http://ir4.rutgers.edu/Ornamental/ornamentalSummaryReports.cfm

IR-4 Ornamental Horticulture Program
Cyprodinil and Fludioxonil Crop Safety and Efficacy

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Acknowledgements
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Abstract

From 2000 to 2007, IR-4 researched crop safety and efficacy of Medallion (fludioxonil), Vanguard (cyprodinil), and Palladium (Switch 65WG, cyprodinil + fludioxonil). Medallion impact on 19 crops was tested, while 6 crops where studies with Palladium. Tests for efficacy included experiments on *Botrytis cinerea*, *Phaeocryptopus gaeumannii*, several *Phytophthora* sp, *Sclerotium rolfsii var. delpinii*, and *Thielaviopsis elegans*.

Introduction

Cyprodinil and fludioxonil are fairly recent introductions into the US. Fludioxonil is registered under the trade name Medallion for ornamental horticulture uses. Cyprodinil is not registered for ornamental horticulture as a stand alone product due to concerns related to development of tolerance in key target fungi. To address resistance management, Palladium a combination product of cyprodinil and fludioxonil was developed. In addition to crop safety, IR-4 tested Medallion in a series of efficacy experiments for *Botrytis cinerea*, *Phytophthora* sp, and *Sclerotium rolfii var. delphinii*. Palladium was tested under the food use trade name Switch 65WG against *Botrytis cinerea* and *Thielaviopsis elegans* along with two trials for crop safety.

Materials and Methods

Medallion was applied as a drench or foliar application at 1, 2, and 4 oz per 100 gal. Palladium was applied as a foliar application at 3, 6, and 12 oz per 100 gal or a drench at 1.9, 3.8 or 7.5 oz per 100 gal. A minimum of four plants (replicate treatments) were required with most researchers exceeding this minimum. When efficacy was the target, different measures were used based on the disease and data were recorded at appropriate assessment intervals after initial application. Phytotoxicity was recorded on a scale of 0 to 10 (0 = no phytotoxicity; 10 = complete kill). For more detailed materials and methods, please see Appendix 1: Protocols, along with the researcher reports in Appendix 3.

Medallion, Switch 65WG, and Vanguard were provided to researchers by Syngenta.

Results and Summary

Efficacy

Medallion. Very little impact was observed on 4 different Phytophthora species and for *Botrytis cinerea* on *Pelargonium x hortorum*.. However, in one experiment Medallion did provide significant efficacy of gray mold on Douglas-fir comparable to Decree.
Palladium/Switch 65WG. Similar to Medallion, Palladium provided good to great control of *Botrytis cinerea* on conifers, but it did not provide sufficient control in *Pelargonium x hortorum*. Palladium did reduce Thielaviopsis root rot in Pansy.
Vangard. This product was tested solely on *Phaeocryptopus gaeumannii* and did not provide commercially acceptable control.

Phytotoxicity

In general, not enough trials were conducted with any of the products to be able to conclusively recommend listing any specific crop. However, with the exception of a single trial on *Pseudotsuga menziesii* and on *Tsuga heterophylla* with Medallion, no injury was observed.

Table 1. List of Medallion treated crops where more information is needed.

Abies sp.
Allium moly
Antirrhinum majus
Crocosmia x crocosmiflora
Delphinium sp.
Dianthus sp.
Festuca sp.
Fragaria sp.
Gerbera sp.
Gladiolus sp.
Hemerocallis sp.
Leucanthemum maximum
Lilium sp.
Pelargonium x hortorum
Pseudotsuga menziesii
Rhododendron sp.
Tsuga heterophylla
Verbena sp.
Viola sp.

Table 2. List of Palladium treated crops where more information is needed.

Abies sp.
Pelargonium x hortorum
Thuja plicata
Tsuga heterophylla
Viola sp.

Table 3. Detailed Summary of Testing with Medallion, Switch, and Vanguard

Notes: Table entries are sorted by crop Latin name. Only those trials with research reports received by 3/15/10 are listed below. Table entries with blank results have been received but not yet cataloged in the database.

