoenig’ x ‘Princess Juliana’, Baysal-Gurel, TN, 2017.**

Treatment	Rate Per 100 Gal	Applic. Interval (days)	Botrytis blight Mean lesion area (cm <sup>2</sup> ) <sup>x</sup>				
			6/6	6/13	6/16	6/20	6/27
Astun™ SC (isofetamid)	10 fl oz	7	0.4 c	0.3 de	0.7 cd	0.9 c	1.6 c
Astun™ SC (isofetamid)	13.5 fl oz	10	0.3 c	1.1 c	0.6 d	0.8 c	1.1 d
Astun™ SC (isofetamid)	17 fl oz	14	0.3 c	0.8 cd	1.3 c	0.1 d	0.3 e
Decree 50WDG (fenhexamid)	1.5 lb/A	10	1.6 b	2.2 b	2.1 b	1.6 b	2.3 b
Nontreated uninoculated	-	-	0.0 c	0.0 e	0.0 d	0.0 d	0.0 e
Nontreated inoculated	-	-	5.6 a	5.5 a	6.2 a	6.5 a	6.3 a

\* Not an IR-4 Experiment: Plant Disease Management Reports 12:OT010.

<sup>x</sup> Numbers in columns followed by the same letter are not significantly different based on Fisher’s LSD Test (P=0.05).

**Table 35. Efficacy for *Botrytis cinerea* on Hydrangea (*Hydrangea macrophylla*) ‘White’, Baysal-Gurel, TN, 2018.**

Treatment	Rate Per 100 Gal	Disease severity (%) <sup>x</sup>	AUDPC	Longevity (days) <sup>y</sup>
Astun (isofetamid)	13.5 fl oz	0.8 c	2.6 d	10.0 a
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 and DSM 14941)	10 oz	2.7 c	7.7 cd	10.0 a
BW165N ( <i>Ulocladium oudemansii</i> U3) strain + Nufilm	3 lb	2.8 c	7.0 cd	7.0 b
Chipco 26019 (iprodione)	16 fl oz	2.7 c	9.7 cd	10.0 a
Medallion (fludioxonil)	4 oz	1.5 c	5.1 d	10.0 a
Oxiphos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)	1 gal	7.5 b	19.0 bc	9.8 a
Regalia (extract of <i>Reynoutria sachalinensis</i> )	1 gal	8.8 b	22.9 ab	4.2 c
SP 2480 + Capsil	20 fl oz + 4 fl oz	2.7 c	9.9 cd	10.0 a
	30 fl oz + 4 fl oz	1.8 c	5.7 d	10.0 a
Nontreated uninoculated	-	0.0 c	0.0 d	10.0 a
Nontreated inoculated	-	16.7 a	34.8 a	9.0 a

<sup>x</sup>Disease severity rating on a scale of 0 to 100%, where 0= No Disease 100= Completely covered. Numbers in columns followed by the same letter are not significantly different based on Fisher’s LSD Test (P=0.05).

<sup>y</sup>The vase life of hydrangea cut flowers was the period between harvest and time until the flower maintains marketability rating of 3 or higher.

**Table 36. Efficacy for *Botrytis cinerea* on Hydrangea (*Hydrangea macrophylla*) ‘Nikko Blue’, Baysal-Gurel, TN, 2019.**

Treatment	Rate Per 100 Gal	Disease severity (%) <sup>x</sup> 7/29	AUDPC	Longevity (days) <sup>y</sup>
Astun (isofetamid)	13.5 fl oz	22.0 bcd	101.6 bcd	10.4 abc
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 and DSM 14941)	10 oz	61.0 abc	401.5 a-d	6.4 bcd
Broadfoam (fluopyram + trifloxystrobin)	8 fl oz	86.0 a	490.0 ab	5.6 cd
BW165N ( <i>Ulocladium oudemansii</i> U3) strain + Nufilm	3 lb + 8 fl oz	64.0 abc	395.0 a-d	6.0 cd
Chipco 26019 (iprodione)	16 fl oz	75.0 ab	510.0 a	5.6 cd
Medallion (fludioxonil)	4 fl oz	61.0 abc	324.3 a-d	8.4 a-d
Orkestra Intrinsic (fluxapyroxad + pyraclostrobin)	8 fl oz	8.4 cd	67.3 cd	11.6 ab
Oxiphos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)	1 gal	90.0 a	568.5 a	4.6 d
Regalia (extract of <i>Reynoutria sachalinensis</i> )	1 gal	67.0 ab	411.0 abc	7.0 bcd
SP 2480 + Capsil	30 fl oz + 4 fl oz	56.0 abc	331.5 a-d	8.0 a-d
Nontreated uninoculated	-	2.4 d	11.8 d	13.2 a
Nontreated inoculated	-	98.0 a	694.0 a	3.6 d

<sup>x</sup>Disease severity rating on a scale of 0 to 100%, where 0= No Disease 100= Completely covered. Numbers in columns followed by the same letter are not significantly different based on Tukey’s Test (P=0.05).

<sup>y</sup>The vase life of hydrangea cut flowers was the period between harvest and time until the flower maintains marketability rating of 3 or higher.

### **Impatiens**

In 2017, Hand conducted a greenhouse experiment to determine efficacy of several fungicides applied as preventative foliar sprays for the control of *Botrytis cinerea* on impatiens. Treatments were applied weekly or biweekly starting Mar 14 according to the table below. One day after the initial application, plants were inoculated on Mar 15. Disease pressure was extremely low in this trial with severity values that were never above 3% throughout the trial period (Table 37). Significant growth reduction was observed with Pageant, S2200 and Tourney.

**Table 37. Efficacy for *Botrytis cinerea* on Impatiens (*Impatiens walleriana*) 'SuperElfin Lipstick', Hand, OH, 2017.**

Treatment	Rate Per 100 Gal	Application Dates	Disease severity (%)			
			3/21	3/28	4/4	4/11
Botector ( <i>Aureobasidium pullulans</i> )	8.0 oz	3/14, 21 and 28	0.31 ab	0.05 b	0.15 a	0.05 a
BW165N ( <i>Ulocladium oudemansii</i> ) + CapSil	3 lb + 6 fl oz	3/14, 21 and 28	0.02 b	0.52 ab	0.40 a	1.92 a
F9110 ( <i>Lupinus</i> extract)	45.7fl oz	3/14, 21 and 28	0.07 ab	1.10 ab	0.07 a	1.30 a
IKF-5411 (isofetamid)	13.5fl oz	3/14 and 28	0.03 b	0.55 ab	0.04 a	0.10 a
MBI 110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	3/14, 21 and 28	0.00 b	0.04 b	0.06 a	0.08 a
Orkestra Intrinsic (fluxapryoxad+pyraclostrobin)	8 fl oz	3/14 and 28	0.62 ab	1.38 ab	0.66 a	0.61 a
Pageant Intrinsic (boscalid + pyraclostrobin)	14 oz	3/14 and 28	0.71 a	2.37 a	0.68 a	0.05 a
Proud 3 (thyme oil)	1 gal	3/14, 21 and 28	0.00 b	0.04 b	0.02 a	2.13 a
S2200 (mandestrobin)	15 fl oz	3/14 and 28	0.11 ab	0.55 ab	0.31 a	0.00 a
Tourney(metconazole)	4 oz	3/14 and 28	0.08 ab	0.08 b	0.21 a	0.10 a
Nontreated uninoculated	-	-	0.00 b	0.00 b	0.41 a	1.55 a
Nontreated inoculated	-	-	0.70 a	1.90 ab	0.59 a	0.75 a

<sup>x</sup>Numbers in columns followed by the same letter are not significantly different based on Tukey HSD 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 38). Significant differences among treatments were not observed. No phytotoxicity was observed from any treatment.

**Table 38.\* Efficacy for *Botrytis cinerea* on Lisianthus (*Eustoma grandiflorum*) ‘Avila Purple’, Wegulo, CA, 2004.**

Treatment	Rate Per100 Gal	Disease Incidence (%) <sup>x</sup>		
		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
Nontreated	-	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.

<sup>x</sup> 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 39). 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 39. 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 <sup>z,y</sup>			
			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> ) <sup>x</sup>	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
Nontreated uninoculated	-	-	1.6 abc	1.8 a	2.1 a	3.3 a
Nontreated inoculated	-	-	2.1 a	1.6 a	2.0 a	3.9 a

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

<sup>y</sup> 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.

<sup>x</sup> 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 40). No significant phytotoxicity was observed from any treatment except Proud 3.

**Table 40. Efficacy for *Botrytis cinerea* on Pansy (*Viola x wittrockiana*), Ong, TX, 2015.**

Treatment	Rate Per 100 Gal	Disease Rating <sup>x</sup>	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
Nontreated non-inoculated	-	2.4 bc	0 b
Nontreated inoculated	-	4.4 b	0 b

<sup>x</sup> 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 41). 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 41. 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) <sup>z,y</sup>				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)	<b>*1.6(<math>\pm</math> 1.0)</b>	<b>*4.6(<math>\pm</math> 1.7)</b>	7.2
	8 oz	7 Days	0.0( $\pm$ 0)	0.0( $\pm$ 0)	<b>*0.9(<math>\pm</math> 0.4)</b>	<b>*3.7(<math>\pm</math> 1.4)</b>	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)	<b>*9.3(<math>\pm</math> 0.9)</b>	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) <sup>x</sup>	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)	<b>*5.3(<math>\pm</math> 0.9)</b>	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

<sup>z</sup>Bolded and asterisks values show results with statistical significance when compared to Nontreated 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.

<sup>y</sup>Total disease rating: scale of 0-10, where 0 = no infection, 10 = 100 % infection with *Botrytis* and powdery mildew.

<sup>x</sup> 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 42). No phytotoxicity was observed from any treatment.

**Table 42. \* Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*), 'Angelica White', Benson, NC, 1998.**

Treatment	Rate Per 100 Gal	Disease Severity (1-10) <sup>x,y</sup>				
		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
Nontreated uninoculated	-	1.2 b	1.7 c	2.3 bcd	2.3 bcd	2.6 bc
Nontreated 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.

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

<sup>y</sup> 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 43). 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 Lesco 78L was used with all Heritage applications. The day following fungicide application, plants were sprayed with a spore suspension of *Botrytis cinerea*. Compass, Daconil and all rates of Heritage provided excellent control of a high Botrytis blight severity (Table 44). No phytotoxicity was observed from any treatment.

**Table 43. \* Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*), 'Angelica White', Benson, NC, 1999a.**

Treatment	Rate Per 100 Gal	Disease Severity (1-10) <sup>x,y</sup>				
		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
Nontreated uninoculated	-	1.7 b	1.4 bc	1.4 c	1.6 c	2.0 cd
Nontreated 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.

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

<sup>y</sup> 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 44. \* Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*), 'Angelica White', Benson, NC, 1999b.**

Treatment	Rate Per 100 Gal	Disease Severity (1-10) <sup>x,y</sup>			
		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
Nontreated uninoculated	-	1.8 bc	2.1 bc	2.2 c	2.7 b
Nontreated inoculated	-	3.6 a	5.3 a	6.3 a	6.2 a

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

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

<sup>y</sup> 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 45). 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 45.\* Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*) ‘Prestige Red’, Beckerman, IN, 2008.**

Treatment	Rate Per 100 Gal	Disease Severity <sup>x, y</sup>		
		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
Nontreated uninoculated	-	8.8 f	19.5 e	27.0 f
Nontreated inoculated		48.5 a	58.0 a	71.0 a

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

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

<sup>y</sup> 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 Nontreated 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 46). 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 46.\* 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> <sup>x</sup>	Health Rating <sup>y</sup>
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
Nontreated 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.

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

<sup>y</sup> 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 2020, Hausbeck screened several fungicides for the control of Botrytis blight on greenhouse-grown poinsettia. Fungicides were applied as foliar sprays with CapSil on Jan 14, and plants inoculated 1 day after fungicide application. Disease pressure was severe in this experiment with the Nontreated inoculated control plants averaging 65.5% of bracts with sporulating *B. cinerea* on the Jan 28. The biocontrol product BWN165N was efficacious with the higher rate tested resulting in bracts with sporulating *B. cinerea* statistically similar to the industry standard product Broadform (Table 47). Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*) 'Prestige Red', Hausbeck, MI, 2020. The experimental product S2200 proved to be very effective in limiting *B. cinerea* with ratings statistically similar to Broadform, while Botector, EcoSwing, and SP2480 were ineffective. Poinsettias treated with Broadform were the only plants that would be considered marketable with an average rating of 0.2. Phytotoxicity and residue were not observed on any of the treated plants in this study.

**Table 47. Efficacy for *Botrytis cinerea* on Poinsettia (*Euphorbia pulcherrima*) 'Prestige Red', Hausbeck, MI, 2020.**

Treatment	Rate Per 100 Gal	Bracts Sporulating with <i>B. cinerea</i> <sup>x</sup>		Disease Severity <sup>y</sup>		Marketability
		1/21	1/28	1/21	1/28	
Botector WG ( <i>Aureobasidium pullulans</i> )	8 oz	17.0 bc	63.2 c	3.3 d	7.7 c	8.5 d
Broadform (fluopyram + trifloxystrobin)	8 fl oz	0.0 a	0.0 a	0.0 a	0.0 a	0.2 a
BW165N ( <i>Ulocladium oudemansii</i> strain U3)	3 lb	5.3 ab	29.0 b	1.7 bc	4.2 b	4.8 bc
	4 lb	3.8ab	11.5 ab	1.5 abc	3.0 b	3.3 b
EcoSwing ( <i>Swinglea glutinosa</i> )	2 pt	30.5 c	74.1 c	3.7 d	7.8 c	8.0 d
S2200 SC (mandestrobin)	7.5 fl oz	1.0 a	13.5 ab	0.5 ab	2.3 ab	3.0 ab
SP2480 (SP2480)	20 fl oz	31.0 c	74.1 c	4.0 d	8.0 c	8.5 d
	30 fl oz	17.1 bc	69.1 c	2.7 cd	6.8	7.5 cd
Nontreated inoculated	-	31.2 c <sup>z</sup>	65.5 c	4.2 d	7.5 c	8.0 d

<sup>x</sup> Means followed by same letter do not differ significantly based on Fishers protected LSD test (P=0.05).

<sup>y</sup> Rated on a scale of 1 to 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/30-50% defoliation, 7=large necrotic areas/51-70% defoliation, 8=large necrotic areas/71-90% defoliation, 9=>91% defoliation, 10=plant death.

<sup>z</sup> Marketability rated on a scale of 0-10; 0-2=still acceptable for retail sale; 3-10=increased levels of damage that would result in a plant not marketable for wholesale or retail.

### **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 48). 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 Nontreated control in the percentage of infected leaves. No phytotoxicity was observed from any treatment.



**Table 48.\* Efficacy for *Botrytis cinerea* on Primrose (*Primula acaulis*) 'Orion Mix', Hausbeck, MI, 2007.**

Treatment	Rate Per 100 Gal	Infected Leaves (%) <sup>x</sup>	Number of Sporulating Lesions	Disease Severity <sup>y</sup>
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
Nontreated 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.