PR #	Product	Target	Crop Latin Name	Crop Cultivar	Production Site	Researcher	Year	Application Type	Trial Results	File Name
23120	Medallion	Botrytis cinerea	Pelargonium x hortorum		Greenhouse	Hausbeck	2002	Foliar	No significant impact on disease at 1, 2, and 4 oz per 100 gal under severe pressure; no injury.	20030929d.pdf
24809	Medallion	Botrytis cinerea	Tsuga heterophylla		Field Container	Lambe	2005	Foliar	Significantly reduced low disease infection at 2 and 4 oz per 100 gal; comparable to Decree.	20060123f.pdf
25675	Medallion	Phytophthora cinnamomi	Rhododendron sp.	R. catawbiense 'Roseum Elegans'	Field Container	Benson	2004	Foliar	No efficacy at 2, 4, and 8 oz per 100 gal.	20060202h.pdf
26995	Medallion	Phytophthora cryptogea	Gerbera sp.	G. jamesonii 'Yellow Revolution'	Greenhouse	Benson	2007	Drench	Extremely high disease pressure; no control at 2 oz per 100 gal	20070725a.pdf
23121	Medallion	Phytophthora nicotianae	Antirrhinum majus		Greenhouse	Hausbeck	2002	Drench	Some initial reduction in disease, however very heavy disease pressure overcame this with 1, 2, and 4 oz per 100 gal; no phytotoxicity while plant were alive.	20030929b.pdf
27634	Medallion	Phytophthora nicotianae	Viola sp.	V. x wittrockiana 'Matrix Purple'	Greenhouse	Benson	2007	Drench	Moderately high disease pressure; virtually no control at 2 oz per 100 gal	20080227d.pdf
14640	Medallion	Phytotoxicity	Abies sp.		Field Container	Linderman	2002	Drench	No injury at 2, 4, and 8 oz per 100 gal.	20030929a.pdf
14848	Medallion	Phytotoxicity	Allium moly	A. sphaerocephalon	Field Container	Linderman	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224a.pdf
14873	Medallion	Phytotoxicity	Crocosmia x crocosmiflora		Field Container	Linderman	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224b.pdf
15022	Medallion	Phytotoxicity	Delphinium sp.	'Double Special Giant Imperial Mixture'	Field In-Ground	Locke	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224j.pdf
14878	Medallion	Phytotoxicity	Dianthus sp.	D. chinensis 'Carpet Snow'	Field Container	Linderman	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224c.pdf
14971	Medallion	Phytotoxicity	Festuca sp.	F. ovina 'Glauca'	Field Container	Linderman	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224d.pdf
14893	Medallion	Phytotoxicity	Fragaria sp.	'Totem'	Field Container	Linderman	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224e.pdf
14899	Medallion	Phytotoxicity	Gladiolus sp.	'Nova Lux'	Field Container	Locke	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224k.pdf
14905	Medallion	Phytotoxicity	Hemerocallis sp.	'Joan Senior'	Field Container	Linderman	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224g.pdf
15063	Medallion	Phytotoxicity	Leucanthemum maximum	'Little Miss Muffet'	Field In-Ground	Locke	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224i.pdf
14897	Medallion	Phytotoxicity	Pelargonium x hortorum	'Orbit Hot Pink'	Field Container	Linderman	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224f.pdf

PR #	Product	Target	Crop Latin Name	Crop Cultivar	Production Site	Researcher	Year	Application Type	Trial Results	File Name
20274	Medallion	Phytotoxicity	Pseudotsuga menziesii		Greenhouse	Lambe	2002	Drench	Very slight needle chlorosis at 8 oz per 100 gal and slight to severe stunting increasing with rate (2, 4, and 8 oz per 100 gal).	20030929e.pdf
20274	Medallion	Phytotoxicity	Pseudotsuga menziesii		Greenhouse	Linderman	2002	Drench	No injury at 2, 4, and 8 oz per 100 gal.	20030929f.pdf
20276	Medallion	Phytotoxicity	Tsuga heterophylla		Greenhouse	Lambe	2002	Drench	Moderate chlorosis at 2, 4, and 8 oz per 100 gal with moderate to significant stunting and stem swelling increasing with rate.	20030929g.pdf
14962	Medallion	Phytotoxicity	Verbena sp.	'Homestead Purple'	Field Container	Linderman	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224h.pdf
15107	Medallion	Phytotoxicity	Verbena sp.	'Romance Scarlet'	Field In-Ground	Locke	1999	Drench	No injury at 1, 2, and 4 oz per 100 gal.	20000224l.pdf
24239	Medallion	Sclerotium rolfsii var. delphinii	Lilium sp.	'Jolanda'	Field In-Ground	Chastagner	2000	Band in-furrow before hilling	Some reduction of Sclerotium delphinii crown rot at 0.04, 0.75, and 0.155 oz ai per 1,000 ft of row; no impact on plant height or other injury.	20030929c.pdf
20266	Switch 62.5WG	Botrytis cinerea	Pelargonium x hortorum	P. x hortorum	Greenhouse	Hausbeck	2002	Foliar	No consistent impact on disease with 3, 6, and 12 oz per 100 gal; no injury observed.	20030827b.pdf
18663	Switch 62.5WG	Botrytis cinerea	Pseudotsuga menziesii		Greenhouse	Lambe	2000	Foliar	Good control of a low infection at 3, 6, and 12 oz per 100 gal per acre; no phytotoxicity.	20010907a.pdf
18663	Switch 62.5WG	Botrytis cinerea	Pseudotsuga menziesii		Greenhouse	Lambe	2001	Foliar	Good control at 3, 6, and 12 oz per acre; no injury.	20030827c.pdf
18665	Switch 62.5WG	Botrytis cinerea	Tsuga heterophylla		Greenhouse	Lambe	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.	20010907b.pdf
18665	Switch 62.5WG	Botrytis cinerea	Tsuga heterophylla		Greenhouse	Lambe	2001	Foliar	Great control with 3, 6, and 12 oz per acre; no injury.	20030827e.pdf
29788	Switch 62.5WG	Chalara elegans	Viola sp.		Greenhouse	Hausbeck	2002	Drench	Some reduction of disease as based on health rating at 1.9, 3.8 and 7.5 oz per 100 gal; no injury.	20030827f.pdf
20260	Switch 62.5WG	Phytotoxicity	Abies sp.	A, procera	Greenhouse	Linderman	2001	Foliar	No injury at 3, 6, and 12 oz per acre.	20030827a.pdf
20262	Switch 62.5WG	Phytotoxicity	Thuja plicata		Greenhouse	Linderman	2001	Foliar	No injury at 3, 6, and 12 oz per acre.	20030827d.pdf
23093	Vangard 75WG	Phaeocryptopus gaeumannii	Pseudotsuga menziesii		Field In-Ground	Chastagner	2002	Foliar	No impact on disease and no injury.	20030827g.pdf

Label Suggestions

IR-4 has not collected sufficient information on Medallion or Palladium to recommend label language.

Appendix 1: Available Protocols

CONTROL OF ORNAMENTAL DISEASES WITH DIRECTED SPRAY APPLICATIONS OF CYPRODINIL + FLUDIOXONIL (SWITCH)

Date: 5/04
Ornamental Protocol Number: XXXXX
General label directions: Refer to product labels.
Research program:
Pest(s)/Plants– Plant pathogens other than labeled species.
Pesticide - Refer to treatment list shown below.
For label, material & if needed spray oil surfactant contact:

Syngenta, Dave Ross, 336-632-6411, david.ross@syngenta.com

Experimental design:
Plot size (must be adequate to reflect actual use condition)
Replicates Minimum of 4 Treatment Units
Controls (untreated controls to be included in all experiments)

Application:		DRENCH	FOLIAR
Dosages -	1/2x	1.5 oz/100 gal.	15 oz/100 gal.
	1x	3.0 oz/100 gal.	30 oz/100 gal.
	2x	6.0 oz/100 gal.	60 oz/100 gal.

Active Ingredients: fludioxonil (medallion).
Volume - Minimum of 100 gal/A for liquid applications.
Timing - 3 applications, 7 Days Spray Interval. Take initial counts, then efficacy and crop safety at 7 (then 2nd appl.), 14 (then 3rd appl.), 28, and 42 DAT.
Reports:
Method of application: Use a directed spray in sufficient water to obtain thorough coverage of the plant crown, plant stem, and soil surface. Report completely on experimental design and method of application. Report plant size height x width before treatment and throughout the experiment.
Weather – Maintain temperature and precipitation (including irrigation) data.
Soil type – Identify soil type used in experimental area.
Product – When submitting data, include EPA registration number of product used.
Efficacy – Data should include both actual counts and percent control as well as an indication that infestation was light, heavy, etc. Record all application and evaluation dates.
Phytotoxicity – Record phytotoxicity data at all rates. Use a 0-10 scale. 0 = No Phytotoxicity 10 = complete kill.