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

<sup>y</sup> 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 49). No phytotoxicity was observed from any treatment.

**Table 49.\* Efficacy for *Botrytis cinerea* on Chrysanthemum (*Chrysanthemum x morifolium*) 'Brandt', Buck, GA, 2008.**

Treatment	Rate Per 100 Gal	Infected Flowers (%) <sup>x</sup>
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
Nontreated inoculated	-	51.0 a

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

<sup>x</sup> 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 50); 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 51); however, there was no statistical difference among treatments. No phytotoxicity was observed from any treatment.

**Table 50. Efficacy for *Botrytis cinerea* on Douglas Fir (*Pseudotsuga menziesii*), Lambe, WA, 2000.**

Treatment	Rate Per100 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
Nontreated	-	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 51. Efficacy for *Botrytis cinerea* on Douglas Fir (*Pseudotsuga menziesii*), Lambe, WA, 2001.**

Treatment	Rate Per100 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
Nontreated 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 52). 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 53 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 44 F. Disease pressure was low and variable in this experiment, and none of the treatments were significantly different than the Nontreated checks (Table 53, Table 54). Seedlings treated with Dithane had significantly higher visual residue ratings as compared to the Nontreated checks. No phytotoxicity was observed from any treatment, except Zeritol causing yellowing and browning to needles.

**Table 52. Efficacy for *Botrytis cinerea* on Douglas Fir (*Pseudotsuga menziesii*), Lambe, WA, 2005.**

Treatment	Rate Per 100 Gal	% Diseased <sup>x,y</sup>		Phytotoxicity <sup>z</sup>	
		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
Nontreated uninoculated	-	5.3 abc	4.2 abc	na	na
Nontreated inoculated	-	1.5 a	2.6 a	na	na

<sup>x</sup> Means followed by the same letter do not differ significantly at the 0.05 level.

<sup>y</sup> Seedlings with sporulating lesions on the needles were counted as diseased.

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

**Table 53. Efficacy for *Botrytis cinerea* on Douglas Fir (*Pseudotsuga menziesii*), Chastagner WA, 2016.**

Treatment	Rate Per 100 Gal	Applic Interval	Applic Dates	Disease Severity <sup>z</sup>	Top Quality <sup>y</sup>	Cross Section Quality <sup>y</sup>	Fungicide Residue <sup>x</sup>	Phytotoxicity <sup>w</sup>
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

<sup>z</sup> 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).

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

<sup>x</sup> 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.

<sup>w</sup> 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 54. 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 <sup>x</sup>	Disease Severity <sup>y</sup>
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

<sup>x</sup> 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).

<sup>y</sup> 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 55). Significant differences among treatments were not observed. No phytotoxicity was observed from any treatment.

**Table 55.\* Efficacy for *Botrytis cinerea* on Rose (*Rosa* sp) ‘Mr. Lincoln’, Wegulo, NE, 2006.**

Treatment	Rate Per 100 Gal	Disease Severity <sup>x,y</sup>			
		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
Nontreated	-	4.4 a	3.8 a	2.5 a	2.9 a

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

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

<sup>y</sup> Rating of 0 to 5 scale with 0 representing no visible signs of disease and 5 representing 100% flower blight.

## Vinca

In 2018, Beckerman conducted a greenhouse experiment to determine efficacy of several fungicides for the control of *Botrytis* blight on vinca. Fungicides were sprayed biweekly from Apr 9 until Jun 7, and plants inoculated with *Botrytis cinerea* on Apr 10 and 2 weeks later. Disease evaluations were performed weekly. Incidence was recorded as percent area of the plant with visible disease such as lesions. Severity was recorded as percent of the plant that was affected by disease. Disease pressure was low to moderate, and infection developed on all plants across all treatments. There were significant differences between the control and plants treated with fungicides for disease incidence but not severity. This may suggest that treating the plants with these fungicides may slow the development of the disease more than prevent infection (Table 56. \* Efficacy for *Botrytis cinerea* on Vinca (*Catharanthus roseus*), ‘Cora Cascade Peach Blush’, Beckerman, IN, 2018.). This variety of vinca, with much more substantial leaves, appears more resistant to gray mold than previously tested cultivars, in addition to its known resistance to some species of *Phytophthora*.

**Table 56. \* Efficacy for *Botrytis cinerea* on Vinca (*Catharanthus roseus*), ‘Cora Cascade Peach Blush’, Beckerman, IN, 2018.**

Treatment	Rate Per 100 Gal	% Incidence <sup>x</sup>			% Severity <sup>x</sup>		
		7 DAI	30 DAI	52 DAI	7 DAI	30 DAI	52 DAI
Broadform SC (fluopyram + trifloxystrobin)	4 fl oz	1.2 ab	7.4 ab	8.2 b	0	7.4 a	8.2 a
	6 fl oz	1.4 ab	6.0 ab	8.0 b	0	5.4 a	8.0 a
	8 fl oz	1.2 ab	5.4 b	7.4 b	0	6.0 a	7.4 a
Mural WG (azoxystrobin + benzovindiflupyr)	5.5oz	0.6 b	7.2 ab	6.6 b	0	7.2 a	6.6 a
Pageant WG (pyraclostrobin + boscalid)	15 oz	0.4 b	5.5 ab	7.3 b	0	5.5 a	7.3 a
Palladium WG (cyprodinil + fludioxonil)	5 oz	0.8 b	7.6 a	7.3 b	0	25.6 a	29.8 a
Orkestra Intrinsic SC (fluxapyroxad + pyraclostrobin)	8 fl oz	0.6 b	6.8 ab	7.6 b	0	6.8 a	7.6 a
Nontreated inoculated	-	2.8 a <sup>y</sup>	6.2 ab	13.8 a	0	6.2 a	13.8 a

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

## 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 57); however results were not statistically different from Nontreated controls. No phytotoxicity was observed from any treatment. In the 2001 experiment, Switch significantly reduced the percentage of plants infected under moderate to high *Botrytis* infection of needles (Table 58). No phytotoxicity was observed from any treatment.

**Table 57. 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
Nontreated	-	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 58. 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
Nontreated 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 59). Milstop, Phyton 27 and STBX-304 were ineffective. No phytotoxicity was observed from any treatment except Phyton 27 and STBX-304.

In 2017, Chastagner conducted a study to determine the efficacy of 31 products for control of gray mold caused by *Botrytis cinerea* on 2- yr-old container-grown western hemlock seedlings. All fungicides were applied as foliar sprays one day before disease inoculation. Affirm, Broadform and Spectro 90 were the most effective treatments, with Pageant, Daconil WS, Picatina Gold, Cleary's 3336, Orkestra, Decree 50WDG, Palladium, Astun, Medallion WDG, Tournay, Chipco 26019, Botector, Empress, Fore and Mural also providing significant to excellent control (Table 60. Efficacy for *Botrytis cinerea* on Western Hemlock (*Tsuga heterophylla*), Chastagner WA, 2017.). Botector was the only biopesticide that provided some significant efficacy.



**Table 59. Efficacy for *Botrytis cinerea* on Western Hemlock (*Tsuga heterophylla*), Lambe, WA, 2005.**

Treatment	Rate Per 100 Gal	% Diseased <sup>x,y</sup>		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
Nontreated uninoculated	-	4.3 b	3.5 ef	na	na
Nontreated inoculated	-	2.0 ab	2.7 de	na	na

<sup>x</sup> Means followed by the same letter do not differ significantly at the 0.05 level.

<sup>y</sup> Seedlings with sporulating lesions on the needles were counted as diseased.

**Table 60. Efficacy for *Botrytis cinerea* on Western Hemlock (*Tsuga heterophylla*), Chastagner WA, 2017.**

Treatment	Rate Per 100 Gal	Disease Incidence <sup>x</sup>		Severity <sup>y</sup>	Overall Level <sup>z</sup>
		5 DPI <sup>w</sup>	29 DPI	29 DPI	
Affirm (polyoxin D)	8 oz	0.2 ab	0.3 ab	0.1 a	0.1 a
Astun (isofetamid)	13.5 fl oz	1.0 ab	1.1 ab	0.8 abc	1.8 ab
Botector ( <i>Aureobasidium pullulans</i> )	10 oz	7.8 gh	7.7 ef	1.8 a-e	14.0 a-d
Broadform (fluopyram + trifloxystrobin)	8 fl oz	0.0 a	0.1 a	0.0 a	0.0 a
BW165N ( <i>Ulocladium oudemansii</i> strain U3)	3 lb	10.0 i	10.0 g	5.8 h-k	58.0 fgh
	4 lb	9.8 i	9.9 g	5.4 g-k	53.9 e-h
Chipco 26019 F (iprodione)	16 fl oz	3.4 de	3.0 cd	1.9 a-f	8.3 abc
Cleary's 3336 (thiophanate methyl)	16 fl oz	0.7 ab	0.6 ab	0.3 ab	0.5 ab
Daconil Weatherstik (chlorothalonil)	2 3/4 pt	0.0 a	0.5 ab	0.5 ab	0.5 ab
Decree (fenhexamid)	1.5 lb	0.6 ab	0.8 ab	0.5 ab	0.7 ab
EcoSwing ( <i>Swinglea glutinosa</i> )	2 pt	10.0 i	10.0 g	6.7 jk	67.0 gh
Empress (pyraclostrobin)	6 fl oz	5.3 ef	7.2 e	1.6 a-e	12.7 abc
Fame SC (fluoxastrobin)	8 fl oz	5.4 f	8.5 efg	3.0 b-g	27.5 b-e
Fore (mancozeb)	2 lb	3.2 cd	3.2 d	0.9 a-d	3.8 ab
Heritage (azoxystrobin)	4 oz	6.6 fg	8.9 efg	3.5 c-h	33.5 c-f
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	9.9 i	10.0 g	4.7 g-j	47.0 efg
Medallion (fludioxonil)	4 oz	1.3 abc	1.2 abc	0.8 abc	1.2 ab
Mural (azoxystrobin + benzovindiflupyr)	7 oz	2.1 bcd	2.1 bcd	0.7 ab	1.7 ab
Orkestra (fluxapyroxad + pyraclostrobin)	8 fl oz	0.6 ab	0.6 ab	0.3 ab	0.4 ab
OxiPhos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)	1 gal	9.7 hi	9.9 g	5.8 h-k	57.7 fgh
Pageant 38WG (pyraclostrobin+boscalid)	14 oz	0.1 ab	0.3 ab	0.3 ab	0.3 ab
Palladium (cyprodinil + fludioxonil)	6 oz	0.4 ab	0.8 ab	0.6 ab	0.8 ab
Picatina Flora (pydiflumetofen + fludioxonil)	13.7 fl oz	0.2 ab	0.5 ab	0.5 ab	0.5 ab
Proud 3 (thyme oil)	1 gal	10.0 i	10.0 g	4.1 e-j	41.0 d-g
Regalia (Extract of <i>Reynoutria sachalinensis</i> )	1 gal	9.0 hi	9.2 fg	3.6 d-i	33.9 c-f
Regime/F9110 ( <i>Lupinus</i> extract)	45.7 fl oz	10.0 i	10.0 g	6.3 ijk	63.0 gh
SP2480 (SP2480)	20 fl oz	10.0 i	10.0 g	5.8 h-k	58.0 fgh
	30 fl oz	9.9 i	10.0 g	7.6 k	76.0 h
Spectro 90 (chlorothalonil + thiophanate methyl)	5.7 lb	0.1 ab	0.2 a	0.1 a	0.1 a
Triathlon ( <i>Bacillus amyloliquefaciens</i> strain D747)	6 qt	9.3 hi	9.8 g	4.6 f-j	45.4 efg
Trinity 2SC (triticonazole)	12 fl oz	9.3 hi	9.7 g	5.3 g-k	52.4 e-h
Tourney (metconazole)	4 oz	0.7 ab	1.2 abc	0.6 ab	0.8 ab
ZeroTol 2.0 (hydrogen dioxide+peroxyacetic acid)	2 gal	10.0 i	10.0 g	6.7jk	67.0 gh
Uninoculated check	-	0.0 a	0.0 a	0.0 a	0.0 a
Inoculated check	-	10.0 i	10.0 g	5.2 g-k	52.0 e-h

<sup>x</sup>The incidence of diseased shoot tips was rated on a scale of 0 to 10 (0=none, 1= 1-10%, 2=11- 20%, 3=21-30%, .... and 10=91- 100% of the tips were blighted. Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

<sup>w</sup>Days post inoculation

<sup>y</sup>The severity of symptom development was rated on a scale of 0 to 10 (0=no symptoms, 1=symptoms restricted to the tips of the shoots, 5=50%, and 10=100% of the shoots blighted).

<sup>z</sup>To estimate the overall level of disease on the seedlings, the incidence rating was multiplied by the severity rating, resulting in a disease index that ranged from 0 to 100.

### **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 61, Table 62). 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 61). 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 62). 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 63). The standard Decree and all other products looked ineffective. There were no significant differences in initial or final plant height.

In 2015, Catlin conducted a greenhouse trial to test the efficacy of several fungicides for the control of *B. elliptica* on an Asiatic hybrid lily cultivar ‘Dazzle’. Treatments were applied every 2 weeks for 7 weeks, starting on Jul 16 (27 d after planting), with the exception of F9110, MBI 110, Proud 3, and Decree, which were applied weekly. Plants were evaluated for disease symptoms weekly from Jul 16 to Sep 1; virtually no disease occurred in the first 4 weeks and data were not included in Table 64. Orkestra / BAS 703, Mural, NUP 09092 and S2200 provided the best control of a severe disease pressure, with severity ratings comparable to the uninoculated check. The standard Decree and all other products looked ineffective. There were no significant differences in initial or final plant height. Mural and S2200 caused bleached, necrotic spots and patches on flowers so these should not be recommended for lilies in bloom.

In 2016, Catlin conducted a greenhouse trial to test the efficacy of several fungicides for the control of *B. elliptica* on an Asiatic hybrid lily cultivar ‘Gironde’. Treatments were applied every 1 or 2 weeks for 5 weeks, starting on Jul 27 (29 d after planting). Botector, MBI 110, Prophytex, Proud, Decree and F9110 and were applied weekly, the other treatments were applied every other week. At all evaluations the treatments with significantly fewer affected leaves and significantly lower disease severity ratings were Orkestra / BAS 703, NUP09092, S2200 and Mural (Table 65). All other treatments were not significantly different from the inoculated control. Of the treatments with good efficacy, NUP09092 generally had the best performance across all evaluation dates, followed by Orkestra / BAS 703 and the high rate of S2200. No significant differences in height were found.

In 2017, Catlin conducted a greenhouse trial to test the efficacy of several fungicides for the control of *B. elliptica* on an Asiatic hybrid lily cultivar ‘Vermeer’. Treatments were applied weekly for 5 weeks, with

the exception of Orkestra and S2200, starting on Jul 19 (36 d after planting). At all evaluations the treatments with significantly fewer affected leaves and significantly lower disease severity ratings were Orkestra, IKF-5411 and S2200 (Table 66). All other treatments were not significantly different from the inoculated control for this severe disease pressure. BW 165N, MBI 110, Prophytex EC and WP, and Affirm) may provide some suppression and management at lower disease pressures. No phytotoxicity symptoms were observed on the flowers or foliage throughout the trial. There were no significant differences in initial or final height, and no significant difference between disease incidence or severity on flowers.

**Table 61. Efficacy for *Botrytis elliptica* on Asiatic Hybrid Lily (*Lilium sp.*), ‘Elite’, Chastagner WA, 2011.**

<b>Treatment</b>	<b>Rate Per 100 Gal</b>	<b>Application Dates<sup>y</sup></b>	<b>Application Interval</b>	<b>Length Foliardieback (cm)<sup>x</sup> 8/8/11</b>	<b>DiseaseSeverity 8/8/11</b>
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
Nontreated Check	-	-	-	14.8 a	2.28 a

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

<sup>y</sup> 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 62. Efficacy for *Botrytis elliptica* on Asiatic Hybrid Lily (*Lilium sp.*), 'London', Chastagner WA, 2012.**

Treatment	Rate Per 100 Gal	Application Dates <sup>z</sup>	Application Interval	Disease Incidence <sup>y</sup> 9/19/12	Foliage Dieback 10/4/12	Disease Severity 10/4/12	Growth (cm) <sup>x</sup>
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> ) <sup>w</sup>	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
Nontreated Check	-	-	-	9.3 a	4.8 a	4.3 a	15.3 a

<sup>z</sup> 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

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

<sup>x</sup> Numbers represent the difference between average plant heights taken on June 11 and July 26, 2012.

<sup>w</sup> This Regalia rate is lower than the lowest labeled rate of 2 quarts per 100 gal.

**Table 63. Efficacy for *Botrytis elliptica* on Asiatic Hybrid Lily (*Lilium sp.*), 'Vermeer', Catlin, NY, 2014.**

Treatment	Rate Per 100 Gal	Disease Severity Rating <sup>x</sup>				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 fl 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
Nontreated uninoculated	-	0.1 bc	0.4 bc	0.9 c	1.3 b	25.0 a	27.8 a
Nontreated inoculated	-	1.3 a	2.6 a	5.0 a	8.3 a	24.6 a	27.1 a

<sup>x</sup> 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).

**Table 64. Efficacy for *Botrytis elliptica* on Asiatic Hybrid Lily (*Lilium sp.*), ‘Dazzle’, Catlin, NY, 2015.**

Treatment	Rate Per 100 Gal	Disease Severity Rating <sup>x</sup>				Height (in)		Width (in)	
		8/14	8/20	8/25	9/1	Initial	Final	Initial	Final
Orkestra/BAS 703 06F (fluxapyroxad + pyraclostrobin)	8 fl oz	0.1 a	0.3 a	0.5 c	1.0 b	55.6 a	73.6 a	18.9 a	21.3
Decree (fenhexamid)	1.5 lb	0.1 a	0.5 a	3.5 b	6.6 a	55.1 a	74.2 a	18.8 a	21.0 a
F9110 (extract of <i>Lupinus</i> )	24 fl oz	0.4 a	0.5 a	3.9 ab	6.5 a	54.8 a	70.1 ab	18.1 a	21.1 a
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	1 gal	0.5 a	0.9 a	5.0 a	6.5 a	53.5 a	70.5 ab	18.9 a	21.1 a
Mural (azoxystrobin + benzovindiflupyr)	7 oz	0.3 a	0.3 a	0.9 c	2.4 b	55.4 a	75.3 a	18.8 a	21.9 a
NUP09092 (fludioxonil)	4 oz	0.3 a	0.5 a	1.0 c	1.9 b	54.4 a	74.0 a	19.5 a	22.3 a
	8 oz	0.1 a	0.5 a	0.8 c	1.1 b	55.1 a	74.2 a	18.0 a	20.4 a
Proud 3 (thyme oil)	1 gal	0.4 a	1.0 a	4.9 ab	6.9 a	55.2 a	70.5 ab	18.6 a	20.4 a
S2200 (mandestrobin)	7.5 oz	0.1 a	0.4 a	0.6 c	2.4 b	54.1 a	74.3 a	18.0 a	21.1 a
	15 oz	0 a	0.4 a	0.8 c	1.4 b	56.4 a	75.9 a	18.6 a	22.2 a
Nontreated uninoculated	-	0 a	0.1 a	0.8 c	1.3 b	52.4 a	62.1 b	18.3 a	20.1 a
Nontreated inoculated	-	0.1 a	0.8 a	5.0 a	6.9 a	57.0 a	76.8 a	19.4 a	21.8 a

<sup>x</sup> 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).



**Table 65. Efficacy for *Botrytis elliptica* on Asiatic Hybrid Lily (*Lilium sp.*), ‘Gironde’, Catlin, NY, 2016.**

Treatment	Rate Per 100 Gal	8/3	8/9	8/15	8/24	8/30	9/6
<i>Disease Severity Rating</i> <sup>x</sup>							
Orkestra/BAS 703 06F (fluxapyroxad + pyraclostrobin)	8 fl oz	0.3 c	1.5 cd	2.0 cd	2.3 cde	2.5 bcd	3.0 cd
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 and DSM 14941)	10 oz	4.6 ab	5.6 a	6.8 a	7.0 ab	8.0 a	8.6 a
Decree (fenhexamid)	1.5 lb	4.8 ab	6.2 a	7.2 a	7.5 ab	8.0 a	8.2 a
F9110 (extract of <i>Lupinus</i> )	24 fl oz	5.3 ab	6.6 a	7.5 a	7.6 ab	8.6 a	8.6 a
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	5.3 ab	6.5 a	7.5 a	8.0 ab	8.8 a	9.2 a
Mural (azoxystrobin + benzovindiflupyr)	7 oz	1.2 c	3.3 b	3.3 b	4.0 c	3.6 bc	6.0 b
NUP09092 (fludioxonil)	4 oz	0.0 c	0.6 d	1.2 cd	1.3 de	1.6 de	2.5 d
Prophytex EC ( <i>Bacillus subtilis</i> )	40 fl oz	4.6 ab	6.3 a	6.6 a	7.8 ab	8.0 a	8.8 a
Prophytex WP ( <i>Bacillus subtilis</i> )	20 oz	3.5 b	5.8 a	5.8 a	6.2 b	7.3 a	8.0 a
Proud 3 (thyme oil)	1 gal	6.2 a	7.0 a	7.6 a	8.3 a	8.8 a	9.6 a
S2200 (mandestrobin)	7.5 oz	0.2 c	2.0 bc	2.8 bc	3.4 cd	4.0 b	4.6 bc
	15 oz	0.3 c	1.5 cd	1.8 cd	2.3 cde	2.0 cde	2.8 cd
Nontreated uninoculated	-	0.0 c	0.0 d	0.0 d	0.6 e	0.5 e	1.2 d
Nontreated inoculated	-	4.6 ab	6.3 a	6.6 a	7.2 ab	7.6 a	8.4 a
<i>Number of Leaves Affected</i>							
Orkestra/BAS 703 06F (fluxapyroxad + pyraclostrobin)	8 fl oz	0.5 c	7.5 cd	11.5 cde	10.3 cd	8.2 bcd	11.5 bc
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 and DSM 14941)	10 oz	36.3 b	47.8 a	52.2 ab	55.3 a	48.0 a	52.8 a
Decree (fenhexamid)	1.5 lb	33.8 ab	54.5 a	59.5 a	57.2 a	53.8 a	53.8 a
F9110 (extract of <i>Lupinus</i> )	24 fl oz	39.2 ab	55.0 a	55.8 ab	56.8 a	51.6 a	54.5 a
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	38.0 ab	50.5 a	52.0 ab	53.0 a	45.3 a	49.0 a
Mural (azoxystrobin + benzovindiflupyr)	7 oz	2.8 c	21.8 b	23.3 c	24.0 b	20.6 b	21.3 b
NUP09092 (fludioxonil)	4 oz	0.0 c	4.2 cd	4.6 de	7.5 cd	4.6 cd	8.8 c
Prophytex EC ( <i>Bacillus subtilis</i> )	40 fl oz	29.8 ab	46.0 a	47.6 ab	53.6 a	44.6 a	50.2 a
Prophytex WP ( <i>Bacillus subtilis</i> )	20 oz	22.6 b	44.3 a	46.2 b	50.0 a	44.6 a	43.2 a
Proud 3 (thyme oil)	1 gal	40.5 a	55.3 a	55.6 ab	58.5 a	52.3 a	51.6 a
S2200 (mandestrobin)	7.5 oz	0.2 c	14.3 b	17.6 cd	17.8 bc	17.2 bc	22.6 b
	15 oz	0.3 c	8.8 bcd	12.0 cde	10.5 cd	9.2 bcd	12.2 bc
Nontreated uninoculated	-	0.0 c	0.0 d	0.0 e	1.3 d	0.6 d	7.0 c
Nontreated inoculated	-	31.6 ab	53.2 a	56.2 ab	51.6 a	52.4 a	51.2 a

<sup>x</sup> Rated on a scale from 0 to 10 where 0=no symptoms and 10= most. Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

**Table 66. Efficacy for *Botrytis elliptica* on Asiatic Hybrid Lily (*Lilium sp.*), ‘Vermeer’, Catlin, NY, 2017.**

Treatment	Rate Per 100 Gal	No. With Symptoms				Disease Severity Rating <sup>x</sup>			
		8/1	8/8	8/15	8/22	8/1	8/8	8/15	8/22
<i>Leaves</i>									
Affirm (polyoxin D)	8 oz	12.2 abc	16.8 ab	21.4 abc	72.4 ab	2.8 a	3.2 a	4.4 bc	7.8 a
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 and DSM 14941)	10 oz	10.4 abc	17.2 ab	23.2 abc	83.8 ab	2.4 a	4.0 a	5.0 abc	8.6 a
BW165N ( <i>Ulocladium oudemansii</i> U3/g)	3 lb	13.4 abc	18.4 ab	29.8 ab	68.8 b	2.4 a	3.2 a	4.0 c	8.0 a
Decree (fenhexamid)	1.5 lb	16.8 ab	24.6 a	30.8 a	66 ab	3.6 a	4.4 a	6.4 ab	7.8 a
F9110 (extract of <i>Lupinus</i> )	24 fl oz	19.2 a	28.6 a	33 a	71.6 ab	3.6 a	4.4 a	5.4 abc	7.8 a
IKF-5411 (isofetamid)	13.5 oz	0.2 bc	1 b	1.4 bc	3 c	0.2 b	0.8 b	0.6 d	1.4 bc
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	12.6 abc	18.2 ab	24.8 abc	71 ab	2.6 a	3.6 a	5.0 abc	8.4 a
Orkestra/BAS 703 06F (fluxapyroxad + pyraclostrobin)	8 fl oz	0 bc	0.4 b	0.6 c	0.8 c	0 b	0.2 b	0.4 d	0.4 c
Prophytex EC ( <i>Bacillus subtilis</i> )	40 fl oz	5.8 abc	9.25 ab	20.3 a	64.8 ab	2.5 a	2.8 a	5.3 abc	8.0 a
Prophytex WP ( <i>Bacillus subtilis</i> )	20 oz	9 abc	16.3 ab	22 abc	77.3 ab	2.5 a	2.8 a	5.0 abc	8.5 a
Proud 3 (thyme oil)	1 gal	14.8 abc	18.2 ab	27.8 ab	82 ab	3.2 a	3.8 a	5.8 abc	8.6 a
S2200 (mandestrobin)	7.5 oz	0.2 bc	0.4 b	1.2 c	6.6 c	0.2 b	0.4 b	0.6 d	2.8 b
Nontreated uninoculated	-	0 bc	0.2 b	0 c	0 c	0 b	0.2 b	0 d	0 c
Nontreated inoculated	-	18.2 a	26.8 a	47.8 a	88 a	3.2 a	4.0 a	6.8 a	9.2 a
<i>Flowers</i>									
Affirm (polyoxin D)	8 fl oz	n/a	0.2 a	2.5 a	n/a	n/a	0.4 a	4.0 a	n/a
Botector ( <i>Aureobasidium pullulans</i> strain DSM 14940 and DSM 14941)	10 oz	n/a	0.6 a	1.8 ab	n/a	n/a	0.8 a	3.5 a	n/a
BW165N ( <i>Ulocladium oudemansii</i> U3/g)	3 lb	n/a	0.4 a	1.8 ab	n/a	n/a	0.8 a	3.75 a	n/a
Decree (fenhexamid)	1.5 lb	n/a	0.5 a	2.0 ab	1.0	n/a	0.5 a	3.2 a	5.0
F9110 (extract of <i>Lupinus</i> )	24 fl oz	n/a	0 a	1.2 ab	n/a	n/a	0 a	4.0 a	n/a
IKF-5411 (isofetamid)	13.5 oz	0	0.8 a	1.8 ab	n/a	0	1.2 a	3.2 a	n/a
MBI-110 ( <i>Bacillus amyloliquifaciens</i> strain F727)	6 qt	0	0.4 a	1.5 ab	n/a	0	0.8 a	3.0 a	n/a
Orkestra/BAS 703 06F (fluxapyroxad + pyraclostrobin)	8 oz	n/a	0 a	2.4 a	1.0	n/a	0 a	3.0 a	2.0
Prophytex EC ( <i>Bacillus subtilis</i> )	40 fl oz	n/a	0 a	1.5 ab	n/a	n/a	0 a	3.0 a	n/a
Prophytex WP ( <i>Bacillus subtilis</i> )	20 oz	n/a	0.5 a	1.5 ab	n/a	n/a	1.0 a	3.0 a	n/a
Proud 3 (thyme oil)	1 gal	n/a	0.2 a	1.4 ab	n/a	n/a	0.2 a	3.8 a	n/a
S2200 (mandestrobin)	7.5 oz	n/a	0 a	1.6 ab	n/a	n/a	0 a	3.2 a	n/a
Nontreated uninoculated	-	n/a	0 a	0.8 b	n/a	n/a	0 a	3.4 a	n/a
Nontreated inoculated	-	n/a	0.2 a	1.2 ab	n/a	n/a	0.2 a	3.2 a	n/a

<sup>x</sup> 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 67 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 67). 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 nontreated check. Torque, Pageant, Disarm, DaconilWeatherStik, Kocide, Trinity, Palladium, and SP2773 were the most effective materials tested. Compared to the Nontreated 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 63 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 68). 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 Nontreated 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 65 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 70). However, sufficient red spot or blotch infection, caused by *Graphiopsis chlorocephala* (formerly *Cladosporium paeoniae*), 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 Nontreated 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 2017, 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 71 for specific intervals and dates). As in 2016, none of the treatments affected Botrytis rating (Table 71). For red spot, caused by *Graphiopsis chlorocephala*, Orkestra, Palladium, and S2200 at the high rate had significantly less incidence than the Nontreated 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 (Figure 1). 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 (Figure 1). 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 67. Efficacy for *Botrytis paeoniae* on Peony (*Paeonia* sp.), Chastagner WA, 2013.**

Treatment	Rate Per 100 Gal	Application Dates <sup>z</sup>	Severity Ratings <sup>x,y</sup> 7/2/13			Plant Vigor <sup>w</sup>
			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
Nontreated Check	-	-	5.5 a	0.0 a	0.4 ab	2.3 ab

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

<sup>y</sup> 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.