Please direct questions to: Dr. Robert M. Herrick, IR-4 Project, 681 US Highway #1 South, North Brunswick, NJ Phone: (732) 932-9575, Ext. 629.

CONTROL OF ORNAMENTAL DISEASES WITH DIRECTED SPRAY APPLICATIONS OF FLUDIOXONIL (MEDALLION)

Date: 3/04

Ornamental Protocol Number: 00002

General label directions: Refer to product labels.

Research program:

Pest(s)/Plants– Plant pathogens other than labeled species.

Pesticide - Refer to treatment list shown below.

For label, material & if needed spray oil surfactant contact:

Syngenta, Dave Ross, 336-632-6411, david.ross@syngenta.com (Medallion)

Experimental design:

Plot size (must be adequate to reflect actual use condition)

Replicates Minimum of 4 Treatment Units

Controls (untreated controls to be included in all experiments)

Application:		MEDALLION 50WP
Dosages -	1/2x	1 oz/100 gal.
	1x	2 oz/100 gal.
	2x	4 oz/100 gal.

Active Ingredients: fludioxonil (medallion).

Volume - Minimum of 10 gal/A for liquid applications.

Timing - 2 applications, 14 Days Spray Interval. Take initial counts, then efficacy and crop safety at 7, 14 (then 2nd appl.), 30, and 42 DAT.

Reports:

Method of application: Use a directed spray in sufficient water to obtain thorough coverage of the plant crown, plant stem, and soil surface. Report completely on experimental design and method of application. Report plant size height x width before treatment and throughout the experiment.

Weather – Maintain temperature and precipitation (including irrigation) data.

Soil type – Identify soil type used in experimental area.

Product – When submitting data, include EPA registration number of product used.

Efficacy – Data should include both actual counts and percent control as well as an indication that infestation was light, heavy, etc. Record all application and evaluation dates.

Phytotoxicity – Record phytotoxicity data at all rates. Use a 0-10 scale. 0 = No Phytotoxicity 10 = complete kill.

Please direct questions to: Dr. Robert M. Herrick, IR-4 Project, 681 US Highway #1 South, North Brunswick, NJ Phone: (732) 932-9575, Ext. 629.

Efficacy of Management Tools for Soil-borne *Phytophthora* Species.

Ornamental Protocol Number: 07-001

Objective: Determine efficacy of new active ingredient formulations and new biopesticides for managing root, crown and stem rots of ornamental plants caused by *Phytophthora* species.

Experimental Design:

Plot Size: Must be adequate to reflect actual use conditions.

Replicates: Minimum of 4 replications

Application Instructions: If plants are to be transplanted, transplant at least 5 days prior to treatment applications so any wounds occurring during transplanting will heal and not serve as access points for disease infection and/or not contribute to increased phytotoxicity. Drench each treatment 2-3 days prior to inoculation with known species of *Phytophthora* except Muscodor which should be applied after inoculation. For woody plant material, reapply treatments 4 weeks later. For phosphorus acid generators, a foliar application may be substituted for the drench application. Applications should be made using application equipment consistent with conventional commercial equipment.

Target Species: *Phytophthora cinnimoni* (Azoxystrobin only), *P. nicotianae*, *P. citricola*, and *P. cactorum*. Contact your regional coordinator if other target species are of interest.

Plant Hosts: Use a plant host suitable for target species, recording species and variety used.

Use Site: May be greenhouse, field container or field in-ground. Please specify in final report.

Evaluations: Record disease severity and incidence 0, 7, 14, and 28 days after application for herbaceous plant material. For woody plant material, record disease severity and incidence 0, 14, 28, 42 and 56 days after initial application. Record plant height & width at initial and final evaluations only. Record phytotoxicity at each rating date on a scale of 0 to 10 (0 = no phytotoxicity; 10 = complete kill). If phytotoxicity is observed in treated plants, take pictures comparing treated and untreated plant material.

Recordkeeping: Keep detailed records of weather conditions including temperature and precipitation, soil-type or soil-less media, application equipment, application volume per area, irrigation, pot/liner size, plant height & width, and plant growth stage at application and data collection dates.

If different application methods or evaluations are made, please clearly specify differences in final report and explain how they enhanced results.

Treatments:

See tables on the following pages. Standards and A priority treatments are in the first table. B and C priority treatments are in the second table.