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

<sup>z</sup> 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 68. Efficacy for *Botrytis paeoniae* on Peony (*Paeonia* sp.), 'Coral Sunset', Chastagner WA, 2014.**

Treatment	Rate Per 100 Gal	Application Interval	Application Dates <sup>z</sup>	Disease Severity <sup>x</sup>	Plant Quality <sup>w</sup>	Residues <sup>y</sup>
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 5O ( <i>Reynoutriasachalinensis</i> extract) <sup>v</sup>	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
Nontreated non-inoculated	-	-	-	2.4 a	2.4 a	0.0 e
Nontreated inoculated	-	-	-	1.2 a	3.0 a	0.0 e

<sup>x</sup> 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).

<sup>y</sup> 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.

<sup>w</sup> 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.

<sup>z</sup> 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.

<sup>v</sup>This Regalia rate is lower than the lowest labeled rate of 2 quarts per 100 gal.

**Table 69. 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 <sup>x</sup>	Botrytis Ratings		Plant Quality <sup>w</sup>	Fungicide Residue <sup>z</sup>
					Leaf Lesion Incidence <sup>x</sup>	Stem Dieback Severity <sup>y</sup>		
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 amyloliquifaciens</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

<sup>x</sup> 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).

<sup>y</sup> Rated on a scale of 0 to 10 scale, where 0 = no dieback and 10 = 91 to 100% of the foliage is dead.

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

<sup>z</sup> 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 70. 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 <sup>x</sup>		Plant Quality <sup>y</sup>
				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
Nontreated check	-	-	-	5.0 ab	1.6 a	1.0 d

<sup>x</sup> 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).

<sup>y</sup> 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 71. 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 <sup>x</sup>	Incidence of <i>Botrytis</i> on the foliage <sup>y</sup>	Incidence of red spots on foliage	Fungicide Residue <sup>z</sup>
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
Nontreated Check	-	-	-	14.5 ab	1.0 ab	2.0 ab	0.0 b

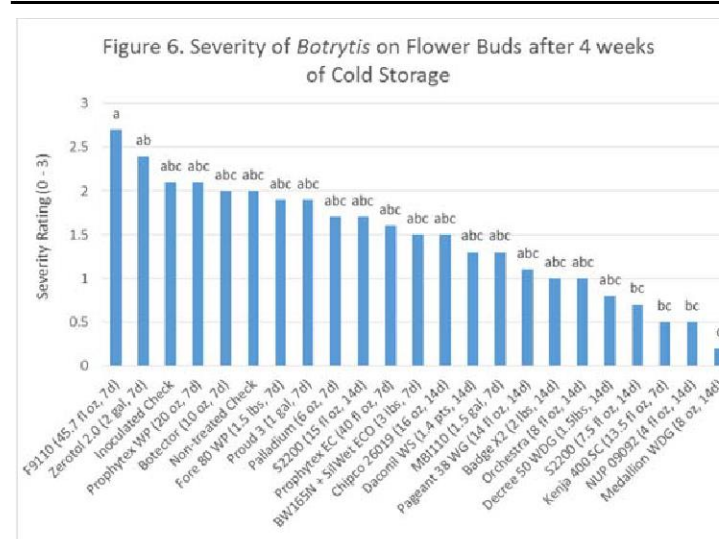
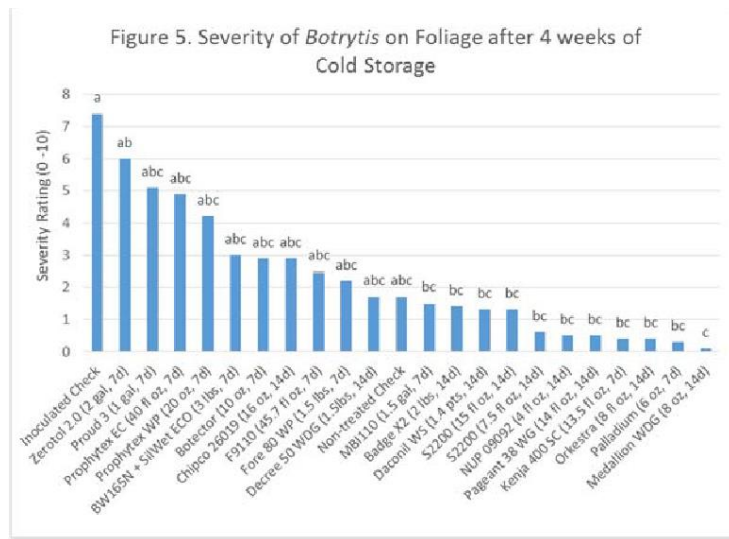
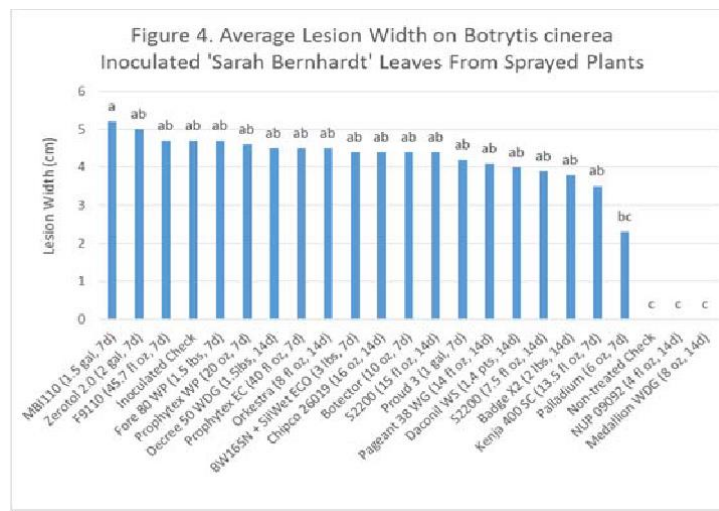
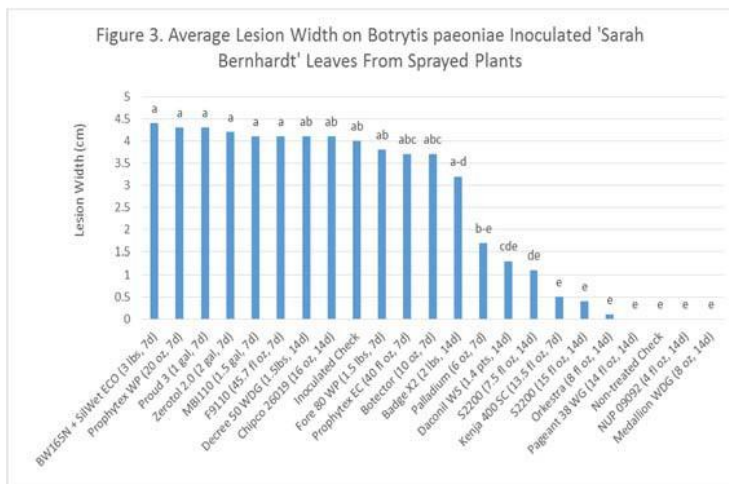
<sup>x</sup> Means followed by the same letter do not differ significantly based on Tukey's HSD Test, (P=0.05).

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

<sup>z</sup> 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, 2017.**



In 2018, Beckerman studied the efficacy of several fungicides for control of *Botrytis* spp. on peony. Fungicides were sprayed biweekly from Apr 30 until Aug 22. Disease evaluation of the plants occurred on a weekly basis starting Jun 19 and ending Sep 10. BASF 750 at all rates and Orkestra Intrinsic offered better protection of leaves from a severe disease pressure throughout the growing season; Broadform provided control for a month while Serenade Opti, was ineffective (**Error! Reference source not found.**). Results suggest that treatment with BASF 750, Orkestra Intrinsic or Broadform provide better protection against disease during critical bloom periods with minimal residue. There was no sign of phytotoxicity for any treatment.

**Table 72.\* Efficacy for *Botrytis* spp. on Peony (*Paeonia* sp.), ‘Madame Emile Debatene’, Beckerman, IN, 2018.**

Treatment	Rate Per 100 Gal	% Leaves Infected With <i>Botrytis</i> <sup>x</sup>			
		7/2	7/23	8/14	9/10
BASF 750 02 F (mefentriconazole)	4 fl oz	17.0 b	44.0 b	52.0 c	60.0 c
	5 fl oz	21.0 b	46.0 b	52.0 c	50.0 c
Broadform SC (fluopyram + trifloxystrobin)	6 fl oz	20.0 b	82.0 a	76.0 b	82.0 ab
Orkestra Intrinsic SC (fluxapyroxad + pyraclostrobin)	8 fl oz	22.0 b	58.0 b	60.0 bc	64.0 bc
Serenade Opti W ( <i>Bacillus subtilis</i> QST 713)	14 oz	84.0 a	98.0 a	99.0 a	99.0 a
Nontreated Check	-	87.0 a <sup>z</sup>	98.0 a	99.0 a	98.0 a

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

### **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 73 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 Nontreated control plants (Table 73). 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 74). In the second trial, both rates of SP2773 had significantly lower severity ratings than the Nontreated control plants (Table 75). 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 76). 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 77). 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 Nontreated checks (Table 77 and Table 78). 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 73. Efficacy for *Botrytis tulipae* on Tulip Flowers (*Tulipa* sp.), 'Dynasty' - Trial 1, Chastagner WA, 2014.**

Treatment	Rate Per 100 Gal	Application Dates / Interval <sup>y</sup>	% Blighted Flowerson 4/30/14 <sup>x</sup>	Severity (0-10) on 5/12/2014 <sup>z</sup>	Flower Height (inches) <sup>x</sup>			
					< 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
Nontreated Check	-	-	100.0 a	8.0 a	16.0 a	11.5 a	1.0 c	28.5 b

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

<sup>y</sup> 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.

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

**Table 74. Efficacy for *Botrytis tulipae* on Tulip Bulb Weight (*Tulipa* sp.), 'Dynasty' - Trial 1, Chastagner WA, 2014.**

Treatment	Rate Per 100 Gal	Application Dates / Interval <sup>y</sup>	Wt (g) of Bulbs on 4/10/2014 <sup>x</sup>				
			< 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
Nontreated Check	-	-	200.7 a	125.1 ab	124.5 ab	0.0 c	450.3 b

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

<sup>y</sup> 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 75. Efficacy for *Botrytis tulipae* on Tulip Flowers (*Tulipa* sp.), 'Dynasty' - Trial 2, Chastagner WA, 2014.**

Treatment	Rate Per 100 Gal	Application Dates <sup>y</sup>	% Blighted Flowers on 4/30/2014 <sup>x</sup>	Severity (0-10) on 5/12/2014 <sup>z</sup>	Flower Height on 4/10/2014 (inches) <sup>x</sup>			
					< 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
Nontreated Check	-	-	100.0 a	8.0 a	16.0 ab	11.5 ab	1.0 ab	28.5 a

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

<sup>y</sup> 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.

<sup>z</sup> 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 76. Efficacy for *Botrytis tulipae* on Tulip Bulb Weight (*Tulipa* sp.), 'Dynasty' - Trial 2, Chastagner WA, 2014.**

Treatment	Rate Per 100 Gal	Application Dates <sup>y</sup>	Wt (g) of Bulbs <sup>x</sup>				
			< 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
Nontreated Check	-	-	200.7 a	125.1 a	124.5 b	0.0 a	450.3 bc

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

<sup>y</sup> 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 77. Efficacy for *Botrytis tulipae* on Tulip Flowers (*Tulipa* sp.), 'Pink Jumbo', Chastagner WA, 2015.**

Treatment	Rate Per 100 Gal	Applic Interval (days)	% Blighted Flowers <sup>x</sup> on 4/10/15 <sup>x</sup>	Severity <sup>y</sup> on 4/28/2015	Foliage Residue <sup>z</sup>	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
Nontreated 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

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

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

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

**Table 78. 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 <sup>x</sup>			
			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
Nontreated Check	-	-	14.8 ab	15.5 a	1.8 e	32.0 b

<sup>x</sup> 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, 2017, 2018, 2019 and 2020 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. In 9 geranium trials, it provided generally poor efficacy against light to moderate and severe *B. cinerea* infections; in 2 begonia and poinsettia experiments, mediocre and poor efficacy were obtained against severe disease pressures. It provided mediocre efficacy against a moderate *B. cinerea* infection in a western hemlock trial. Poor efficacy on *Botrytis elliptica* was obtained in 2 experiments on Asiatic hybrid lily. Results of an impatiens experiment for *B. cinerea* were inconclusive due to very low infection.

**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, while a recent experiment on western hemlock showed poor efficacy.

**Azoxystrobin + Benzovindiflupyr.** Mural provided good to excellent efficacy for *B. cinerea* in 2 geranium and western hemlock trials, and for *B. elliptica* in 2 experiments on Asiatic hybrid lily. Results of a trial against *B. paeoniae* and *B. cinerea* on peony were inconclusive because of considerable variability in disease development. Mediocre efficacy on *B. cinerea* was obtained in a vinca trial.

**Azoxystrobin + Difenoconazole.** Alibi Flora provided excellent efficacy for *B. cinerea* in a geranium trial. 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* on begonia, geranium and western hemlock, and on *B. tulipae* on 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 2 experiments for *B. cinerea* on Douglas fir and impatiens were inconclusive.

**Bacillus amyloliquifaciens strain F747.** Triathlon provided poor efficacy for *B. cinerea* in a recent western hemlock experiment.

**Bacillus subtilis QST713.** Rhapsody and QRD 713 provided good efficacy for *B. cinerea* in 2 experiments on geranium and lisianthus. Similarly more recent products Serenade ASO and Serenade Opti applied as curative treatments provided good efficacy in 2 geranium trials. Poor efficacy against *Botrytis* spp. was obtained with Serenade Opti in a peony trial.

**Bacillus subtilis strain B1111.** Prophytex EC and WP formulations provided mediocre efficacy for *B. cinerea* in a geranium trial and for *B. tulipae* in 2 tulip trials. 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 another peony trial, and an experiment for *B. cinerea* on Douglas fir were inconclusive.

**Chlorothalonil.** Daconil generally provided excellent efficacy for *B. cinerea* in 22 experiments on chrysanthemum, geranium, lisianthus, poinsettia, primrose and western hemlock. 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 2 experiments on geranium and western hemlock; 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 18 experiments on begonia, chrysanthemum, Douglas fir, geranium, pansy, poinsettia, rose, vinca 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 27 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 4 Asiatic hybrid lily trials.