Reports:

Reports submitted on the standard IR-4 Ornamental Horticulture Research Report Form are preferred. However, reports in the F&N Tests format are acceptable as long as those reports are amended with detailed experimental design and materials and methods, along with raw data, recordkeeping information, and any pictures.

A report submitted electronically is preferred but not required. If the report is provided electronically, the basic report can be sent in MS Word or WordPerfect, the recordkeeping information as pdf or other electronic documents, and the raw data in MS Excel or other suitable program such as ARM.

Please direct questions to: Cristi Palmer, IR-4 HQ, Rutgers University, 500 College Road East, Suite 201W, Princeton, NJ 08540, Phone 732-932-9575 x4629, palmer@aesop.rutgers.edu.

Draft Date: 5/11/07
Revised By: CLP

Priority A and Standard Treatments List with rates, special application instructions, and contact information to obtain product and any suitable adjuvant needed.

Priority	#	Product	Rates	Reapplication Interval	Special Application Instructions (Soil Drench)	Contact Information to obtain materials and any needed adjuvants
A	1	Segway (cyazofamid)	3.0 oz/100 gal	14 – 28 d	DO NOT add organosilicone surfactant	ISK, Mel Grove, 713-393-3750, grovem@iskbc.com
	2	Segway (cyazofamid)	6.0 oz/100 gal			
	3	Heritage (azoxystrobin)	0.9 oz/100 gal	28 day	Apply 4 oz/6 inch pot or 2pt/sq ft.	Syngenta, Nancy Rechsigl, 941-708-9338, nancy.rechcigl@syngenta.com
	4	Heritage (azoxystrobin)	1.8 oz/100 gal			
	5	V-10161 4FL	60 ml/100gal	28 day	Apply 1 pint solution per sq ft. Increase volume to 2 pints solution per sq ft if soil media depth is greater than 4 inches.	Valent, Joe Chamberlin, 770-985-0303, jcham@valent.com
	6	V-10161 4FL	120 ml/100 gal			
Standards	7	Standard Control 1*	See below	See below	See below	See below
	8	Standard Control 2*	See below	See below	See below	See below
	9	Untreated Uninoculated	--	--	--	
	10	Untreated Inoculated	--	--	--	
Optional Uninoculated Treatments	11	Cyazofamid	6.0 oz/100 gal	See above	Use same application instructions as above for appropriate products	See above
	12	Heritage (azoxystrobin)	1.8 oz/100 gal			
	13	V-10161 4FL	60 ml/100 gal			

* Select 2 of the four standards below						
Standards	a	Aliette (fosetyl Al)	6.4 to 12.8 oz/100 gal		Apply 2 pints solution per sq ft	Bayer, Mike Gorrell, , mike.gorrell@bayercropscience.com
	b	Captan	See label for specific rate based on plant		Refer to label for directions	Arysta, Doug Houseworth, 904-321-0795, LlHouse9@aol.com
	c	Subdue Maxx (mefonaxam)	See label for specific rate based on plant species		Refer to label for directions	Syngenta, Nancy Rechsigl, 941-708-9338, nancy.rechcigl@syngenta.com
	d	Terrazole (etridiazole)	8 oz/100 gal		Refer to label for specific directions based on planting location or container size	Chemtura, Kevin Donovan, 203-573-2028, kevin.donovan@chemtura.com
	e	Stature DM (dimethomorph)	Herbaceous:6.4 oz/100 gal Woodies: 12.8 oz/100 gal	14 d intervals	Apply at 14 d intervals	BASF, Kathie Kalmowitz, 919-270-4592, kathie.kalmowitz@basf.com

Priority B & C Treatments List with rates, special application instructions, and contact information to obtain product and any suitable adjuvant needed.