**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 17 experiments on begonia, chrysanthemum, Douglas fir, geranium, hydrangea, lisianthus, poinsettia, rose and western hemlock; an experiment on pansy produced inconclusive data, and it provided poor efficacy against a severe disease pressure in a begonia trial. 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 3 tulip trials. 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.

**Fluopyram + Trifloxystrobin.** Broadform provided excellent efficacy for *B. cinerea* in 2 poinsettia and western hemlock tests, mediocre and excellent efficacy in 2 experiments on geranium, mediocre efficacy in a vinca, and poor efficacy in a hydrangea trial. Mediocre efficacy for *Botrytis* spp. was obtained in a peony trial.

**Fluoxastrobin.** Disarm provided mediocre efficacy for *B. cinerea* in 3 experiments on geranium and poinsettia, but no efficacy in a miniature rose trial; an experiment on pansy produced inconclusive data. Poor efficacy was obtained with Fame in a western hemlock trial. 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 7 trials on geranium, and single experiments on hydrangea, miniature rose, pansy and western hemlock, but mediocre efficacy against a severe disease pressure in a begonia trial, and against a light disease pressure on vinca. In a peony trial, poor efficacy against a severe *Botrytis* spp. pressure was obtained. Excellent efficacy was obtained for *B. elliptica* in 4 Asiatic hybrid lily trials, and for *B. tulipae* in 2 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, 2 trials for *B. cinerea* on Douglas fir and impatiens produced inconclusive data.

**Gliocladium catenulatum.** Prestop provided variable efficacy (poor, mediocre and excellent) for *B. cinerea* in 3 geranium trials. Results of 2 experiments for *B. paeoniae* on peony were inconclusive.

**Hydrogen dioxide + peroxyacetic acid.** ZeroTol provided mediocre to excellent efficacy for *B. cinerea* in 3 geranium experiments, and poor efficacy in a western hemlock trial. 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. Chipco 26019 Flo provided good and poor efficacy for *B. cinerea* in 2 experiments on hydrangea, and mediocre efficacy in a western hemlock trial.

**Isofetamid.** In 6 geranium experiments, Astun and IKF-5411 provided efficacy for *B. cinerea* at least comparable to the standard Decree; excellent efficacy was obtained in a western hemlock trial. In 4 hydrangea trials, both products generally provided excellent efficacy, and in an Asiatic hybrid lily trial, IKF-5411 provided excellent efficacy for *B. elliptica*. However, IKF-5411 provided poor efficacy for a severe *B. cinerea* pressure in a begonia trial. 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 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. It provided excellent efficacy for *B. cinerea* in a begonia experiment, but was ineffective in 3 geranium experiments, and for *B. elliptica* in 4 Asiatic hybrid lily trials. Results of an experiment for *B. cinerea* on pansy, and 3 trials for *B. paeoniae* on peony were inconclusive. Also 2 trials for *B. cinerea* on Douglas fir and impatiens produced inconclusive data. An experiment on western hemlock showed poor efficacy of Regime on *B. cinerea*.

**Mandestrobin.** S2200 generally provided excellent efficacy for *B. elliptica* in 4 Asiatic hybrid lily experiments, and for *B. tulipae* in 2 tulip trials, good efficacy for *B. cinerea* in 2 pansy and poinsettia experiments, but poor efficacy against a severe *B. cinerea* pressure in a begonia trial. In 7 geranium experiments, mixed efficacy (poor to excellent) was obtained for *B. cinerea*. 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 2 trials for *B. cinerea* on Douglas fir and impatiens produced inconclusive data.

**Mefentriconazole.** BAS 750 provided mediocre efficacy for *B. cinerea* in a peony experiment, although it was slightly better than Broadform and Orkestra Intrinsic.

**Metconazole.** Tourney provided excellent efficacy for *B. cinerea* in 2 geranium and western hemlock experiments, but poor efficacy in a pansy trial. Results of single trials for *B. elliptica* on Asiatic hybrid lily, and for 2 trials for *B. cinerea* on Douglas fir and impatiens were inconclusive.

**Mono and di potassium salts of phosphorus acid + hydrogen peroxide.** Oxiphos provided good and poor efficacy for *B. cinerea* in 2 hydrangea experiments, and poor efficacy in a western hemlock trial.

**Polyoxin D.** Affirm, Endorse and Veranda O generally provided good efficacy for *B. cinerea* in 16 experiments on Douglas fir, geranium, primrose, and western hemlock. In an Asiatic hybrid lily trial, Affirm looked ineffective.

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

**Pydiflumetofen.** Picatina provided good efficacy for *B. cinerea* in 2 geranium experiments.

**Pydiflumetofen + Difenconazole.** Postiva provided excellent efficacy for *B. cinerea* in a geranium experiment.

**Pydiflumetofen + Fludioxonil.** Picatina Flora provided good and excellent efficacy for *B. cinerea* in 2 geranium experiments, and a western hemlock trial.

**Pyraclostrobin.** Insignia, Cabrio, Empress and BAS 500 generally provided excellent efficacy for *B. cinerea* in 9 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 11 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 5 experiments for *B. cinerea* on pansy, Douglas fir and impatiens, and for *B. paeoniae* and *B. cinerea* on peony were inconclusive. Mediocre efficacy for *B. cinerea* was obtained in a vinca trial.

**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. It provided excellent efficacy in a geranium trial but poor efficacy in 3 hydrangea and western hemlock trials.

**SP2480.** This product provided no to mediocre efficacy for *B. cinerea* in 3 geranium experiments, and poor efficacy in 2 western hemlock and poinsettia trials. Mediocre and excellent efficacy was obtained in 2 hydrangea trials.

**SP2770.** This product provided no efficacy for *B. cinerea* and powdery mildew in a miniature rose experiment, for *B. elliptica* in an Asiatic 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 an Asiatic hybrid lily trial. Results of 3 experiments with SP2773 for *B. cinerea* on pansy and for *B. paeoniae* on peony were inconclusive.

**Swinglea glutinosa.** EcoSwing provided poor to mediocre efficacy for *B. cinerea* in 3 geranium experiments, and poor efficacy in 2 poinsettia and western hemlock trials.

**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. It provided excellent efficacy for *B. cinerea* in a geranium trial.

**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. Excellent efficacy was obtained in a western hemlock trial with 3336.

**Thyme Oil.** Proud 3 provided mediocre efficacy against a severe *B. cinerea* pressure in a begonia experiment, and no efficacy for *B. cinerea* in 8 experiments on geranium, pansy, miniature rose and western hemlock, for *B. elliptica* on Asiatic hybrid lily in 5 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 2 trials for *B. cinerea* on Douglas fir and impatiens produced inconclusive data.

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

**Triticonazole.** Trinity provided excellent efficacy for *B. cinerea* in a geranium experiment, but poor efficacy in 2 pansy and western hemlock trials. 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. It provided poor efficacy for *B. cinerea* in 2 begonia and western hemlock trials; in 5 geranium trials, mediocre efficacy was obtained in two, and poor efficacy in 3 other trials. It provided good efficacy in a poinsettia experiment. In 2 hydrangea trials, it provided mediocre and good efficacy. Results of an impatiens experiment for *B. cinerea* were inconclusive due to very low infection.

### **Phytotoxicity**

No phytotoxicity was observed with the products listed above with the exception of the following products in geranium experiments: Switch and Medallion in 2001, Captan in 2004, Palladium in 2008 and 2009, Proud in 2015, and Picatina Flora in 2018. 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. In a 2017 impatiens trial, significant growth reduction was observed with Pageant, S2200 and Tourney.

Phytotoxicity was not observed in hydrangea, but chemical residue was observed on flowers treated with BW165N (dark chemical residue on flower petals) and Regalia (red or pink color on flower petals). The chemical residue impacted marketability and also shelf life (longevity) of white hydrangea flowers.

**Table 79. 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 2/23/2021 are included in the table below.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33157	3336 F (Thiophanate-methyl)	FRAC 1	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
34430	3336 F (Thiophanate-methyl)	FRAC 1	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Virtually complete control of a high disease pressure with 16 fl oz per 100 gal; statistically comparable to non-inoculated check.
33083	Affirm (Polyoxin D zinc salt)	FRAC 19	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)	FRAC 19	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 per 100 gal applied twice.
32633	Affirm (Polyoxin D zinc salt)	FRAC 19	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2017	Foliar	Excellent control of a severe disease pressure with 0.5 lb per 100 gal applied 3 times weekly; superior to Nontreated uninoculated Check; best treatment.
33003	Affirm (Polyoxin D zinc salt)	FRAC 19	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Complete control of a high disease pressure with 8 oz per 100 gal; comparable to non-inoculated check.
33986	Affirm (Polyoxin D zinc salt)	FRAC 19	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	No control of a severe disease pressure with 8 oz per 100 gal applied weekly.
32070	Alibi Flora SC (Azoxystrobin + difenoconazole)	FRAC 11 + FRAC 3	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 SC (Azoxystrobin + difenoconazole)	FRAC 11 + FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lath House	Palmateer (UF)	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.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33148	Alibi Flora SC (Azoxytrobin + difenoconazole)	FRAC 11 + FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
33557	Astun (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Cut Flowers White'	Field Container	Baysal-Gurel	TN	2018	Dipped in solution	Excellent efficacy on a low disease pressure with 13.5 fl oz per 100 gal; comparable to uninoculated Check.
33557	Astun (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1:Effective control of postharvest Botrytis blight with 13.5 fl oz per 100 gal; comparable to the standard Medallion and to uninoculated check.
33557	Astun (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2:Effective control of postharvest Botrytis blight with 13.5 fl oz per 100 gal; comparable to the standard Medallion and to uninoculated check.
33557	Astun (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	Effective control of postharvest Botrytis blight with 13.5 fl oz per 100 gal; better than the standard Medallion; almost comparable to uninoculated check.
33551	Astun (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2018	Foliar	Mediocre efficacy for a low to moderate disease pressure with 13.5 fl oz per 100 gal applied 4 times biweekly; comparable to the standard Decree.
33551	Astun (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2017	Foliar	Good control of a severe disease pressure with 13.5 fl oz per 100 gal applied biweekly; comparable to uninoculated Check.
33551	Astun (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2018	Foliar	Mediocre control of a moderate disease pressure with 13.5 fl oz per 100 gal applied 3 times biweekly; comparable to the standard Chipco 26019.
34425	Astun (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Excellent control of a high disease pressure with 13 fl oz per 100 gal; statistically comparable to non-inoculated check.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
31355	Badge X2 (Copper Oxychloride + Copper Hydroxide)	FRAC M1	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.
33045	Badge X2 (Copper Oxychloride + Copper Hydroxide)	FRAC M1	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
33045	Badge X2 (Copper Oxychloride + Copper Hydroxide)	FRAC M1	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 2 lb per 100 gal. Significant postharvest disease reduction on foliage, but not on flower buds.
25046	BAS 516 UFF (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from Nontreated Check at 9.5 oz and 18 oz per 100 gal.
25047	BAS 516 UFF (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	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)	FRAC 3	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.
33024	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Mediocre control with 8 oz per 100 gal applied 3 times weekly; plants not saleable at the end of experiment.
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.
33075	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Prestige Red'	Greenhouse	Hausbeck	MI	2019	Foliar	Poor control of a severe disease infection with 8 oz per 100 gal.
34142	Botector (Aureobasidium pullans strain DSM		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla	Field Container	Baysal-Gurel	TN	2018	Dipped in solution	Great efficacy on a low disease pressure with 10 oz per 100 gal; comparable to uninoculated Check.



PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
	14940 + strain DSM 14941)			'Cut Flowers White'						
34142	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1:Effective control of postharvest Botrytis blight with 10 oz per 100 gal; comparable to the standard Medallion and to uninoculated check.
34142	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2:Mediocre control of postharvest Botrytis blight with 10 oz per 100 gal; inferior to the standard Medallion and to uninoculated check.
34142	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	Mediocre control of postharvest Botrytis blight with 10 oz per 100 gal; comparable to the standard Medallion; inferior to uninoculated check.
33584	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.
32694	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
32694	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 10 oz per 100 gal. No significant postharvest disease reduction on foliage and flower buds.
33033	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Orbit White'	Greenhouse	Catlin	NY	2019	Foliar	No control of a severe disease pressure with 8 oz per 100 gal applied 3 times weekly, mediocre control when applied 7 days pre-inoculation, then 3 times weekly. No injury.
33033	Botector (Aureobasidium pullans strain DSM		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum)	Greenhouse	Hand	OH	2016	Foliar	Mediocre efficacy on a very high disease pressure with 8 oz per 100 gal applied 3 times weekly.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
	14940 + strain DSM 14941)			'Maverick Appleblossom'						
33033	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2017	Foliar	Poor control of a severe disease pressure with 8 oz per 100 gal applied 3 times weekly.
33033	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2018	Foliar	Significant, but poor control of a severe disease pressure with 8 oz per 100 gal applied weekly.
33033	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2017	Foliar	Significantly reduced a light to moderate disease pressure with 8 oz per 100 gal applied 5 times weekly; AUDPC comparable to non-inoculated check.
33033	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2018	Foliar	Mediocre efficacy for a low to moderate disease pressure with 8 oz per 100 gal applied 8 times weekly; slightly better than the standard PreStop.
33033	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2017	Foliar	Poor control of a severe disease pressure with 8 oz per 100 gal applied weekly.
33033	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2018	Foliar	Mediocre control of a moderate disease pressure with 8 and 14 oz per 100 gal applied 5 times weekly; comparable to the standard Chipco 26019.
33033	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White to Rose'	Greenhouse	Santamaria	OR	2019	Foliar	Mediocre control of a moderate disease pressure with 8 oz per 100 gal applied 3 or 4 times weekly; comparable to the standard Chipco 26019.
32686	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
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.
34426	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Good control of a high disease pressure with 10 oz per 100 gal; statistically comparable to non-inoculated check.
32674	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field Container	Catlin	NY	2016	Foliar	No control of a severe disease pressure with 10 oz per 100 gal applied 5 times weekly.
32674	Botector (Aureobasidium pullans strain DSM 14940 + strain DSM 14941)		Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	No control of a severe disease pressure with 10 oz per 100 gal applied weekly.
34331	Broadform SC500 (Fluopyram + Trifloxystrobin)	FRAC 7 + 11	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Prestige Red'	Greenhouse	Hausbeck	MI	2019	Foliar	100% control of a severe disease infection with 8 fl oz per 100 gal.
33558	Broadform SC500 (Fluopyram + Trifloxystrobin)	FRAC 7 + 11	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1: Poor control of postharvest Botrytis blight with 8 fl oz per 100 gal; inferior to the standard Medallion and to uninoculated check.
33558	Broadform SC500 (Fluopyram + Trifloxystrobin)	FRAC 7 + 11	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2: Mediocre control of postharvest Botrytis blight with 8 fl oz per 100 gal; comparable to the standard Medallion; inferior to uninoculated check.
33558	Broadform SC500 (Fluopyram + Trifloxystrobin)	FRAC 7 + 11	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	No significant control of postharvest Botrytis blight with 8 fl oz per 100 gal; inferior to the standard Medallion and to uninoculated check.
33556	Broadform SC500 (Fluopyram + Trifloxystrobin)	FRAC 7 + 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum)	Greenhouse	Santamaria	OR	2017	Foliar	Poor control of a severe disease pressure with 6 fl oz per 100 gal applied biweekly.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33556	Broadform SC500 (Fluopyram + Trifloxystrobin)	FRAC 7 + 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2018	Foliar	Mediocre control of a moderate disease pressure with 6 fl oz per 100 gal applied 3 times biweekly; comparable to the standard Chipco 26019.
33093	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Mediocre control with 3 lb per 100 gal applied 3 times weekly; plants not saleable at the end of experiment.
34328	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Prestige Red'	Greenhouse	Hausbeck	MI	2019	Foliar	Effective control of a severe disease infection with 3 and 4 lb per 100 gal; almost comparable to the standard Broadform.
33563	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Cut Flowers White'	Field Container	Baysal-Gurel	TN	2018	Dipped in solution	Excellent efficacy on a low disease pressure with 3 lb per 100 gal; comparable to uninoculated Check. Dark chemical residue on flowers.
33563	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1: Mediocre control of postharvest Botrytis blight with 3 lb per 100 gal + Ag Aide; inferior to the standard Medallion and to uninoculated check. Dark application residue on flowers.
33563	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2: No significant control of postharvest Botrytis blight with 3 lb per 100 gal + Ag Aide; inferior to the standard Medallion and to uninoculated check. Dark application residue on flowers.
33563	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	Mediocre control of postharvest Botrytis blight with 3 lb per 100 gal + Ag Aide; comparable to the standard Medallion; inferior to uninoculated check. Dark application residue on flowers.
33583	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33091	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 3 lb per 100 gal + Silwet. No significant postharvest disease reduction on foliage and flower buds.
33094	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Orbit White'	Greenhouse	Catlin	NY	2019	Foliar	Mediocre control of a severe disease pressure with 3 lb per 100 gal applied 3 times weekly, no control at 4 lb. No injury.
33094	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2018	Foliar	Poor control of a severe disease pressure with 3 and 4 lb per 100 gal applied weekly.
33094	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2017	Foliar	Significantly reduced a light to moderate disease pressure with 3 lb per 100 gal + Activator 90 applied 5 times weekly; AUDPC comparable to non-inoculated check.
33094	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2018	Foliar	Mediocre efficacy for a low to moderate disease pressure with 3 lb per 100 gal + Activator 90 applied 8 times weekly; comparable to the standard PreStop.
33094	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2017	Foliar	Poor control of a severe disease pressure with 1360 oz per 100 gal applied weekly.
33094	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2018	Foliar	Mediocre control of a moderate disease pressure with 4 lb per 100 gal applied 5 times weekly; comparable to the standard Chipco 26019.
33094	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White to Rose'	Greenhouse	Santamaria	OR	2019	Foliar	No control of a moderate disease pressure with 3 and 4 lb per 100 gal applied 3 times weekly.
34428	BW165N (Ulocladium oudemansii strain U3)		Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No significant control of a high disease pressure with 3 and 4 lb per 100 gal.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33985	BW165N (Ulocladium oudemansii strain U3)		Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	No control of a severe disease pressure with 3 lb per 100 gal applied weekly.
34141	Chipco 26019 FLO (iprodione)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Cut Flowers White'	Field Container	Baysal-Gurel	TN	2018	Dipped in solution	Excellent efficacy on a low disease pressure with 16 fl oz per 100 gal; comparable to uninoculated Check.
34141	Chipco 26019 FLO (iprodione)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1: Poor control of postharvest Botrytis blight with 16 fl oz per 100 gal; inferior to the standard Medallion and to uninoculated check.
34141	Chipco 26019 FLO (iprodione)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2: No significant control of postharvest Botrytis blight with 16 fl oz per 100 gal; inferior to the standard Medallion and to uninoculated check.
34141	Chipco 26019 FLO (iprodione)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	No significant control of postharvest Botrytis blight with 16 fl oz per 100 gal; inferior to the standard Medallion and to uninoculated check.
34429	Chipco 26019 FLO (iprodione)		Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Good control of a high disease pressure with 16 fl oz per 100 gal; statistically comparable to non-inoculated check.
31532	Chipco 26019 N/G 50WP (Iprodione)	FRAC 2	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.
33044	Chipco 26019 N/G 50WP (Iprodione)	FRAC 2	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
33044	Chipco 26019 N/G 50WP (Iprodione)	FRAC 2	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 16 oz per 100 gal. No significant postharvest disease

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
										reduction on foliage and flower buds.
34381	Chipco 26019 N/G 50WP (Iprodione)	FRAC 2	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2018	Foliar	Mediocre control of a moderate disease pressure with 16 fl oz per 100 gal applied 3 times biweekly.
30556	Chipco 26019 N/G 50WP (Iprodione)	FRAC 2	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)	FRAC 2	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)	FRAC 2	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)	FRAC 2	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)	FRAC M5	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.
31686	Daconil Weather Stik (2787 Flowable Fungicide) (Chlorothalonil)	FRAC M5	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 1.4 pt per 100 gal.
33039	Daconil Weather Stik (2787 Flowable Fungicide) (Chlorothalonil)	FRAC M5	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
33039	Daconil Weather Stik (2787 Flowable Fungicide) (Chlorothalonil)	FRAC M5	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 1.4 pt per 100 gal. Significant postharvest disease reduction on foliage, but not on flower buds.
33154	Daconil Weather Stik (2787 Flowable)	FRAC M5	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
	Fungicide) (Chlorothalonil)									
34431	Daconil Weather Stik (2787 Flowable Fungicide) (Chlorothalonil)	FRAC M5	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Virtually complete control of a high disease pressure with 2.75 pt per 100 gal; statistically comparable to non-inoculated check.
31533	Decree (Fenhexamid)	FRAC 17	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.
33043	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
33043	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 1.5 lb per 100 gal. No significant postharvest disease reduction on foliage and flower buds.
33606	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Orbit White'	Greenhouse	Catlin	NY	2019	Foliar	Overall good management of a severe disease pressure with 1.5 lb per 100 gal applied twice biweekly.
33606	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2018	Foliar	Excellent control of a severe disease pressure with 1.5 lb per 100 gal applied weekly.
33606	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2017	Foliar	Significantly reduced a light to moderate disease pressure with 1.5 lb per 100 gal applied 3 times biweekly; AUDPC comparable to non-inoculated check.
33606	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2018	Foliar	Mediocre efficacy for a low to moderate disease pressure with 1.5 lb per 100 gal applied 4 times biweekly; AUDPC comparable to non-inoculated check.
25740	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from



PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
										Nontreated Check at 1 lb per 100 gal.
34432	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Excellent control of a high disease pressure with 1.5 lb per 100 gal; statistically comparable to non-inoculated check.
25744	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Significantly reduced low disease infection at 1 lb per 100 gal.
32068	Decree (Fenhexamid)	FRAC 17	Botrytis Gray Mold (Botrytis cinerea)	Violet (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 Nontreated inoculated and Nontreated uninoculated.
32351	Decree (Fenhexamid)	FRAC 17	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.
32351	Decree (Fenhexamid)	FRAC 17	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field In-Ground	Catlin	NY	2016	Foliar	No control of a severe disease pressure with 1.5 lb per 100 gal applied 5 times weekly.
32351	Decree (Fenhexamid)	FRAC 17	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field In-Ground	Catlin	NY	2017	Foliar	No control of a severe disease pressure with 1.5 lb per 100 gal applied weekly.
31529	Disarm 480SC (Fluoxastrobin)	FRAC 11	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)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2014	Foliar	Did not reduce Botrytis and powdery mildew severity with 8 fl oz per 100 gal.
32065	Disarm 480SC (Fluoxastrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Violet (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 Nontreated inoculated and Nontreated uninoculated.
30448	Disarm 480SC (Fluoxastrobin)	FRAC 11	Botrytis elliptica	Lily (Lilium sp.) 'Elite'	Field In-Ground	Chastagner	WA	2011	Foliar	Significantly reduced foliage dieback and severity of a moderate

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
			(Botrytis elliptica)							disease pressure with 4 and 8 fl oz per 100 gal.
30448	Disarm 480SC (Fluoxastrobin)	FRAC 11	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.
33155	Dithane 75DF Rainshield (Mancozeb)	FRAC M3	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
34329	EcoSwing (Swinglea glutinosa)	FRAC BM-01	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Prestige Red'	Greenhouse	Hausbeck	MI	2019	Foliar	Poor control of a severe disease infection with 2 pt per 100 gal.
33552	EcoSwing (Swinglea glutinosa)	FRAC BM-01	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Orbit White'	Greenhouse	Catlin	NY	2019	Foliar	Poor control of a severe disease pressure with 2 pt per 100 gal applied 3 times weekly or 7 days pre-inoculation, then 3 times weekly. No injury.
33552	EcoSwing (Swinglea glutinosa)	FRAC BM-01	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2018	Foliar	Significant, but poor control of a severe disease pressure with 2 pt per 100 gal applied weekly.
33552	EcoSwing (Swinglea glutinosa)	FRAC BM-01	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2018	Foliar	Mediocre efficacy for a low to moderate disease pressure with 2 pt per 100 gal applied 8 times weekly; slightly better than the standard PreStop.
33552	EcoSwing (Swinglea glutinosa)	FRAC BM-01	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2018	Foliar	Mediocre control of a moderate disease pressure with 1 and 2 pt per 100 gal applied 5-6 times weekly; comparable to the standard Chipco 26019.
33552	EcoSwing (Swinglea glutinosa)	FRAC BM-01	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White to Rose'	Greenhouse	Santamaria	OR	2019	Foliar	Mediocre control of a moderate disease pressure with 2 pt per 100 gal applied 3 or 4 times weekly; comparable to the standard Chipco 26019 when applied 4 times.
34433	EcoSwing (Swinglea glutinosa)	FRAC BM-01	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No control of a high disease pressure with 2 pt per 100 gal.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33153	Empress Intrinsic Brand Fungicide (Pyraclostrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
34434	Empress Intrinsic Brand Fungicide (Pyraclostrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Good control of a high disease pressure with 6 fl oz per 100 gal; statistically comparable to non-inoculated check.
25228	Endorse (Polyoxin D)	FRAC 19	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)	FRAC 19	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from Nontreated Check at 4, 8 and 12 oz per 100 gal.
25203	Endorse (Polyoxin D)	FRAC 19	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.
34435	Fame SC (Fluoxastrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No significant control of a high disease pressure with 8 oz per 100 gal.
33046	Fore 80WP (Manganese + Zinc + Ethylene bis-dithiocarbamate Ion)	FRAC M3	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
33046	Fore 80WP (Manganese + Zinc + Ethylene bis-dithiocarbamate Ion)	FRAC M3	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 1.5 lb per 100 gal. No significant postharvest disease reduction on foliage and flower buds.
34436	Fore 80WP (Manganese + Zinc + Ethylene bis-dithiocarbamate Ion)	FRAC M3	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Excellent control of a high disease pressure with 2 lb per 100 gal; statistically comparable to non-inoculated check.
33156	Heritage (Azoxystrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
34437	Heritage (Azoxystrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No significant control of a high disease pressure with 4 oz per 100 gal.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33987	IKF-309 (IKF-309)		Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	IKF-5411 (isofetamid) tested. Excellent control of a severe disease pressure with 13.5 fl oz per 100 gal applied weekly; comparable to Nontreated uninoculated Check.
33861	IKF-5411 (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Poor control with 13.5 fl oz per 100 gal applied twice biweekly; plants not saleable.
33085	IKF-5411 (isofetamid)	FRAC 7	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.
33586	IKF-5411 (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.
33087	IKF-5411 (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 13.5 fl oz per 100 gal. Significant postharvest disease reduction on foliage, but not on flower buds.
33088	IKF-5411 (isofetamid)	FRAC 7	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.
33088	IKF-5411 (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2017	Foliar	Good control of a severe disease pressure with 13.5 fl oz per 100 gal applied twice biweekly; comparable to Nontreated uninoculated Check.
33088	IKF-5411 (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2017	Foliar	Significantly reduced a light to moderate disease pressure with 13.5 fl oz per 100 gal applied 3 times biweekly; AUDPC comparable to non-inoculated check.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33088	IKF-5411 (isofetamid)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2017	Foliar	Good control of a severe disease pressure with 13.5 fl oz per 100 gal applied biweekly; comparable to uninoculated Check.
25741	Insignia 20WDG Intrinsic Brand Fungicide (Pyraclostrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from Nontreated Check at 8 and 16 oz per 100 gal.
25745	Insignia 20WDG Intrinsic Brand Fungicide (Pyraclostrobin)	FRAC 11	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.
31687	Kocide 2000 (Griffin) (Copper hydroxide)	FRAC M1	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 lb per 100 gal.
33860	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Poor control with 8 fl oz per 100 gal applied twice biweekly; plants not saleable.
34144	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Cut Flowers White'	Field Container	Baysal-Gurel	TN	2018	Dipped in solution	Excellent efficacy on a low disease pressure with 4 oz per 100 gal; comparable to uninoculated Check.
34144	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1:Effective control of postharvest Botrytis blight with 4 fl oz per 100 gal; slightly inferior to uninoculated check.
34144	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2:Effective control of postharvest Botrytis blight with 4 fl oz per 100 gal; comparable to uninoculated check.
34144	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	Mediocre control of postharvest Botrytis blight with 4 fl oz per 100 gal; inferior to uninoculated check.
31534	Medallion (Fludioxonil)	FRAC 12	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

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
										Cladosporium paenoniae with 8 oz per 100 gal.
32259	Medallion (Fludioxonil)	FRAC 12	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.
32259	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
32259	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 8 oz per 100 gal. Significant postharvest disease reduction on foliage, but not on flower buds.
23120	Medallion (Fludioxonil)	FRAC 12	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)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from Nontreated Check at 4 and 8 oz per 100 gal.
31572	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2014	Foliar	Did not reduce Botrytis and powdery mildew severity with 8 oz per 100 gal.
34439	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Excellent control of a high disease pressure with 4.0 oz per 100 gal; statistically comparable to non-inoculated check.
24809	Medallion (Fludioxonil)	FRAC 12	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)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (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 Nontreated inoculated and Nontreated uninoculated.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32069	Medallion (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (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.
30555	Medallion (Fludioxonil)	FRAC 12	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)	FRAC 5	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)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from Nontreated Check at 5 lb per 100 gal.
25043	MilStop (Potassium bicarbonate)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from Nontreated Check at 5 lb per 100 gal.
33084	Mural WDG (Azoxystrobin + benzovindiflupyr)	FRAC 11 + FRAC 7	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 WDG (Azoxystrobin + benzovindiflupyr)	FRAC 11 + FRAC 7	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 WDG (Azoxystrobin + benzovindiflupyr)	FRAC 11 + FRAC 7	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.
33149	Mural WDG (Azoxystrobin + benzovindiflupyr)	FRAC 11 + FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
34440	Mural WDG (Azoxystrobin + benzovindiflupyr)	FRAC 11 + FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Excellent control of a high disease pressure with 7.0 oz per 100 gal; statistically comparable to non-inoculated check.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32350	Mural WDG (Azoxystrobin + benzovindiflupyr)	FRAC 11 + FRAC 7	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.
32350	Mural WDG (Azoxystrobin + benzovindiflupyr)	FRAC 11 + FRAC 7	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 WDG (Azoxystrobin + benzovindiflupyr)	FRAC 11 + FRAC 7	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field In-Ground	Catlin	NY	2016	Foliar	Good control of a severe disease pressure with 7 oz per 100 gal applied 3 times biweekly.
33027	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Mediocre control with 8 fl oz per 100 gal applied twice biweekly; plants not saleable by 21 DAT.
33074	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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.
33560	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1:Effective control of postharvest Botrytis blight with 8 fl oz per 100 gal; comparable to the standard Medallion and to uninoculated check.
33560	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2:Effective control of postharvest Botrytis blight with 8 fl oz per 100 gal; comparable to the standard Medallion; inferior to uninoculated check.
33560	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	Effective control of postharvest Botrytis blight with 8 fl oz per 100 gal; better than the standard Medallion; almost comparable to uninoculated check.
33588	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.



PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
31935	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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.
31935	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
31935	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 8 fl oz per 100 gal. Significant postharvest disease reduction on foliage, but not on flower buds.
32376	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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 8 fl oz per 100 gal applied twice biweekly.
32376	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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.
32376	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2017	Foliar	Good control of a severe disease pressure with 8 fl oz per 100 gal applied twice biweekly; comparable to Nontreated uninoculated Check.
32876	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lath House	Palmateer (UF)	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 (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2017	Foliar	Poor control of a severe disease pressure with 8 fl oz per 100 gal applied biweekly.
32685	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
31894	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2014	Foliar	Significantly reduced Botrytis and powdery mildew severity with 4 and 8 oz per 100 gal; best treatment.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
31894	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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.
31894	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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.
34441	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Virtually complete control of a high disease pressure with 8 fl oz per 100 gal; statistically comparable to non-inoculated check.
32715	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (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 (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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.
32345	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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 (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field Container	Catlin	NY	2016	Foliar	Great control of a severe disease pressure with 8 fl oz per 100 gal applied 3 times biweekly.
32345	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	Excellent control of a severe disease pressure with 8 fl oz per 100 gal applied biweekly; comparable to Nontreated uninoculated Check.
31946	Orkestra Intrinsic (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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 (Fluxapyroxad + pyraclostrobin)	FRAC7 + FRAC 11	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.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33561	OxiPhos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)	FRAC 33	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Cut Flowers White'	Field Container	Baysal-Gurel	TN	2018	Dipped in solution	Good efficacy on a low disease pressure with 1 gal per 100 gal; inferior to uninoculated Check.
33561	OxiPhos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)	FRAC 33	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1:Effective control of postharvest Botrytis blight with 1 gal per 100 gal; almost comparable to the standard Medallion and to uninoculated check.
33561	OxiPhos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)	FRAC 33	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2:No significant control of postharvest Botrytis blight with 1 gal per 100 gal; inferior to the standard Medallion and to uninoculated check.
33561	OxiPhos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)	FRAC 33	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	No significant control of postharvest Botrytis blight with 1 gal per 100 gal; inferior to the standard Medallion and to uninoculated check.
34442	OxiPhos (Mono and di potassium salts of phosphorus acid + hydrogen peroxide)	FRAC 33	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No control of a high disease pressure with 1 gal per 100 gal.
33589	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.
31530	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	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.
33040	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
33040	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 14 oz per 100 gal. Significant postharvest disease

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
										reduction on foliage, but not on flower buds.
32631	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	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)	FRAC 7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lath House	Palmateer (UF)	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)	FRAC 7 + FRAC 11	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.
25742	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Not significantly different from Nontreated Check at 12.5 and 16.5 oz per 100 gal.
34443	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Virtually complete control of a high disease pressure with 14 oz per 100 gal; statistically comparable to non-inoculated check.
25746	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	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 Nontreated controls, but infection level was very low; moderate level of injury with the BAS 516-04 38% WG formulation.
32066	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (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 Nontreated inoculated and Nontreated uninoculated.
32066	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (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.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
30480	Pageant Intrinsic (Boscalid + Pyraclostrobin)	FRAC 7 + FRAC 11	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)	FRAC 7 + FRAC 11	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)	FRAC 7 + FRAC 11	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)	FRAC 7 + FRAC 11	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 + fludioxonil)	FRAC 9 + FRAC 12	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.
33041	Palladium (Cyprodinil + fludioxonil)	FRAC 9 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
33041	Palladium (Cyprodinil + fludioxonil)	FRAC 9 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 6 oz per 100 gal. Significant postharvest disease reduction on foliage, but not on flower buds.
31563	Palladium (Cyprodinil + fludioxonil)	FRAC 9 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2014	Foliar	Did not reduce Botrytis and powdery mildew severity with 6 oz per 100 gal.
34444	Palladium (Cyprodinil + fludioxonil)	FRAC 9 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Excellent control of a high disease pressure with 6.0 oz per 100 gal; statistically comparable to non-inoculated check.
32059	Palladium (Cyprodinil + fludioxonil)	FRAC 9 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (Viola X wittrockiana) V.	Greenhouse	Benson	NC	2013	Foliar	Data inconclusive because there was no significant difference between treatments, including Nontreated inoculated and Nontreated uninoculated.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
				x wittrockiana 'Delta Premium Pure White'						
32059	Palladium (Cyprodinil + fludioxonil)	FRAC 9 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (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.
30554	Palladium (Cyprodinil + fludioxonil)	FRAC 9 + FRAC 12	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 + fludioxonil)	FRAC 9 + FRAC 12	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)	FRAC M1	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Higher than Nontreated Check at 1.5 and 2 oz per 100 gal; phytotoxic
25045	Phyton-27 (Copper sulfate pentahydrate)	FRAC M1	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Field Container	Lambe	WA	2005	Foliar	Low disease infection. Higher than Nontreated Check at 1.5 and 2 oz per 100 gal; phytotoxic
33553	Picatina (Pydiflumetofen)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2018	Foliar	Excellent control of a severe disease pressure with 13.7 fl oz per 100 gal applied biweekly; almost comparable to the standard Decree applied weekly.
33553	Picatina (Pydiflumetofen)	FRAC 7	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2018	Foliar	Good efficacy for a low to moderate disease pressure with 13.7 fl oz per 100 gal applied 4 times biweekly; better than the standard Decree.
33554	Picatina Flora (Pydiflumetofen + fludioxonil)	FRAC 7 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2018	Foliar	Excellent control of a severe disease pressure with 27.8 fl oz per 100 gal applied biweekly; comparable to the standard Decree applied weekly. Some injury (chlorosis).
33554	Picatina Flora (Pydiflumetofen + fludioxonil)	FRAC 7 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2018	Foliar	Good efficacy for a low to moderate disease pressure 27.8 fl oz per 100 gal applied 4 times biweekly; better than the standard Decree.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
34445	Picatina Flora (Pydiflumetofen + fludioxonil)	FRAC 7 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Virtually complete control of a high disease pressure with 13.7 fl oz per 100 gal; statistically comparable to non-inoculated check.
34020	Postiva (pydiflumetofen + difenoconazole)	FRAC 7 + FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Orbit White'	Greenhouse	Catlin	NY	2019	Foliar	Overall good management of a severe disease pressure with 21 and 28 fl oz per 100 gal applied twice biweekly; best performing product. No injury.
34020	Postiva (pydiflumetofen + difenoconazole)	FRAC 7 + FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2018	Foliar	Mediocre control of a moderate disease pressure with 21 and 28 fl oz per 100 gal applied 5 times weekly; comparable to the standard Chipco 26019.
34020	Postiva (pydiflumetofen + difenoconazole)	FRAC 7 + FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White to Rose'	Greenhouse	Santamaria	OR	2019	Foliar	Mediocre control of a moderate disease pressure with 21 and 28 fl oz per 100 gal applied 3 times weekly; comparable to the standard Chipco 26019.
33859	Prestop (Gliocladium catenulatum Strain J1446)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Drench	Mediocre control with 13.2 oz per 100 gal applied 3 times weekly; plants not saleable.
31535	Prestop (Gliocladium catenulatum Strain J1446)	FRAC NC	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)	FRAC NC	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.
33607	Prestop (Gliocladium catenulatum Strain J1446)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2017	Foliar	Significantly reduced a light to moderate disease pressure with 13.2 oz per 100 gal applied 5 times weekly; AUDPC comparable to non-inoculated check.
33607	Prestop (Gliocladium catenulatum Strain J1446)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum)	Greenhouse	Meadows	NC	2018	Foliar	Mediocre efficacy for a light to moderate disease pressure with 13.2 oz per 100 gal applied 8 times

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
				'Maverick Scarlet'						weekly; AUDPC comparable to non-inoculated check.
32884	Prestop (Gliocladium catenulatum Strain J1446)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lath House	Palmateer (UF)	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease pressure with 32 oz per 100 gal; comparable to non-inoculated check.
33028	Prophytex EC (Bacillus subtilis strain B1111)		Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Good control with 40 fl oz per 100 gal applied 3 times weekly; plants saleable by 21 DAT.
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.
32697	Prophytex EC (Bacillus subtilis strain B1111)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
32697	Prophytex EC (Bacillus subtilis strain B1111)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 40 fl oz per 100 gal. No significant postharvest disease reduction on foliage and flower buds.
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.
32690	Prophytex EC (Bacillus subtilis strain B1111)		Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
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.
32677	Prophytex EC (Bacillus subtilis strain B1111)		Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field Container	Catlin	NY	2016	Foliar	No control of a severe disease pressure with 40 fl oz per 100 gal applied 5 times weekly.



PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32677	Prophytex EC (Bacillus subtilis strain B1111)		Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	No control of a severe disease pressure with 40 fl oz per 100 gal applied weekly.
33029	Prophytex WP (Bacillus subtilis strain B1111)		Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Mediocre control with 20 oz per 100 gal applied 3 times weekly; plants saleable by 21 DAT.
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.
32698	Prophytex WP (Bacillus subtilis strain B1111)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
32698	Prophytex WP (Bacillus subtilis strain B1111)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 20 oz per 100 gal. No significant postharvest disease reduction on foliage and flower buds.
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.
32691	Prophytex WP (Bacillus subtilis strain B1111)		Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
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.
32678	Prophytex WP (Bacillus subtilis strain B1111)		Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field Container	Catlin	NY	2016	Foliar	No control of a severe disease pressure with 20 oz per 100 gal applied 5 times weekly.
32678	Prophytex WP (Bacillus subtilis strain B1111)		Botrytis elliptica	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	No control of a severe disease pressure with 20 oz per 100 gal applied weekly.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
			(Botrytis elliptica)							
33030	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Mediocre control with 1 gal per 100 gal applied 3 times weekly; plants not saleable at the end of experiment.
33081	Proud 3 (Thyme oil (5.6%))	FRAC 46	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.
33591	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.
31524	Proud 3 (Thyme oil (5.6%))	FRAC 46	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 paoniae with 4 qt per 100 gal.
32254	Proud 3 (Thyme oil (5.6%))	FRAC 46	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.
32254	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
32254	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 1 gal per 100 gal. No significant postharvest disease reduction on foliage and flower buds.
32380	Proud 3 (Thyme oil (5.6%))	FRAC 46	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.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32380	Proud 3 (Thyme oil (5.6%))	FRAC 46	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.
32380	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2017	Foliar	Poor control of a severe disease pressure with 1 gal per 100 gal applied 3 times weekly.
32380	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2017	Foliar	Did not significantly reduced a light to moderate disease pressure with 1 gal per 100 gal applied 5 times weekly; AUDPC comparable to inoculated check.
32878	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lath House	Palmateer (UF)	FL	2015	Foliar	Efficacy not reliable because leaves were severely burned with 4 qt per 100 gal.
32692	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
31564	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2014	Foliar	Did not reduce Botrytis and powdery mildew severity with 4 qt per 100 gal.
31564	Proud 3 (Thyme oil (5.6%))	FRAC 46	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.
31564	Proud 3 (Thyme oil (5.6%))	FRAC 46	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.
34446	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No significant control of a high disease pressure with 1 gal per 100 gal.
32060	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Violet (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 Nontreated inoculated and Nontreated uninoculated.
32716	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet	Greenhouse	Ong	TX	2015	Foliar	No reduction of a moderate disease severity with 4 qt per 100 gal applied 5 times weekly; high injury.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
				(Viola X wittrockiana)						
32679	Proud 3 (Thyme oil (5.6%))	FRAC 46	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.
32679	Proud 3 (Thyme oil (5.6%))	FRAC 46	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.
32679	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field Container	Catlin	NY	2016	Foliar	No control of a severe disease pressure with 1 gal per 100 gal applied 5 times weekly.
32679	Proud 3 (Thyme oil (5.6%))	FRAC 46	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	No control of a severe disease pressure with 1 gal per 100 gal applied weekly.
31356	Proud 3 (Thyme oil (5.6%))	FRAC 46	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.
31948	Proud 3 (Thyme oil (5.6%))	FRAC 46	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%))	FRAC 46	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.
34447	Regalia MAXX (Extract of Reynoutria sachalinensis)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No significant control of a high disease pressure with 1 gal per 100 gal.
32080	Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	FRAC NC	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)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2014	Foliar	Did not reduce Botrytis and powdery mildew severity with 4 oz per 100 gal.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32067	Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Violet (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 Nontreated inoculated and Nontreated uninoculated.
31360	Regalia O5 (MOI-10605) (Extract of Reynoutria sachalinensis)	FRAC NC	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.
34143	Regalia SC (MOI 106) (Extract of Reynoutria sachalinensis)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Cut Flowers White'	Field Container	Baysal-Gurel	TN	2018	Dipped in solution	Good efficacy on a low disease pressure with 1 gal per 100 gal; inferior to uninoculated Check. Red or pink chemical residue on flowers.
34143	Regalia SC (MOI 106) (Extract of Reynoutria sachalinensis)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1: Poor control of postharvest Botrytis blight with 1 gal per 100 gal; comparable to the standard Medallion; inferior to uninoculated check. Red or pink application residue on flowers.
34143	Regalia SC (MOI 106) (Extract of Reynoutria sachalinensis)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2: No significant control of postharvest Botrytis blight with 1 gal per 100 gal; inferior to the standard Medallion and to uninoculated check. Red or pink application residue on flowers.
34143	Regalia SC (MOI 106) (Extract of Reynoutria sachalinensis)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	Mediocre control of postharvest Botrytis blight with 1 gal per 100 gal; comparable to the standard Medallion; inferior to uninoculated check. Red or pink application residue on flowers.
32885	Regalia SC (MOI 106) (Extract of Reynoutria sachalinensis)	FRAC NC	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lath House	Palmateer (UF)	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.
33025	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Excellent control with 45.7 fl oz per 100 gal applied 3 times weekly; best product tested, comparable to uninoculated check.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33076	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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.
33585	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.
31522	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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.
32253	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
32253	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 45.7 fl oz per 100 gal. No significant postharvest disease reduction on foliage and flower buds.
32377	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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.
32377	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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.
32377	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2017	Foliar	Poor control of a severe disease pressure with 45.7 fl oz per 100 gal applied 3 times weekly.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32687	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
31562	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2014	Foliar	Did not significantly reduce Botrytis and powdery mildew severity with 32 oz per 100 gal.
31562	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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.
31562	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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.
34448	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No control of a high disease pressure with 45.7 fl oz per 100 gal.
32058	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis Gray Mold (Botrytis cinerea)	Violet (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 Nontreated inoculated and Nontreated uninoculated.
32346	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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.
32346	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field Container	Catlin	NY	2016	Foliar	No control of a severe disease pressure with 24 oz per 100 gal applied 5 times weekly.
32346	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	No control of a severe disease pressure with 45.7 fl oz per 100 gal applied weekly.
31947	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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	Regime (Banda de Lupinus albus doce (BLAD))	FRAC BM01	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.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
33032	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Poor control with 7.5 fl oz per 100 gal applied 3 times weekly; plants not saleable.
33082	S2200 4SC (Mandestrobin)	FRAC 11	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.
33082	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Prestige Red'	Greenhouse	Hausbeck	MI	2019	Foliar	Excellent control of a severe disease infection with 7.5 fl oz per 100 gal; comparable to the standard Broadform.
33592	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.
31936	S2200 4SC (Mandestrobin)	FRAC 11	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.
31936	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
31936	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 7.5 and 15 fl oz per 100 gal. Significant postharvest disease reduction on foliage, but not on flower buds.
32381	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Orbit White'	Greenhouse	Catlin	NY	2019	Foliar	Virtually no control of a severe disease pressure with 7.5 and 15 fl oz per 100 gal applied twice biweekly. No injury.
32381	S2200 4SC (Mandestrobin)	FRAC 11	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.



PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32381	S2200 4SC (Mandestrobin)	FRAC 11	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.
32381	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum)	Greenhouse	Hausbeck	MI	2017	Foliar	Mediocre control of a severe disease pressure with 15 fl oz per 100 gal applied twice biweekly.
32381	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2018	Foliar	Significant, but poor control of a severe disease pressure with 7.5 and 15 fl oz per 100 gal applied biweekly.
32381	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2018	Foliar	Mediocre efficacy for a low to moderate disease pressure with 15 fl oz per 100 gal applied 4 times biweekly; comparable to the standard Decree.
32879	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lath House	Palmateer (UF)	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.
32381	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2017	Foliar	Poor control of a severe disease pressure with 15 fl oz per 100 gal applied biweekly.
32381	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White to Rose'	Greenhouse	Santamaria	OR	2019	Foliar	Mediocre control of a moderate disease pressure with 7.5 fl oz per 100 gal applied twice biweekly; comparable to the standard Chipco 26019.
32693	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
32227	S2200 4SC (Mandestrobin)	FRAC 11	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.
32227	S2200 4SC (Mandestrobin)	FRAC 11	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.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32717	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (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)	FRAC 11	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.
32347	S2200 4SC (Mandestrobin)	FRAC 11	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.
32347	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field Container	Catlin	NY	2016	Foliar	Good and great control of a severe disease pressure with 7.5 and 15 oz per 100 gal applied 3 times biweekly.
32347	S2200 4SC (Mandestrobin)	FRAC 11	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	Excellent control of a severe disease pressure with 7.5 fl oz per 100 gal applied weekly; comparable to Nontreated uninoculated Check.
31949	S2200 4SC (Mandestrobin)	FRAC 11	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)	FRAC 11	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.
34330	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Poinsettia (Euphorbia pulcherrima) 'Prestige Red'	Greenhouse	Hausbeck	MI	2019	Foliar	Poor control of a severe disease infection with 20 and 30 fl oz per 100 gal.
33562	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Cut Flowers White'	Field Container	Baysal-Gurel	TN	2018	Dipped in solution	Excellent efficacy on a low disease pressure with 20 and 30 fl oz per 100 gal + NIS; comparable to uninoculated Check.
33562	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 1: Mediocre control of postharvest Botrytis blight with 30 fl oz per 100 gal + Capsil; almost comparable to the standard

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
										Medallion; inferior to uninoculated check.
33562	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Dipped in solution	Trial 2:Mediocre control of postharvest Botrytis blight with 30 fl oz per 100 gal + Capsil; almost comparable to the standard Medallion; inferior to uninoculated check.
33562	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Hydrangea (Hydrangea sp.) H. macrophylla 'Nikko Blue'	Field Container	Baysal-Gurel	TN	2019	Foliar	Mediocre control of postharvest Botrytis blight with 30 fl oz per 100 gal + Capsil; comparable to the standard Medallion; inferior to uninoculated check.
33555	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Orbit White'	Greenhouse	Catlin	NY	2019	Foliar	Mediocre control of a severe disease pressure with 20 and 30 fl oz per 100 gal applied 3 times weekly. No injury.
33555	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2018	Foliar	Significant, but poor control of a severe disease pressure with 20 and 30 fl oz per 100 gal + Capsil applied weekly.
33555	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Maverick Scarlet'	Greenhouse	Meadows	NC	2018	Foliar	No efficacy for a low to moderate disease pressure with 20 and 30 fl oz per 100 gal + Activator 90 applied 8 times weekly.
33555	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Nano'	Greenhouse	Santamaria	OR	2018	Foliar	Mediocre control of a moderate disease pressure with 30 fl oz per 100 gal applied 3 times biweekly; comparable to the standard Chipco 26019.
34449	SP2480 (SP2480)		Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No control of a high disease pressure with 20 and 30 fl oz per 100 gal.
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.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
31565	SP2770 10WP (SP2770)		Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2014	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)	Violet (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 Nontreated inoculated and Nontreated 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.
31566	SP2773 (SP2773)		Botrytis Gray Mold (Botrytis cinerea)	Rose (Rosa sp.) 'Karina miniature rose'	Greenhouse	Jiang	CA	2014	Foliar	Did not reduce Botrytis and powdery mildew severity with 1.33 lb per 100 gal.
32062	SP2773 (SP2773)		Botrytis Gray Mold (Botrytis cinerea)	Violet (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 Nontreated inoculated and Nontreated 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.
33152	Spectro 90WDG (Thiophanate-methyl + Chlorothalonil)	FRAC 1 + FRAC M5	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
34450	Spectro 90WDG (Thiophanate-methyl + Chlorothalonil)	FRAC 1 + FRAC M5	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Complete control of a high disease pressure with 5.7 lb per 100 gal; comparable to non-inoculated check.
33078	Spirato (Fludioxonil)	FRAC 12	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.
32696	Spirato (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
32696	Spirato (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 4 fl oz per 100 gal. Significant postharvest disease reduction on foliage, but not on flower buds.
32379	Spirato (Fludioxonil)	FRAC 12	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	Spirato (Fludioxonil)	FRAC 12	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.
32689	Spirato (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
32226	Spirato (Fludioxonil)	FRAC 12	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.
32226	Spirato (Fludioxonil)	FRAC 12	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.
32720	Spirato (Fludioxonil)	FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet	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.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
				(Viola X wittrockiana)						
32676	Spirato (Fludioxonil)	FRAC 12	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.
32676	Spirato (Fludioxonil)	FRAC 12	Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field Container	Catlin	NY	2016	Foliar	Excellent control of a severe disease pressure with 4 oz per 100 gal applied 3 times biweekly; best treatment.
32225	Spirato (Fludioxonil)	FRAC 12	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.
33026	Stargus (Bacillus nakamurai strain F727)		Botrytis Gray Mold (Botrytis cinerea)	Begonia (Begonia sp.) 'AmeriHybrid Picotee Flamenco'	Greenhouse	Jiang	CA	2017	Foliar	Poor control with 6 qt per 100 gal applied 3 times weekly; plants not saleable.
33077	Stargus (Bacillus nakamurai strain F727)		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.
33587	Stargus (Bacillus nakamurai strain F727)		Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.
32695	Stargus (Bacillus nakamurai strain F727)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
32695	Stargus (Bacillus nakamurai strain F727)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 1.5 gal per 100 gal. Significant postharvest disease reduction on foliage, but not on flower buds.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32378	Stargus (Bacillus nakamurai strain F727)		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	Stargus (Bacillus nakamurai strain F727)		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.
32378	Stargus (Bacillus nakamurai strain F727)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Pinto Premium White'	Greenhouse	Hausbeck	MI	2017	Foliar	Poor control of a severe disease pressure with 6 qt per 100 gal applied 3 times weekly.
32378	Stargus (Bacillus nakamurai strain F727)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) /n	Greenhouse	Santamaria	OR	2017	Foliar	Poor control of a severe disease pressure with 192 fl oz per 100 gal applied weekly.
32688	Stargus (Bacillus nakamurai strain F727)		Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
32261	Stargus (Bacillus nakamurai strain F727)		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.
32261	Stargus (Bacillus nakamurai strain F727)		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.
34438	Stargus (Bacillus nakamurai strain F727)		Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No significant control of a high disease pressure with 6 qt per 100 gal.
32675	Stargus (Bacillus nakamurai strain F727)		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.
32675	Stargus (Bacillus nakamurai strain F727)		Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Gironde'	Field Container	Catlin	NY	2016	Foliar	No control of a severe disease pressure with 6 qt per 100 gal applied 5 times weekly.
32675	Stargus (Bacillus nakamurai strain F727)		Botrytis elliptica (Botrytis elliptica)	Lily (Lilium sp.) 'Vermeer'	Field Container	Catlin	NY	2017	Foliar	No control of a severe disease pressure with 8 qt per 100 gal applied weekly.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32263	Stargus (Bacillus nakamurai strain F727)		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.
20266	Switch 62.5WG (Cyprodinil + Fludioxonil)	FRAC 9 + FRAC 12	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)	FRAC 9 + FRAC 12	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)	FRAC 9 + FRAC 12	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 Nontreated inoculated controls.
18665	Switch 62.5WG (Cyprodinil + Fludioxonil)	FRAC 9 + FRAC 12	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)	FRAC 9 + FRAC 12	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla) t. heterophylla	Greenhouse	Lambe	WA	2001	Foliar	Great control with 3, 6, and 12 oz per acre; no injury.
31527	Torque 3.6SC (Tebuconazole)	FRAC 3	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)	FRAC 3	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)	FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum)	Shadehouse/ Lath House	Palmateer (UF)	FL	2015	Foliar	Significantly reduce incidence and severity of a moderate disease



PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
				hortorum 'Rocky Mountain Red'						pressure with 8 oz per 100 gal; comparable to non-inoculated check.
32063	Torque 3.6SC (Tebuconazole)	FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Violet (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 Nontreated inoculated and Nontreated uninoculated.
31357	Torque 3.6SC (Tebuconazole)	FRAC 3	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.
31357	Torque 3.6SC (Tebuconazole)	FRAC 3	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.
31952	Torque 3.6SC (Tebuconazole)	FRAC 3	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.
33590	Tourney 50WDG (Metconazole)	FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Impatiens, Common Garden; Buzzy Lizzy (Impatiens walleriana)	Greenhouse	Hand	OH	2017	Foliar	Inconclusive data from this experiment due to extremely low disease severity.
32632	Tourney 50WDG (Metconazole)	FRAC 3	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.
33150	Tourney 50WDG (Metconazole)	FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
34453	Tourney 50WDG (Metconazole)	FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	Excellent control of a high disease pressure with 4.0 oz per 100 gal; statistically comparable to non-inoculated check.
32718	Tourney 50WDG (Metconazole)	FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (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)	FRAC 3	Botrytis elliptica	Lily (Lilium sp.) London	Field In-Ground	Chastagner	WA	2012	Foliar	Did not significantly reduce incidence or severity of a low

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
			(Botrytis elliptica)							disease pressure with 4 oz per 100 gal applied every 14 days.
34451	Triathlon (Bacillus amyloliquefaciens Strain D747)	IRAC 11/FRAC 44	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No significant control of a high disease pressure with 6 qt per 100 gal.
31531	Trinity 2SC (Triticonazole)	FRAC 3	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.
32883	Trinity 2SC (Triticonazole)	FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/Lath House	Palmateer (UF)	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)	FRAC 3	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.
34452	Trinity 2SC (Triticonazole)	FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No significant control of a high disease pressure with 12 fl oz per 100 gal.
32719	Trinity 2SC (Triticonazole)	FRAC 3	Botrytis Gray Mold (Botrytis cinerea)	Pansy, Large Flowering; Wittrock's Violet (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)	FRAC 3	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)	FRAC 3	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	2014	Foliar	Did not reduce Botrytis and powdery mildew severity with 16 fl oz per 100 gal.

PR#	Product (Active Ingredients)	MOA Class	Target	Crop	Production Site	Researcher	State	Year	Application Type	Results
32064	V-10135 (Fenpyrazamine)		Botrytis Gray Mold (Botrytis cinerea)	Violet (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 Nontreated inoculated and Nontreated 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.
33042	ZeroTol (Hydrogen dioxide)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt' and Mixed Variety	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to highly variable disease incidence and severity.
33042	ZeroTol (Hydrogen dioxide)		Botrytis Gray Mold (Botrytis cinerea)	Peony (Paeonia sp.) 'Sarah Bernhardt'	Field Container	Chastagner	WA	2017	Foliar	No significant reduction of lesion width on leaves inoculated with Botrytis spp. with 2 gal per 100 gal. No significant postharvest disease reduction on foliage and flower buds.
33151	ZeroTol (Hydrogen dioxide)		Botrytis Gray Mold (Botrytis cinerea)	Fir, Douglas (Pseudotsuga menziesii)	Field Container	Chastagner	WA	2016	Foliar	No significant differences between treatments in this experiment due to low and variable disease pressure.
34454	ZeroTol (Hydrogen dioxide)		Botrytis Gray Mold (Botrytis cinerea)	Hemlock, Western (Tsuga heterophylla)	Greenhouse	Chastagner	WA	2017	Foliar	No control of a high disease pressure with 2 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.
32877	ZeroTol 2.0 (Hydrogen dioxide + peroxyacetic acid)		Botrytis Gray Mold (Botrytis cinerea)	Geranium, Zonal (Pelargonium x hortorum) 'Rocky Mountain Red'	Shadehouse/ Lath House	Palmateer (UF)	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.

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