Priority	Product	Rates	Reapplication Interval	Special Application Instructions	Contact Information to obtain materials and any needed adjuvants
C	Actinovate	Drench: 10 oz/100 gal Foliar application: 12-oz per 100 gallons per acre	Drench:21-28 days Foliar: 7-14 days	Drench: Completely drench growing medium. First application is best done as early in growing cycle as possible in order to establish the microbe on the Rhizosphere Foliar: Use a non-ionic spreader –sticker in conjunction (i.e Capsil)	Natural Industries, Matt Kowalski, 888-261-4731, mattk@naturalindustries.com
B	Alude	12.7 fl oz/100 gal	28 d	Drench: Apply 1 pint per sq ft.	Cleary, Rick Fletcher, 732-329-8399, rick.fletcher@clearychemical.com
B	BioPhos	64 fl oz/100 gal		Apply at 2 pts per sq ft	AgBio, Jan Meneley, 303-469-9221, agbio@agbio-inc.com
C	Disarm	2 oz/100 gal Optional: 1 oz/100 gal for inoculated and 2 oz/100 gal for uninoculated		Drench	Arysta, Doug Houseworth, 904-321-0795, LlHouse9@aol.com
B	Fenamidone	14.0 oz/100 gal		Drench at 1 – 2 pints per sq ft.	Bayer, Mike Gorrell, mike.gorrell@bayercropscience.com
C	Heritage + Subdue	0.9 oz + 1 oz		Drench	Syngenta, Nancy Rechsigl, 941-708-9338, nancy.rechcigl@syngenta.com
B	Insignia (Pyraclostrobin)	8 oz/100 gal		Must use a minimum of 200 ml spray volume in a 6" standard pot. Drench directions state: Drench at half volume is equal to a volume of fungicide solution that replaces the top half of the volume of water/air-filled pore space of a given potting media in a given pot at field capacity. 200 ml is considered the minimum required or half volume; 400 ml is considered the full volume or maximum drench column required.	BASF, Kathie Kalmowitz, 919-270-4592, kathie.kalmowitz@basf.com

Priority	Product	Rates	Reapplication Interval	Special Application Instructions	Contact Information to obtain materials and any needed adjuvants
B	Magellan	Foliar applications: Herbaceous: 1.25 – 4 pints per 100 gal Woodies: 2 – 5 pints per 100 gal Drench application: 6 – 12 fl oz/100 gal	14 d for bedding plants 30 d for conifers 28 d	Apply 2 pints solution per sq ft.	Nufarm, Jim Fickle, 708-205-0255, jim.fickle@us.nufarm.com
B	MultiGuard (furfural)	1000 ppm drench	7 d	MultiGuard Protect contains 8.68 lbs. furfural/gallon: to make a 1,000 PPM solution, use 0.96 ml Multiguard Protect/liter of drench solution. Drench solutions should be made immediately prior to use. For drench applications, sufficient drench solution should be applied so that water just starts running from the pots. This will ensure complete distribution of the product throughout the root zone.	Agriguard, Jerry Hensley, 731-664-9185, jhensley@agriguardcompanyllc.com
B	*Muscodor albus*	7.5 grams per liter soil volume		Apply after pathogen inoculation	AgraQuest, Brett Highland, bhighland@agraquest.com
B	NOA 446510 (mandipropamid)	4 oz/100 gal 8 oz/100 gal	7 – 14 d	Drench application	Syngenta, Nancy Rechsigl, 941-708-9338, nancy.rechcigl@syngenta.com
B	TM-473 480SC	3 oz/100 gal			Arysta, Doug Houseworth, 904-321-0795, LlHouse9@aol.com
B	Vital	Herbaceous: 2 - 4 pints/100 gal Woodies: Drench application: 4 pints/100 gal per 400 sq.ft. Foliar application: 4 pints/100 gal	14 d 30 d 14 d		Luxembourg Industries, Vince Morton, 336-286-9714, mortv@aol.com

Appendix 2: Contributing Researchers

Dr. Mike Benson	NC State University Dept. of Plant Pathology 840 Method Rd. – Unit 3 Raleigh, NC 27695
Dr. Gary Chastagner	Washington State University Research and Extension Center 7612 Pioneer Way East Puyallup, WA 98371
Dr. Mary Hausbeck	Michigan State University Dept. of Plant Pathology 140 Plant Pathology Building East Lansing, MI 48824
Dr. Robert Lambe	Lambes Consulting PO Box 65483 Port Ludlow, WA 98365-0483
Dr. Bob Linderman (*retired*)	Horticultural Crops Research Lab USDA-ARS 3420 NW Orchard Ave. Corvallis, OR 97330
Dr. Jim Locke	ATRU Univ of Toledo, GPRG USDA-ARS 2801 W. Bancroft St., Mail Stop 604 Toledo, OH 43606

Appendix 3: Submitted Data

Researcher reports included in the printed copy of this report are those received by 3/15/2010. Reports on following pages are in alphanumeric order of author and PR number.